FIRE ISLAND INLET TO MORICHES INLET
FIRE ISLAND STABILIZATION PROJECT

Evaluation of a Stabilization Plan for Coastal Storm Risk Management In Response to Hurricane Sandy & Public Law 113-2

FINAL ENVIRONMENTAL ASSESSMENT

U.S. Army Corps of Engineers
New York District

June 2014

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APE	Area of Potential Affect
BA	Biological Assessment
BCP	Beach Contingency Plan
BMP	Best Management Practice
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation Act
CZM	Coastal Zone Management
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EAS	Environmental Assessment Statement
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FCAF	Federal Consistency Assessment Form
FIIS	Fire Island National Seashore
FILT	Fire Island Lighthouse
FIMI	Fire Island Inlet to Moriches Inlet
FIMI TSP	Fire Island Inlet to Moriches Inlet Tentatively Selected Plan
FIMP	Fire Island Inlet to Montauk Point
GDM	General Design Memorandum
GMP	General Management Plan
HAPC	Habitat of Particular Concern

HIS	Habitat Suitability Index
HTRW	Hazardous, Toxic, Radioactive Waste
HSUS	Humane Society of the United States
JMA	John Milner Assoc. Inc.
LIRPB	Long Island Regional Planning Board
LLP	Level of Protection
LTRCMP	Long Term Regional Comprehensive Management Plan
MAFMC	Mid-Atlantic Fisheries Management Council
MHW	Mean High Water
MLW	Mean Low Water
MIDU	Updated Middle Alignment
MSFCMA (MSA)	Magnuson-Stevens Fishery Conservation and Management Act
MSL	Mean Sea Level
NED	National Economic Development
NEPA	National Environmental Policy Act
NHP	Natural Heritage Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRHP	National Register of Historic Places
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
NYSSHPO	New York State Office of Parks, Recreation, and Historic Preservation
PCR	Physical Cultural Resource

PL	Public Law
POW	Point of Woods
OBP	Ocean Bay Park
ORV	Off-Road Vehicle
RCRA	Resource Conservation and Recovery Act
RFMRP	Riverhead Foundation for Marine Research and Preservation
RMSP	Robert Moses State Park
RTE	Rare, Threatened and Endangered
SAV	Submerged Aquatic Vegetation
SCFWH	Significant Coastal Fish and Wildlife Habitats
SEQR	State Environmental Quality Review
SPCP	Smith Point County Park
SPCP-TWA	Smith Point County Park- TWA Memorial
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
USACOE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS/	Office of the U.S. Geological Survey- Biological Research Division
WQC	Water Quality Certificate
WRDA	Water Resources Development Act
WRP	Waterfront Revitalization Program

1.0 INTRODUCTION

1.1 Study Authority

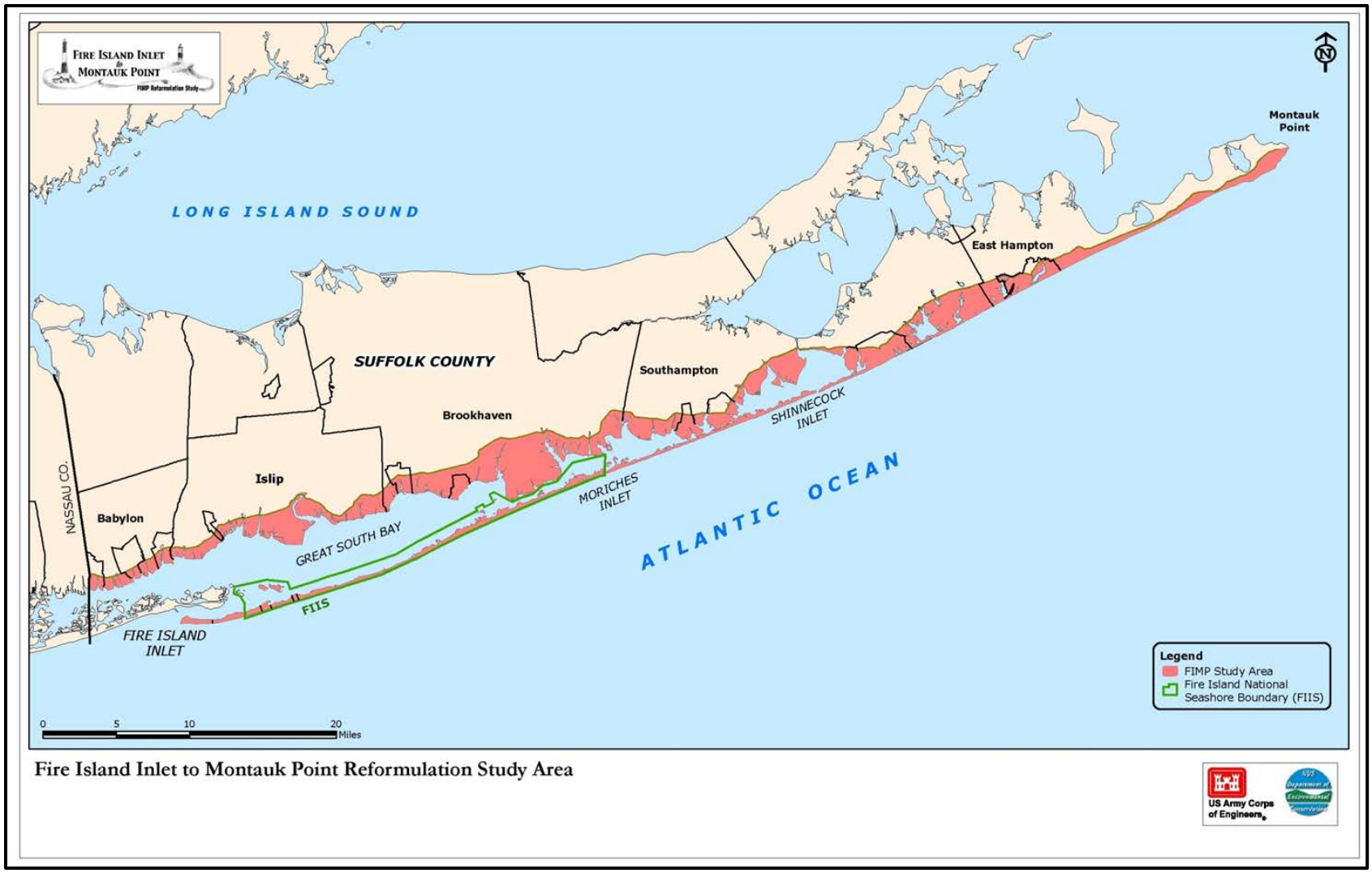
The Fire Island Inlet to Montauk Point (FIMP), New York, Combined Beach Erosion Control and Hurricane Protection Project was authorized by the River and Harbor Act of 14 July 1960, and subsequently modified in accordance with Section 103 of the River and Harbor Act of 12 October 1962. The project authorization was modified again by Section 31 of the Water Resources Development Act (WRDA) of 1974 (Public Law {PL} 93-251). The authorization was further modified by section 502 of the WRDA of 1986 (P.L. 99-662). For portions of Fire Island to Montauk Point, other than the portion from Moriches Inlet to Shinnecock Inlet, Section 103 of the WRDA of 1986 (P.L. 99-662) defined the cost sharing of the first cost to be 65% Federal. In addition, Section 156 of the WRDA of 1976, as modified by Section 934 of the WRDA 1986, provides for continued renourishment not to exceed 50 years from initiation of construction of each of these reaches.

This document is an Environmental Assessment (EA), prepared to demonstrate project compliance with the National Environmental Policy Act (NEPA) in accordance with the Council of Environmental Quality (CEQ) regulations (November 20, 1978, 40 CFR Parts 1500-1508).

1.1.1 Fire Island Inlet to Moriches Inlet (FIMI) Study Area

The FIMI study area includes Fire Island, including Great South Bay which extends approximately 30 miles east from Fire Island Inlet to Moriches Inlet. Fire Island Inlet and Moriches Inlet are Federal navigation channels that connect the ocean and the bays (see Figure 2 and Appendix B of the HSLRR). Beaches along the barrier island are generally characterized by a well-defined dune system with crest elevations ranging from 6 to 40 feet relative to the National Geodetic Vertical Datum (NGVD). Beach berm widths vary throughout the study area, ranging from approximately 30 feet to 150 feet, with average beach berm elevations of approximately six to ten feet NGVD.

Within the study area, ocean shoreline sand generally moves east to west alongshore, in response to waves, and currents during normal conditions and during storms. This alongshore movement of sand maintains the prevailing shoreline conditions. In addition to alongshore movement, sediment is also exchanged in the cross-shore direction, through erosion and accretion of the beach and dune, exchange of sand through and across tidal inlets, continued erosion of the inner continental shelf, redistribution of reworked sediments, and during large storm events through the episodic transport of sand over the island through overwash or breaching.



Fire Island Inlet to Montauk Point Reformulation Study Area

Figure 1 – FIMP Study Area

1.2 Purpose and Need

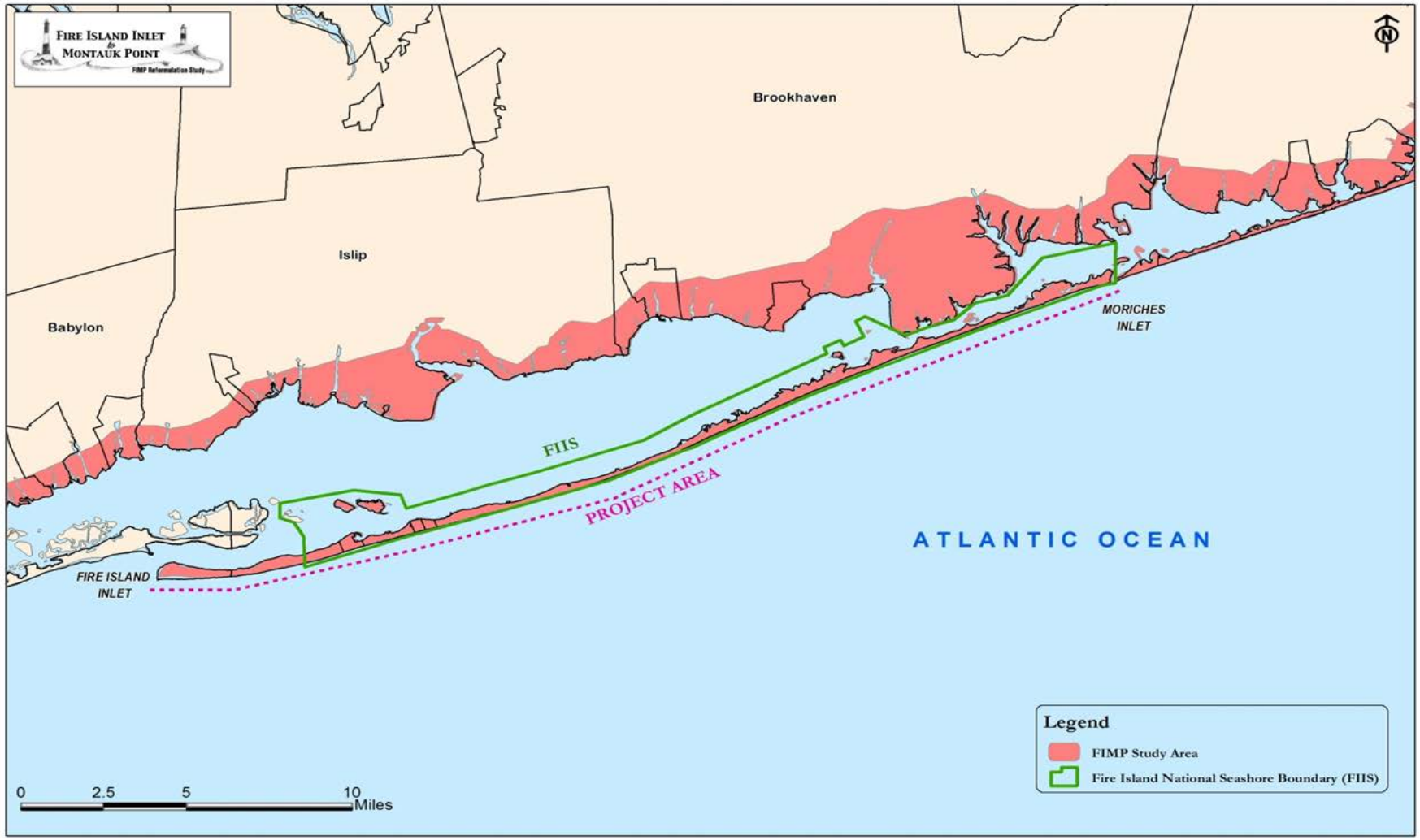
Recent storm events, most notably Hurricane Sandy in 2012, have reduced sand volumes of beaches and dunes in the project area, leaving communities on the coastal barrier and along the bay shores north of Fire Island vulnerable to potential future storm surges. There is increased potential for overwash and breaching of the coastal barriers during storm events. Although beach berm widths have recovered in the time period since Hurricane Sandy, dunes deflated by these storms leave the area more prone to overwash from storm surge. The slow rate of dune growth will leave the Fire Island communities and the coastal barrier vulnerable for the foreseeable future without active intervention. This EA documents the impacts associated with implementing the FIMI Stabilization Project. (Additional details on the purpose and need are contained in the HSLRR, specifically, Appendix B – Physical Conditions)

A proposed solution to address the vulnerability is the implementation of Stabilization Projects (within FIMI and also Downtown Montauk to be discussed in another report). These projects are proceeding on a separate, accelerated path separate from those previously executed as "Interim Projects" along the south shore of Long Island with because of the urgency to restore the coastline in this particular reach, thereby addressing the immediate need to reduce risk to life and property that resulted from Hurricane Sandy. The assumption for these Stabilization Projects is that these projects are advancing as unique 100% Federally-funded stabilization components and separate from other projects.

The FIMI Stabilization Project has been developed to reinforce the existing dune and berm system along the island. The selected design includes beachfill at Robert Moses State Park, Fire Island Lighthouse Tract, all of the communities outside of Federal Tracts, and Smith Point County Park. Beachfill is not included in any Major Federal Tracts, except Fire Island Lighthouse which was requested by the National Park Service to protect the Lighthouse and the only access road to the communities on Fire Island.

1.3 Background/Relationship to Other Projects and Studies

The Fire Island Inlet to Montauk Point, NY project (FIMP) was originally authorized in the River and Harbor Act of 1960 including Fire Island. For this project, in 1963, a General Design Memorandum (GDM) was prepared. The GDM recommended building groins and placing beach fill along the south shore of Long Island. Construction began in 1965, and 11 groins were built. Later in the 1960's 4 more groins were constructed bringing the number of groins constructed to 15. In the 1970s, the final two groins were built. All of the constructed groins were located east of Fire Island. The FIMP project was halted in 1972 when New York State withdrew its support of the project. In 1978, an Environmental Impact Statement (EIS) was prepared by the New York District for the FIMP project. After consultation with the U.S. Department of Interior, the EIS was referred to the Council on Environmental Quality (CEQ), which found the document to be inadequate because of the lack of consideration of alternatives. In addition, CEQ indicated that the impact analysis needed to treat the complete length of the barrier island as a system. Work began on a Reformulation Study, but was halted in 1984 because of a disagreement about cost sharing. This disagreement was resolved following the adoption of the Water Resources Development Act of 1986.



Fire Island to Montauk Point (FIMP) Reformulation Study - Project Area

Figure 2 – FIMI Study Area

Study efforts were resumed in 1994 and are ongoing. Additional details on the Reformulation project are presented in the Hurricane Sandy Limited Reevaluation Report (HSLRR) that accompanies to this EA. While the FIMP Reformulation Study is being completed and prior to implementation of the FIMI selected plan, the barrier islands are still subject to storms that could damage structures, open breaches, and cause flooding on the bayshore. With support from state and local interests, three Interim Plans have been developed while the Reformulation Study proceeds. The first Interim Plan entailed breach fill, dune construction, and support of the existing groin field in Westhampton Beach. A design by New York State was modified by the USACE and was approved by all involved local and federal agencies. The Westhampton Interim Project was constructed in 1997 and 1998. The second interim project was the development of a Breach Contingency Plan (BCP). The BCP authorized the closing of a barrier island breach within 3 months, and rebuilding the beach and dunes to provide protection consisting of a berm at elevation 9 feet above NGVD. The BCP was developed and is in place. Another Interim Plan prepared provided for the protection of the commercial fishing facilities West of Shinnecock Inlet. The beach west of Shinnecock Inlet is subject to overwash with high breach potential, and the area is subject to severe erosion.

The wind and storm surge associated with Hurricane Sandy (2012) caused numerous overwashes and three breaches occurred on south shore barrier island system of Long Island. Two of those three breaches were on Fire Island and within the boundaries of Fire Island National Seashore: one at Old Inlet (within the Otis Pike Fire Island High Dune Wilderness) and another in Smith Point County Park. In response to breaching of the barrier island, the Department of Environmental Conservation in concert Suffolk County requested assistance from USACE to close the Smith Point and Cupsoque County Park breaches under the Breach Contingency Plan (BCP). The breaches at Cupsogue County Park and Smith Point County Park and were closed in November 2012 and December 2012, respectively. The breach at the "Old Inlet" area within the Fire Island Wilderness Area is being evaluated by the National Park Service to create a baseline from which to measure changes in the breach. At this time, no closure activities have been initiated. In Fiscal Year 2014, National Park Service received funds to evaluate ecological responses and prepare a NEPA analysis to inform future breach management decisions at Fire Island. Expected date of the draft document for public review is mid 2015.

2.0 ALTERNATIVES

The overall FIMP Reformulation Study was undertaken to evaluate alternatives to determine Federal interest in participating in one or more of these alternatives, and identify a mutually agreeable joint Federal/state/locally supported plan for addressing the storm risk management needs in the study area. In addition to addressing the USACE's national objectives of storm risk management and environmental sustainability, this collaborative effort identified alternatives for implementation by other Federal, state and local agencies to achieve broader study objectives. This section provides a summary of the formulation and provides an introduction to the FIMI Stabilization effort.

2.1 Alternative Analysis

The Fire Island Inlet to Montauk Point, New York, Combined Beach Erosion Control and Hurricane Protection Project (FIMP) was first authorized by the River and Harbor Act of 14 July 1960 which established the authorized project. The project is being reformulated by USACE as the lead Federal agency to identify a comprehensive long-term solution to manage the risk of coastal storm damages along the south shore of Long Island in a manner which balances the risks to human life and property while maintaining, enhancing, and restoring ecosystem integrity and coastal biodiversity.

Summary of Alternative Plan Development

The following is a summary of the formulation process to date which identified the TSP.

The FIMP Reformulation Study followed three-iterations of planning to arrive at the TSP, including first an initial screening of measures, to identify what types of solutions warranted further consideration. This initial screening was followed with a design and evaluation of alternatives where each measure from the screening phase was developed for different scales of risk management and compared relative to each other to identify the optimal scale of protection. The third phase of the alternative analysis was the combination of these optimized features into plans.

The result of the design and evaluation analyses of proposed alternatives identified that a wide range of the individual alternatives are cost effective options for Storm Risk management within the Study Area. The analysis also indicated that there is not one alternative that addresses all the storm risk management problems, but rather, addressing multiple problems requires multiple solutions. In this respect, many of the alternatives considered complement each other, and Alternative Plans benefit from combinations of alternatives. In addition, the NER evaluation of measures identified that various restoration alternatives are complimentary to, or compatible with each of the Storm Risk management Plans. This phase recommended the following features be integrated into overall Plans of improvement:

- Inlet bypassing Plans
- Breach Response Plans (Responsive Plan at +9.5 ft NGVD, Responsive or Proactive Plans at +13 ft NGVD)
- Non-Structural Plans (6-year and 10-year levels of risk management) - defined as those activities to minimize potential damages through elevation, relocation, flood proofing, buyout, etc
- Beachfill (13 ft Dune and 15 ft Dune) - soft structural measures, generally are those constructed of sand and are designed to “augment and/or” mimic the existing natural protective features

These Alternative Plans were developed by combining the above alternatives in accordance with the procedures in the Planning Overview Chapter. The approach gives first priority to management options, particularly options that restore natural processes. The second priority is to include non-structural alternatives with beach nourishment or other structural alternatives considered last. This formulation approach ensures that Plans are consistent with the NY State Coastal Zone Management policies, and also places a priority on avoiding or minimizing any negative environmental impacts.

Based on the evaluation of the individual alternatives, combined plans were developed. First, Second and Third added plans were developed by incrementally adding Management Alternatives (Plan 1), Non-Structural Alternatives (Plan 2), and Structural Alternatives (Plan 3). The scale of the alternatives selected for inclusion was based on the results of the optimization of individual alternatives and the potential for the combined alternatives to more fully satisfy the project objectives and evaluation criteria.

Identification of FIMI Beachfill Alternative

The post-Sandy Fire Island Stabilization Project, which encompasses Fire Island to Moriches Inlet, was developed based upon the Engineering, Economic, Environmental, and Planning efforts that have been undertaken through the ongoing FIMP Reformulation Study that compared alternatives referenced in this report to identify the recommended scale and scope of a beachfill project from the TSP, as an independent stabilization effort. Stabilization efforts were focused on FIMI as this reach is most greatly subjected to barrier island overwash and breach thereby exposing the back-bay to considerable damages. There is a more urgent need to advance the stabilization of this reach due to its vulnerability and potential for major damage and risk to life and property.

The stabilization effort has been developed as a one-time, stand-alone construction project to repair damages caused by Hurricane Sandy and to stabilize the island. The FIMI Stabilization Project has its own independent utility, and as developed does not limit the options available in the overall FIMP Reformulation Study or pre-suppose the outcome of the Reformulation Study. After the initial placement of sand, the project is expected to erode, and diminish in its protective capacity, eventually returning to a pre-project condition. In the absence of a future decision, the area is expected to continue to be managed consistent with current practices.

Two alternatives are evaluated in this EA, the No Action Alternative and a Beach Fill Alternative. The beach fill alternative is the recommended alternative and is the environmentally preferred plan because it reduces storm damages in a manner that mimics the natural protective features of the barrier island for more information refer to the HSLRR .

2.2 No Action Alternative

Under the No Action Alternative, the Corps of Engineers and the Federal government would take no action to reduce storm damages in the study area. It is recognized that in the absence of Federal action that Local Governments and non-Governmental groups, such as homeowner associations could take actions to protect themselves by undertaking their own construction projects to build up the beach and dune profiles. Although these actions are likely to occur, these have not been included in the no action alternative, for purposes of this analysis. The following is a summary of the elements what is likely to occur within the No Action Alternative:

- As defined by existing Federal/State navigation authorities, the existing inlets (Fire Island, and Moriches Inlets) and their corresponding approach and back-bay navigation channels will be maintained near the present widths depths, and locations through the study period.
- Periodic beach fills and beach scraping will continue to be implemented by local governments and home owner associations to maintain some threshold beach condition. This condition is based on a review of historic activities including the extent of local and private activities. It is likely that future regulatory requirements may limit the size, scope, and timing of future local projects; but even with these conditions, it is expected that within their available resources, local groups will continue to maintain a minimum beach and dune condition.
- No Federal interim storm protection projects will be considered in place except for the Westhampton Interim Project, which will be maintained until the end of the renourishment period in 2027. After 2027, the Westhampton Interim Project will be subject to agreements outside the USACE jurisdiction. Further, the West of Shinnecock Inlet (WOSI) Interim Project

period of renourishment has expired as a WOPFC. (Although these projects are outside the footprint of the FIMI area, their influence has been accounted for in this project).

- The Interim Breach Contingency Plan (BCP), which is presently in place, will not be considered as part of the WOPFC because it is intended as a temporary measure to be superseded by the results of the Reformulation Study. BCP was approved in 1996 and implemented under Advanced Measures (PL 84-99).
- It is recognized that even in the absence of a BCP that breaches in the barrier islands will be closed either through natural closure or human intervention. This condition is based on the historic pattern of repeated breach closures, including after the storms of 1938, 1954, 1962, 1980, & 1992, and the State's history to close breaches and conduct breach maintenance activities. In the absence of a streamlined approval process it is estimated that breach closure would occur within approximately 12 months in all areas outside of the Otis G. Pike Wilderness Area. Within the Wilderness Area of the Fire Island National Seashore, closure of a breach would be subject to agreement with the National Park Service, and require additional compliance to satisfy the Wilderness Management Plan.
- It is recognized that there is an existing breach at Old Inlet, which was formed during Hurricane Sandy, and is currently open with a width of approximately 1,000 ft. It is acknowledged that the decision to take action with this breach is subject to a separate decision-making process. There is the possibility that the breach could close naturally, another storm could trigger the need to close the breach under emergency provisions, a decision could be made to close the breach, or another decision could be reached as a result of the separate, decision-making process.

2.3 FIMI Stabilization Beach Fill Alternative (Selected Plan)

The proposed project is comprised of three (3) design templates identified as "berm only" "small" and "medium", which are described below. These features are described relative to NGVD throughout the report. The conversion to NAVD is provided below.

The "berm only" design template includes a berm width of 90 ft at elevation +9.5 NGVD (+8.5 ft NAVD), and no dune behind the berm (no vegetation is proposed for this design template). It includes a foreshore slope of 12 horizontal (H) on 1 vertical (V) from +9.5 to +2 ft NGVD, or mean high water (MHW), equating to an additional 115 ft of beach above MHW. This template is proposed in areas where eroded berm conditions have been observed, but where existing dune elevation and width are sufficient to reduce the risk of overwashing and breaching. Areas that meet these criteria include Robert Moses State Park, western Smith Point County Park and the TWA Memorial Beach.

The "small" template is intended to reduce the risk of breaching. It is proposed for areas with limited oceanfront structures. The "small" fill template includes a berm width of 90 ft, at elevation +9.5 ft NGVD (+8.5 ft NAVD) and a vegetated dune with a crest width of 25 ft at an elevation of +13 ft NGVD (+12 ft NAVD). It also includes a foreshore slope of 12H:1V from +9.5 to +2 ft NGVD, equating to an additional 115 ft of beach above MHW. It is proposed for areas with limited oceanfront structures, including Smith Point County Park.

Fire Island Lighthouse Tract (modified "small" design template): The dune and beach design template the NPS Fire Island Lighthouse Beach would include an unvegetated dune. The proposed 3,800 ft length of dune would be constructed at +13 NGVD (+12 ft NAVD) and have side slopes of 1V:10H, and a 25 ft crest width.

The "medium" design template is proposed for areas that have the greatest potential for damages to oceanfront structures and includes the 17 communities on Fire Island (including Kismet to Lonelyville,

Town Beach to Corneille Estates, Ocean Beach to Seaview, Ocean Bay Park to Point O' Woods, Cherry Grove, Fire Island Pines, Water Island, and Davis Park). The medium design template includes a berm width of 90 ft at an elevation at +9.5 ft NGVD (+8.5 ft NAVD), and a vegetated dune with a crest width of 25 ft at an elevation of +15 ft NGVD (+14 ft NAVD). It also includes a dune slope of 1V:5H and a foreshore slope of 12H:1V.

West of Robbins Rest (modified "medium" design template): In the area between Atlantique and Robbins Rest, approximately 900 ft of the proposed dune northward to the existing vegetation will be re-aligned in an effort to conserve partial overwash habitat that formed in this area due to Hurricane Sandy. The dune design template in this area includes a berm width of 90 ft at an elevation at +9.5 ft NGVD (+8.5 ft NAVD), and a vegetated dune with a crest width of 25 ft at an elevation of +15 ft NGVD (+14 ft NAVD). It also includes a dune slope of 1V:5H and a foreshore slope of 12H:1V.

Based upon consultation with the USFWS under Section 7 of the Endangered Species Act, project features have been incorporated as habitat offsets for Piping Plover. These features have been included as non-discretionary measures in the project as defined in the Reasonable and Prudent Measures of the Biological Opinion. These features are provided in detail in the report, and generally include:

- Devegetation and topographical alteration and management in the Vicinity of Great Gunn Beach and extending eastward to Moriches Inlet, to provide approximately 33.7 hectares of piping plover nesting and foraging habitats including ephemeral pools.
- The creation of plover foraging and nesting habitat on six hectares of habitat in the vicinity of the dredge material management site located near New Made Island.
- The adaptive management of plover habitat through vegetation management to achieve sparsely vegetated overwash areas in Smith Point County Park at the Pattersquash Island Overwash, Smith Point Breach Location, and New Made Island Overwash.
- The development and implementation of a coordinated plover monitoring program, coordinated mammalian predator management plan, coordinated stewardship, and coordinated effectiveness monitoring to inform the adaptive management of these habitat offset areas.

The total initial project fill volume would be 6,992,145 yd3 which represents the volume of sand necessary to achieve the design fill, advance fill, overfill, and contingency profiles for 19 mi of beach. No renourishment cycles are planned for the proposed project.

The sandy offshore habitats that are designated as sand mining areas are known as Borrow Area 2C, Borrow Area 4C and Borrow Area 5B (refer to Figure 3 and Section 3.34). {Note: During the preparation of this EA, Fire Island National Seashore received emergency Hurricane Sandy funds from the Federal Highway Administration's Eastern Federal Lands Division to dredge approximately 60,000 cubic yards from the Seashore's Watch Hill boat channel and marina. Currently, the plans are to undertake dredging during the channel's fall dredge window of 2014 (October 1 - December 15) which would coincide with the Stabilization Project's proposed construction schedule. While the Watch Hill project's objective is to re-establish the channel for safe passage by all users of the channel, it also outlines the beneficial use of the dredged material by either stockpiling or placement in permitted areas (FIIS, 2013).}

NPS is proposing that the 60,000 cubic yards be beneficially placed to create a feeder beach with a berm elevation not to exceed 9.5 ft. NGVD on the first 1500 feet of the eastern end of Davis Park. This action will augment the Stabilization Project's need for sand within Davis Park. NPS is proposing that the pipeline from the channel to the placement site will be positioned on public land (Federally or locally permitted).

The alignment of the FIMI Selected Plan has been optimized to the existing barrier island profile, including beach berm and dumes, and minimizes shifting the beach alignment seaward to protect a small number of structures that are set apart from the other structures. In several areas, tapers have been adjusted per consultations with U.S. Fish and Wildlife Service and National Park Service in order to address park objectives and minimize potential adverse impacts to threatened and endangered species. The selected alignment requires 41 real estate acquisitions, 6 real estate relocations (6 structures and relocation/reconstruction of the Ocean Beach well complex) and over 600 permanent easements for construction. The majority of the acquisitions are in either Ocean Bay Park (19) or Davis Park (19). The other three acquisitions are located in Dunewood (2) and Robbins Rest (1). Beach fill tapers are also proposed in several locations within Federal Tracts to avoid and lessen the end losses of the proposed project's dune and berm features. Table 1 provides an overview of the dune elevations by location along the selected plan.

Table 1 – Overview of Selected Design Sections

BERM/DUNE DESIGN	**NGVD 29**	***NAVD 88***
A. ROBERT MOSES STATE PARK		
Berm Width	90 ft.	NA
Top Elevation	9.5 ft.	8.5 ft
Slope	12H:1V	NA
Fill Volume	1,160,400 c.y	NA
Vegetation	NA	NA
B. SMITH POINT COUNTY PARK		
Berm Width	90 ft.	NA
Top Elevation	9.5 ft.	8.5 ft
Foreshore Slope	12H:1V	NA
Dune Slope	5H:1V	NA
Dune Crest Width	25 ft	NA
Dune Elevation	13 ft	12ft
Fill Volume	1,430,000 c.y	NA
Vegetation	18 inch spacing	NA
1. Pattersquash Island Overwash		
Berm Width	90 ft.	NA
Top Elevation	9.5 ft.	8.5 ft
Foreshore Slope	12H:1V	NA
Dune Slope	5H:1V	NA
Dune Crest Width	25 ft	NA
Dune Elevation	13 ft	12ft
Volume	13 Hectares	NA
Vegetation	18 " spacing	NA
2. Smith Point Breach Overwash		
Berm Width	90 ft.	NA

Top Elevation	9.5 ft.	8.5 ft
Foreshore Slope	12H:1V	NA
Dune Slope	5H:1V	NA
Dune Crest Width	25 ft	NA
Dune Elevation	13 ft	12ft
Volume	6.1 Hectares	NA
Vegetation	18” spacing	NA

3. New Made Island Overwash – 10.5 HA

Berm Width	90 ft.	NA
Top Elevation	9.5 ft.	8.5 ft
Foreshore Slope	12H:1V	NA
Dune Slope	5H:1V	NA
Dune Crest Width	25 ft	NA
Dune Elevation	13 ft	12ft
Volume	10.5 Hectares	NA
Vegetation	18” spacing	NA

4. New Made Dredge Disposal Habitat Location

Volume	4 HA +2 HA Expansion	NA

5. Great Gunn

Berm Width	90 ft.	NA
Top Elevation	9.0-7.0 ft.	8.0-6.0 ft
Foreshore Slope	12H:1V	NA
Dune Slope	5H:1V	NA
Dune Crest Width	25 ft	NA
Dune Elevation	13 ft	12ft
Volume	768,350 cy &34 Hectares	NA
Vegetation	18” spacing	NA

C. FIRE ISLAND LIGHTHOUSE TRACT

Berm Width	90 ft	NA
Top Elevation	9.5 ft.	8.5 ft
Foreshore Slope	12H:1V (vegetated)	NA
Fill Volume	444,500 c.y	NA
Dune Crest Width	25 ft	NA
Dune Elevation	13 ft	12 ft
Dune Slope	5H:1V	NA

D. COMMUNITIES (MEDIUM)

Berm Width	90 ft	NA
Top Elevation	9.5 ft.	8.5 ft
Slope	1V:5H (vegetated)	NA

Fill Volume	3,635,000 cy	NA
Dune Crest Width	25 ft	NA
Dune Elevation	15 ft	14 ft
Dune Slope	5H:1V	NA

E. ROBBINS REST

Berm Width	90 ft	NA
Top Elevation	9.5 ft.	8.5 ft
Slope	1V:10H (un-vegetated)	NA
Dune Crest Width	25 ft	NA
Dune Elevation	15 ft	14 ft
Length	900 ft	NA

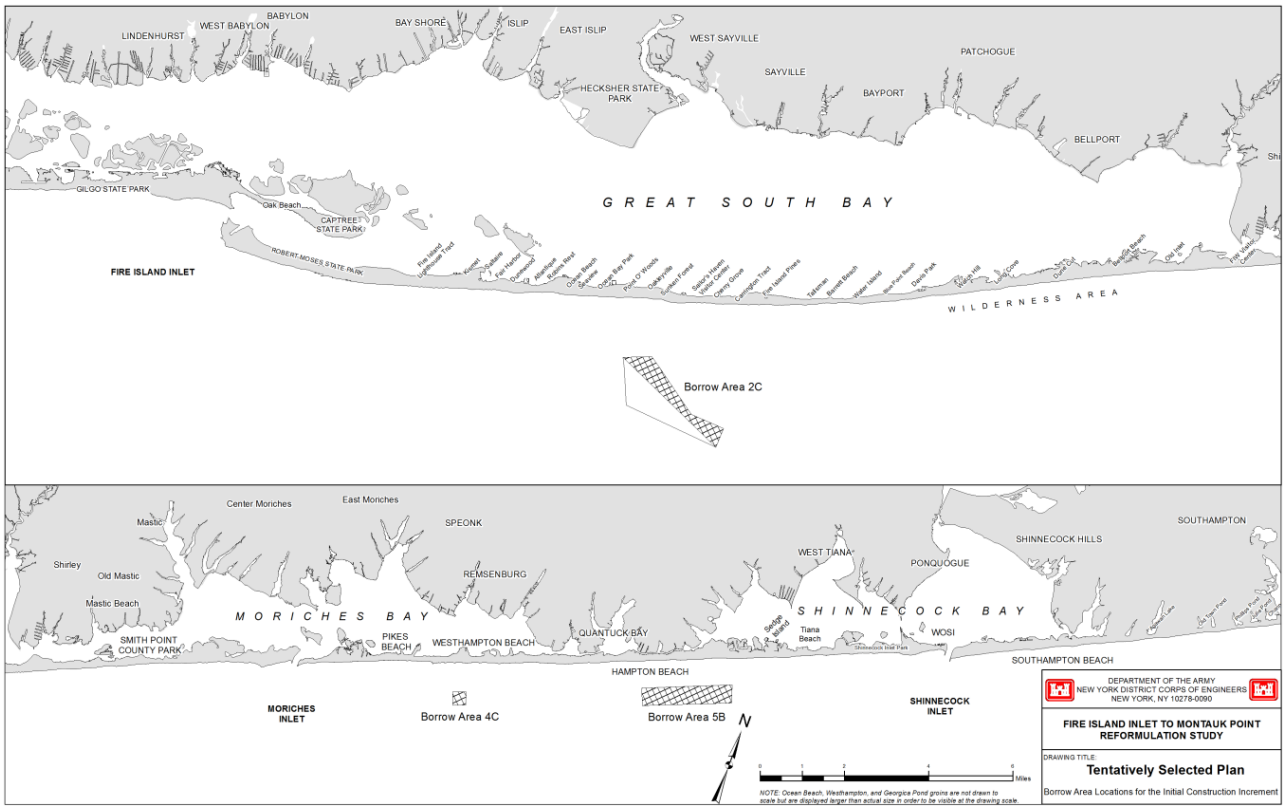


Figure 3 – Selected Plan Borrow Area Locations

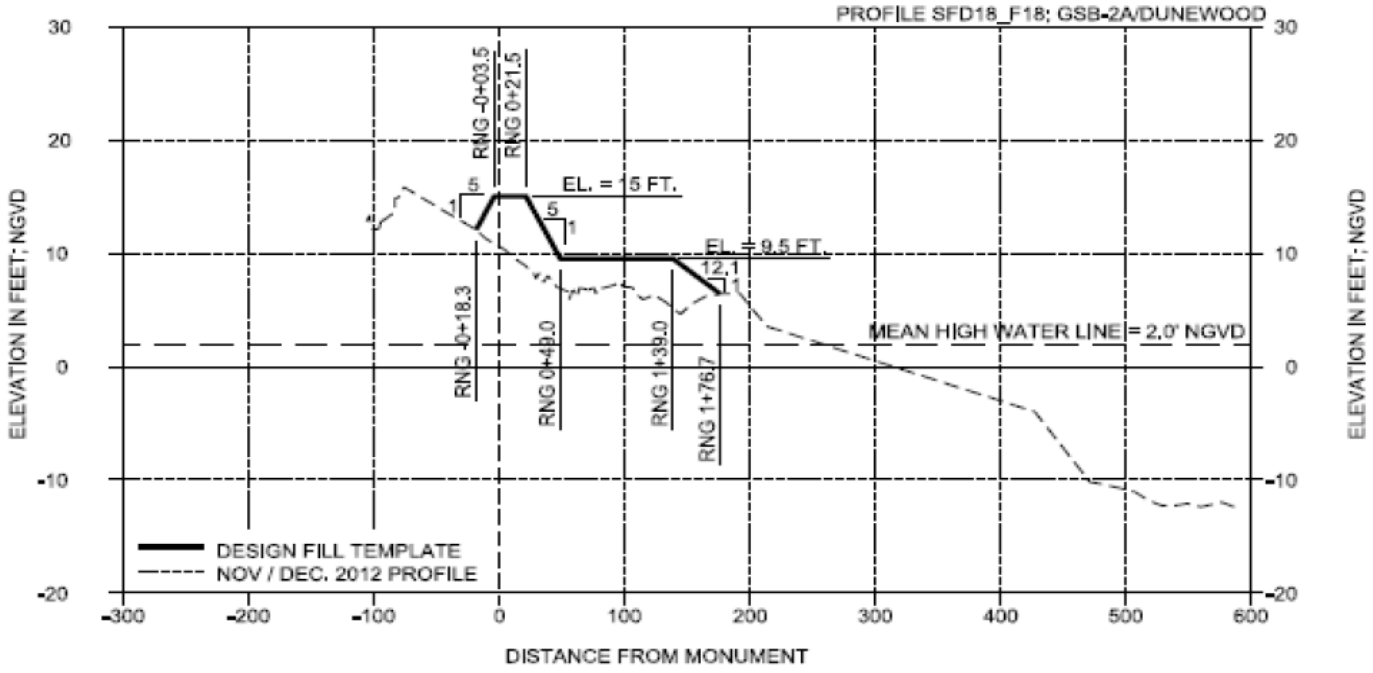


Figure 4 – Typical Medium Beachfill Section

Advance Fill

To ensure the integrity of the design fill cross-section, advance fill will be placed along the proposed project shoreline. Advance fill is a sacrificial quantity of sand which acts as an erosional buffer against long-term and storm-induced erosion, in addition to beachfill losses caused by "spreading out" or diffusion. The required advance berm width was computed based on representative erosion rates. The representative erosion rates were calculated based on the historical sediment budget, the performance of recent beach fill projects on the island, and anticipated beachfill spreading.

Fill Volumes

The total initial project fill volume is the sum of the design fill, advance fill, and overfill and contingency. The total initial fill volumes for each design reach are presented in Table 2. The total initial fill volume for the initial construction increment is estimated at 6,992,145 cy.

Conservation Measures/Project Design Adjustments

The alignment of the FIMI Selected Plan has been optimized to the existing barrier island profile, including beach berm and dunes, and minimizes shifting the beach alignment seaward to protect a small number of structures that are set apart from the other structures. In several areas, tapers have been adjusted per consultations with U.S. Fish and Wildlife Service and National Park Service in order to address park objectives and minimize potential adverse impacts to threatened and endangered species. Specifically discussed here are the adjustments to the FIMI Plan. Detailed plan layouts (1 on 100 scale) of the proposed action are presented in Attachment A of this report refer to the engineering report for more detailed information.

The adjustments to the plan include 1) modification to the dune slope in areas to facilitate endangered species usage, 2) modification of the vegetation plan in these areas, 3) inclusion of a devegetation plan in these areas, 4) inclusion of a devegetation plan for an additional location to increase available shorebird habitat, and 5) modification to the dune alignment in another location to increase the amount of beach habitat.

There are three locations that have been identified for modification to the dune slope, modification of the vegetation plan and inclusion of a devegetation plan. The locations where these modifications have been included are in undeveloped locations that overwashed during Hurricane Sandy, where these plans could allow for shorebird access across the island. Three locations have been identified in Smith Point County Park (Pattersquash overwash area, Smith Point breach area, and New Made Island overwash area). The plan includes a dune template aligned with the adjacent toe of dune, with 1V:10H seaward slope, 25 ft crest width, and 1V:10H landward slope to intersection of existing topography. These slopes have been selected to allow for shorebirds to cross the dune structure. To ensure the continued access across the dune, no vegetation planting or snow fencing would be included as a component of the project in these locations. Further, in these three locations, the plan includes 10 years of monitoring and adaptive management to manage the density of vegetation, in a condition optimal for endangered species usage.
Within the Lighthouse Tract, a portion of the area will also include modification of the dune slope as described above, and modification of the vegetation planting plan, as described above. To be consistent with NPS management policies, this area would not be subject to active management of the vegetation.
In addition to the locations described above, there is a recommendation to devegetate an area within Smith Point county Park, in the proximity of Great Gunn, to improve the habitat for endangered species usage. This area has been selected as a wide, stable beach that presently has limited use by off road

vehicles, and would have minimal management conflicts within the park. This area also includes 10 years of monitoring and adaptive management to manage the density of vegetation, and maintain a condition optimal for endangered species usage.

Additionally, in the Federal tract of land west of the community of Robbins Rest, the dune alignment has been adjusted landward to maintain a larger beach area for shorebird usage.

Schedule

The tentative construction schedule for the three contract areas of the FIMI Selected Plan is as follows:

Contract 1	September 2014 to March 2015	Smith Point County Park (MB-1A, MB-1B, MB-2A);
Contract 2	November 2014 to March 2015	Lonelyville to Robert Moses State Park (GSB-1A, GSB-1B, GSB-2A);
Contract 3	December 2014 to August 2015	Davis Park to Town Beach (GSB-2B, GSB-2C, GSB-2D, GSB-3A, GSB-3C, GSB-3E, GSB-3G).

Duration of Effects

The period of analysis for the FIMI Stabilization Project has been developed based upon the period of time over which there is a measurable difference between the without project future condition and with-project condition. The Project is designed with advance fill to maintain design conditions for a period of 5 years, and it is estimated that the residual effect of the fill placement would last another 5 years. After the residual effect of beachfill has diminished, there is further residual effect of 10 years that is provided by the acquisition and relocation of structures. The total period over which residual effects are expected is 20 years. For more information refer to the HSLRR.

Table 2 – Fill Volumes by Design Reach - FIMI Selected Plan

Location	Design Reach	Fill Length (ft)	Design Fill Volume (cy)	Advance Fill Volume (cy)	10% Overfill Factor (cy)	Subtotal Volume (cy)	15% Contingency (cy)	Total Initial Fill (cy)
RMSP	GSB-1A	16,562	458,164	110,942	56,911	635,238	95,286	730,524
FILT	GSB-1B	5,461	253,025	98,301	35,133	386,459	57,969	444,428
Kismet to Lonelyville	GSB-2A	8,918	200,098	109,770	30,987	340,855	51,128	391,983
Town Beach to Corneille Est.	GSB-2B	4,529	313,822	92,548	40,637	447,008	67,051	514,059
Ocean Beach to Seaview	GSB-2C	3,752	147,569	75,401	22,297	245,267	36,790	282,057
OBP to POW	GSB-2D	7,228	250,258	97,956	34,821	384,077	57,612	441,689
Cherry Grove	GSB-3A	2,950	10,278	0	1,028	14,041	2,106	16,147
Fire Island Pines	GSB-3C	6,457	549,255	346,159	89,541	1,029,435	154,415	1,183,850
Water Island	GSB-3E	1,196	30,676	9,127	3,980	59,670	8,951	68,621
Davis Park	GSB-3G	4,167	305,013	215,297	52,031	639,880	95,982	735,862
SPCP-TWA	MB-1A	6,342	265,725	13,872	27,960	373,830	56,075	429,905
SPCP	MB-1B	13,095	681,702	96,696	77,840	856,239	128,436	984,675
Great Gunn	MB-2A	4,461	525,019	43,725	56,874	668,126	100,219	768,345
Total		**85,118**	**3,990,604**	**1,309,794**	**530,040**	**6,080,125**	**912,020**	**6,992,145**

3.0 AFFECTED ENVIRONMENT

3.1 Overview of Long Island and Fire Island

This section presents background information on the overall study area, with focus on the FIMI project area and sets the context necessary for describing the affected environment within the study area. It includes a synopsis of the formation and erosion events on Fire Island, human settlement, establishment of the Fire Island National Seashore, and the involvement of USACE.

Fire Island is located between Fire Island Inlet on the west and Moriches Inlet on the east. The island is about 30 miles long and generally less than 2,500 feet wide. It is located about 50 miles east of the southern tip of Manhattan, the Battery. Fire Island is aligned generally east-west along the southern side of Long Island and is separated from the larger island by South Oyster, Great South, Moriches and Narrows Bays.

3.1.1 Formation and History

Fire Island is a barrier island that was formed as a result of marine transgression of the Pleistocene post-Glacial landscape (the last ice age). It provides a buffer to the bay shore of Long Island from Atlantic Ocean storm waves. These storm waves cause Fire Island to erode and accrete sand. The erosion and accretion varies greatly over both space and time. Fire Island has evolved geologically in three segments. Geologically over the last 2000 years, the eastern segment has migrated landward. Over the past ~750-1000 years, central Fire Island has been geologically stable, and over the last 300-500 years the western segment formed as a prograding spit. Fire Island has remained in approximately the same location since European settlement of North America Fire Island Inlet has been recorded on the earliest maps, although its size has varied. Moriches Inlet has come and gone several times according to various maps. In addition, multiple inlets along the eastern segment of Fire Island have been mapped. These inlets are formed and are then naturally filled. Bellport used Old Inlet for a short time for direct access to the Atlantic Ocean by ships in foreign trade. The current Moriches Inlet was formed in 1931. It was first stabilized by local government, and became a federal channel in the 1980's.

Over the past 60 years human development has increased on Fire Island, and a number of large storms have struck and caused erosion and damage to structures. Little has been recorded about storms and the effects on the barrier islands prior to about 1900. The hurricane of 1938 is the first, well-known, major storm of the 20th century that caused large-scale erosion and property damage. On September 21, 1938, the hurricane came ashore without warning. The winds are estimated to have been about 120 miles per hour. The water level rose about 10 feet above normal on the ocean front, and because of breaches in Fire Island allowing water into the Great South Bay, the water level on the bay shore rose about 13 to 15 feet. At least seven new inlets were formed along the south shore of Long Island, and numerous small overwashes occurred. It is estimated that about 20 square miles of the bayshore were inundated.

A series of hurricanes and northeastern storms caused more erosion and property damage during the 1940's and 1950's after the hurricane of 1938. After the storms, accretion of sand restored some of the beach width. According to anecdotal information, the dune heights lowered and beaches narrowed gradually under natural processes during this period. The next storm that caused heavy erosion and wide spread property damage occurred in March 1962. This storm is often referred to as the Ash Wednesday storm. It was a northeaster that lasted for about three days, including five tidal cycles. Two low-pressure systems joined and became stationary to the south of Fire Island. Ocean waves of 20 to 30 feet were reported, and the water level rose to about 7.7 feet above National Geodetic Vertical

Datum (NGVD), which approximates Mean Sea Level (MSL). About 50 overtoppings of the barrier islands were reported, and a new inlet at Westhampton, east of Fire Island, formed. About 12 square miles of the bay shore was flooded.

Again, over time, sand accreted, dune elevations rose due to natural processes, and beaches widened to the east, both naturally and with human intervention after the Ash Wednesday storm. The northeaster that occurred on December 11 and 12, 1992 is taken to be an approximation in terms of flood inundation of the 100-year storm. This storm lasted through four tidal cycles with water levels at or above 8 feet NGVD. Ocean waves of 15 to 25 feet were reported. The bayshore in Islip and Babylon were flooded. On March 13 and 14, 1993, a blizzard struck Fire Island. Because the December 11th storm had eroded many of the dunes and had narrowed the beach, this blizzard caused extensive overtopping of the barrier island and flooding of the bayshore. Numerous storms have caused erosion and property damage since 1992. Local efforts were taken to mitigate erosion and flooding problems caused by storms.

The most recent major storm events to impact the project area are the storms in the Fall of 2009 and Hurricane Sandy (2012).

Hurricane Sandy made landfall near Atlantic City, NJ on October 29th with wind speeds equivalent to a Category 1 hurricane. The orientation of Hurricane Sandy's wind field prior to landfall caused strong winds to blow across the continental shelf towards New York. Because the peak storm surge was in phase with the peak high tide, storm-induced flood was exacerbated. Hurricane Sandy's unusually large diameter resulted in long fetch lengths generating extreme wave heights at the study area. These three factors (track, timing, and extraordinary size) resulted in record water levels and wave heights in the New York Bight. The maximum water level at Sandy Hook, NJ is estimated to have reached elevation 11.6 feet NAVD88 exceeding the previous record by over 4 feet (USACE, 2013).

A team from the USGS went to Fire Island before and after Hurricane Sandy to survey the beach and assess morphological changes. The following excerpt from their field report provides a summary of the immediate impacts along Fire Island after Hurricane Sandy (USGS, 2012):

"The impacts to the island were extensive. The majority of oceanfront homes in the communities within Fire Island National Seashore were damaged or destroyed. Enormous volumes of sand were carried from the beach and dunes to the central portion of the island, forming large overwash deposits, and the island was breached in 3 locations. With few exceptions, lower-relief dunes were overwashed and flattened. High dunes, which are more commonly found within undeveloped portions of the island, experienced severe erosion and overwash. The elevation of the beach was lowered and the dunes form vertical scarps where they survived."

Portions of the beaches of Fire Island are particularly narrow and subject to erosion, susceptibility that has been greatly exacerbated by these two recent storms. Smaller storms, including the seven storms that occurred in the winter of 2012 to 2013 also can impact the barrier island (Hapke, et.al., 2013).

3.1.2 Human Settlement History

Native Americans traveled to the barrier island for shellfishing, fishing, and hunting. No prehistoric sites have been identified on Fire Island. Colonists did not use Fire Island for intensive human habitation until the second half of the 19th century. However, Fire Island was used to access various important natural resources of the time, prior to general settlement. The early uses of Fire Island did not require concentrated settlements. Whaling was commonly done from the beach until about 1750, when whales were no longer found near the beach. Salt hay from the marshes was harvested for mulch and

insulation. Farmers gathered horseshoe crabs as fertilizer. The beach of Fire Island was considered to be dangerous and inhabited by pirates. Shipwrecks were common along Fire Island during this time. From 1787 to 1890, New York State law allowed wreck masters to salvage cargo and parts from grounded ships. To reduce the number of groundings and shipwrecks, the federal government began to build lighthouses for safe navigation. The first lighthouse was built at Fire Island Inlet in 1825. The second lighthouse was built in 1858 at Shinnecock Inlet. However, the perception of Fire Island as home to pirates and shipwrecks remained into the last half of the 19th century.

Governor Dongan's Patent of 1686, which conveyed lands and lands under water to the Towns, did not include lands south of the bayshore, such as Fire Island. Because of this oversight, William Tangier Smith claimed ownership of Fire Island, Great South Bay, and Moriches Bay in 1693. The lands passed through various heirs and legal machinations. David Sammis in 1845 purchased land to build a hotel. Ownership of the land was disputed and lead to lawsuits that lasted well into the 1920's. The Great Partition of 1878 is the basis of the final settlement of the lawsuits and ownership of the land. David Sammis' Surf Hotel became a resort center in the second half of the 19th century. The Great Partition allowed development of lots for summer homes. The Chautauqua movement of self-improvement blossomed in the 1890's, and Chautauqua Assemblies became common on Fire Island at that time. These assemblies, active primarily during the summer months, introduced Fire Island to a large number of people who lived in tents and bungalows. To accommodate these visitors, regular ferry service from the bay shore to Fire Island began.

With the Great Partition of 1878 allowing secure purchase and ownership of land and the Chautauqua Assemblies bringing people to Fire Island, communities were settled. The first of these, the Point O' Woods Association, began in 1898. Other communities quickly followed, although the youngest community, Dunewood, was formed in 1958. Each of the communities developed with its own distinctive personality. The summer population began to grow. According to an analysis of aerial photographs, approximately 950 structures were identified on Fire Island in 1928. This number grew slowly to 1,260 in 1955, and then the number of structures doubled to about 2,400 in 1962. The number of structures reached about 3,500 in the 1970's and has remained fairly constant except for the structures removed from what is now the Otis G. Pike Wilderness Area after the formation of the Fire Island National Seashore.

3.1.3 Fire Island National Seashore (FIIS)

Fire Island National Seashore (FIIS) -was established by Public Law 88-587 on September 11, 1964, and placed under the jurisdiction of the DOI, National Park Service. FIIS encompasses much of Fire Island, with only Robert Moses State Park on the far western end of the barrier island excluded, and represents 26 miles of the approximately 31 miles of Atlantic Ocean shoreline under consideration in this HSLRR for the FIMI project. The boundaries of the seashore extend 1,000 feet into the Atlantic Ocean and 4,000 feet into the Great South and Moriches Bays. The islands and marshlands adjacent to Fire Island are also included in FIIS. A General Management Plan (GMP) and the Final EIS on the General Management Plan were accepted in 1978, and have served as the basis for park management. The GMP is currently under revision, but not yet finalized.

The management strategy for the FIIS recognizes that significant areas of shorelines and back lands on Fire Island have been affected by human manipulation and population growth and now support stable communities. NPS policy directs that "Natural shoreline processes (such as erosion, deposition, dune formation, overwash, inlet formation, and shoreline migration) will be allowed to continue without interference. Where human activites or structures have altered the nature or rate of natural shoreline processes, NPS will, in consultation with appropriate state and federal agencies, investigate alternatives for mitigating the effects of such activities or structures and for restoring natural conditions (4.8.1

Shorelines and Barrier Islands). NPS policies generally allow/permit for intervention with natural geologic processes when: 1) when directed by Congress, 2) necessary some emergencies that threaten human life and property, 3) there is no other feasible way to protect natural resources, park facilities, or historic properties, and 4) intervention is necessary to restore impacted conditions and processes, sucha as restoring habitat for threatened or endanagered species (4.8.1 Protection of Geologic Processes).

The Wilderness Act, which was passed by Congress on September 3, 1964, established the National Wilderness Preservation System. The Otis G. Pike High Dunes Wilderness Areas was established on December 20, 1980 under Public Law 95-585 and comprises 1,360 acres of the FIIS, the only federal wilderness area in New York State. The Wilderness Area encompasses 6 miles of alongshore distance immediately west of Smith Point Park. The cross-shore extent of the wilderness boundaries extend from the seaward toe of the dune to the bay shoreline. The Wilderness Management Plan for FIIS was accepted by the Secretary of the Interior in November 1983 and governs activities in the Wilderness Area.

The authorizing law for the Fire Island National Seashore also contains specific language that requires that any plan for shore protection on lands within the boundary of Fire Island National Seashore be mutually acceptable to the Secretary of the Interior and the Secretary of the Army, as a requirement for the USACE to undertake or contribute to measures that manage coastal storm risk.

The Fire Island Light Station Historic District is located at the west end of the FIIS. Established in 2010, the District expanded the original Fire Island Light Station National Register property boundaries to include the Fire Island Light Station, consisting of the present Lighthouse, the Radio Compass Station, the First Lighthouse Foundation, Keeper's Quarters and the Old House, to incorporate the contributing landscape features of Burma Road, historic pathways from the Light Station to the shoreline, and the surrounding coastal grasslands, thicket zones and upper beach and dune vegetation. Significant views contributing to the historic district include the view to and from the Fire Island Light Station (NPS 2004)

3.2 Human Environment

3.2.1 Land Use and Management

Land use differs throughout the study area that may be impacted if the barrier island remains vulnerable to coastal storms. The FIMI barrier island study area is generally more developed to the west in the communities of Saltaire, Ocean Beach, Cherry Grove and Fire Island Pines with no development in the middle wilderness area. Smith Point County Park is located on the westernmost side of the FIMI project area. The backbay areas of the FIMI study area are described below, followed by a description of Fire Island communities. As the Fire Island communities are within the FIIS and are interspersed with other parks, the land use discussion for the FIMI project area incorporates both the residential communities and public lands.

Town of Babylon

To the west, near the Nassau County border, there is very little agricultural use and more commercial/industrial use. The Town of Babylon includes communities on the mainland including the Villages of Amityville, Lindenhurst, and Babylon and the hamlets of Copiague and West Babylon. Land use in this area generally consists of medium-density detached homes, with high-density residential uses found close to the water's edge.

Commercial uses run along most of the length of Montauk Highway. The Babylon study area also includes several recreational and park uses fronting the Great South Bay. In addition, the Town of Babylon includes part of Captree State Park on Captree Island and the easternmost tip of the Jones

Beach/Gilgo Beach on the barrier island to the west of Fire Island Inlet.

Town of Islip

The study area within Islip is primarily residential, with some large open spaces (e.g., Great River and Connetquot River State Park on the bayshore) and commercial development concentrated along Montauk Highway. Communities in this area include West Bayshore and Bayshore, the Village of Brightwaters, Islip and East Islip, Great River, Oakdale, West Sayville and Sayville, and Bayport.

Commercial development includes primarily small- to medium-sized shops and services, some of which are part of strip mall developments. Marine and marine-related commercial development is located near Great South Bay and its tributaries. There is no significant amount of industrial activity south of the Montauk Highway; industrial uses are located just outside of the study area, primarily along Union Boulevard.

Town of Brookhaven

With 260 square miles of land area, Brookhaven is the largest municipality on Long Island. Development in the municipality is generally less dense than Islip (with a notable exception being the area that includes Shirley and Mastic), with a number of undeveloped parcels. Communities in this area include Blue Point, the Village of Patchogue, Bellport, Brookhaven, Shirley, Mastic, Mastic Beach, Center Moriches, and East Moriches.

Within Brookhaven, retail commercial development is found along the Montauk Highway, especially in downtown Patchogue and in Shirley; there are also some small shops along the highway in Center Moriches. Industrial uses, including maritime industry and boating, are found along the Patchogue River. There are also major open spaces and recreational amenities, including the Bellport Park Golf Course at South Country Road and South Howell's Point Road, Smith Point County Marina near the Smith Point Bridge, and Wertheim National Wildlife Refuge, between Shirley and Brookhaven. There are also a number of smaller neighborhood parks and playgrounds.

Land and Water Uses on Fire Island

The 2,940-acre island is narrow, with widths ranging from a few hundred feet at Talisman to a ½ mile at Saltaire. From west to east Fire Island comprises Robert Moses State Park, 17 residential beach communities, and Smith Point County Park. The 17 communities and Smith Point County Park are located within FIIS. Since World War II, the island has boomed into a renowned summer destination for New York City and Long Island residents. Consequently, its developable land is almost completely built. The remainder of the island has been federal park land since Congress authorized enabling legislation for FIIS in 1964. This law allowed NPS to acquire land on Fire Island through donations and condemnation, a process that was complete by the mid 1970's.

Robert Moses State Park encompasses the westernmost 4.5 miles of the island. The park consists of an open beach area covered with dunes and natural grasses. The central, non-waterfront area is composed of landscapes ranging from a sunken forest to wilderness to grassy dunes. FIIS begins at the state park's eastern edge, and encompasses the remaining 26 miles to Moriches Inlet. Surrounding waters and 25 smaller bay islands are also included within FIIS. Directly east of the FIIS western boundary are 13 of the island's 17 residential communities, from Kismet to Oakleyville. These communities span the island from the bay to the ocean, and are primarily occupied during the summer months, although small year-round

populations live in the incorporated villages of Saltaire and Ocean Beach, and various other locations.

Continuing east from Oakleyville, the prominent landscape feature is the Sunken Forest, a native preserve accessible from the FIIS Sailors Haven Visitors Center. Sunken Forest is a unique maritime forest that is protected by dunes from direct exposure to the Atlantic Ocean. East of Sunken Forest are the hamlets of Cherry Grove and Fire Island Pines. Interspersed with uninhabited FIIS property to the east of Fire Island Pines are the communities of Barrett Beach, Water Island, and Davis Park. The Watch Hill Visitor Center near Davis Park is a popular recreational area and the gateway to the Otis G. Pike Wilderness Area, New York State's only congressionally designated wilderness area. Within the 8-mile-long Otis G. Pike Otis G. Pike Wilderness Area, which stretches to the east of Davis Park, is a private beach under the jurisdiction of the Village of Bellport. Smith Point Suffolk County Park covers the remaining 6 miles of Fire Island from Smith Point to Moriches Inlet.

Residential. All residential communities on Fire Island are within the towns of Brookhaven and Islip. (including two incorporated villages: Saltaire and Ocean Beach). Because they are also within the National Seashore, any development must occur within established residential zones.

Each community has a distinctive character owing to its individual history and clientele. Saltaire and Ocean Beach, for example, were both developed as real estate promotions. Oakleyville was started as a base for construction workers, and Point O' Woods was established as an educational and religious community. Fair Harbor was founded in 1923 as a summer haven for working families, while Water Island grew around a well-known resort hotel founded in 1890. As a result of their various backgrounds, the communities of Fire Island now vary in size, density, and land use. Following is a brief description of each community, from west to east.

Kismet is a family community with a small commercial area around the ferry dock. It is rustic, with large lots and wide sidewalks. Most of the wood houses have been built since the postwar boom, but a few newer homes are interspersed with the old.

East of Kismet, and at the widest point of the islands is Saltaire, one of the island's two incorporated villages. Large lots and plentiful open space spanning the ½-mile between the bay and ocean are meticulously maintained. Because of strict zoning in Saltaire, the only commercial businesses are in a small area near the marina. It is a family community, allowing only single- family rentals and accommodating children with day programs and lifeguard-protected beaches.

Fair Harbor is also a comfortable family community, with a small bayside commercial area. The 400 houses built in Fair Harbor are at a higher density than the houses in Saltaire. Wooden boardwalks connect the homes, which are surrounded by lush vegetation.

Three smaller communities, Dunewood, Lonelyville, and Atlantique are also present. Dunewood was established in 1958 as the first planned community on Fire Island. This family-oriented community is zoned strictly for residential use, and features 100 homes and an excellent infrastructure. Lonelyville is one of the island's oldest and most private settlements. Most homes are vintage beach cottages, some dating back to early in the 20th century. Atlantique is also a private family community, accessible only by the sandy Burma Road or private boat. Atlantique Town Park is managed by the Town of Islip and has extensive recreational facilities.

Robbins Rest has 40 homes ranging from cottages to modern structures. This secluded community is built at a low density. Fire Island Summer Club is one of the smallest communities. The houses are owned but the land is leased from the club, which maintains a private clubhouse and tennis

courts. Corneille Estates is a 2-block long area with large lots and abundant foliage. Located immediately next to Ocean Beach is the island's only elementary school, Woodhull School.

The family-oriented Village of Ocean Beach is one of the most densely built locations on all of Long Island. It has a thriving bayside commercial area and many recreational facilities. Outside the commercial area, Ocean Beach's quaint residential community consists of 600 homes. The Village maintains the only police department on Fire Island.

Next to Ocean Beach is Seaview, which features an eclectic mix of architectural styles on large, private lots as well as the island's only synagogue. The municipal border between the towns of Brookhaven and Islip straddles Seaview, at times bisecting individual parcels. The next community to the east is Ocean Bay Park, which is known for its relaxed and liberal attitude toward group renters. It has a bayside commercial district featuring an active social scene.

Point O' Woods is the oldest and most private community, containing about 120 homes. Meandering paths connect the expensive shingle-style homes, which are surrounded by lush vegetation and large lots. The exclusive nature of Point O' Woods is characterized by private ferry service and stringent residency standards. Oakleyville is the island's smallest settlement, with about a dozen homes. It is very private, nestled within the edge of the Sunken Forest.

Cherry Grove is located east of the Sunken Forest. Cherry Grove has a very active social scene and strong community spirit. The commercial area near the dock serves the residents of its 300 cottages.

The Pines is the largest community on Fire Island, with more than 700 homes, a community- owned harbor, and exclusive commercial area. It is zoned for large-lot development, and includes some of the island's most sprawling homes and swimming pools.

By contrast, Water Island is a quiet community of about 50 homes. It is strictly residential and only recently became accessible by ferry service. Davis Park, with its celebrated social circuit, is one of the most popular destinations for Long Island residents. Within the rustic community, the Town of Brookhaven manages Leja Beach, which is open to the public.

Community Services. The communities have powers that are similar to cooperatives or condominiums. They also act like unincorporated communities. Many communities have individual volunteer fire and ambulance services, and several communities have doctors available. Suffolk County provides police coverage of the island, and the Ocean Beach Police Department and Saltaire Security enforce local ordinances. The National Park Service is responsible for policing conservation laws on federal property, and the U.S. Coast Guard enforces boat safety regulations in surrounding waters.

Coastal Barrier Resources Barrier Act

Congress passed the Coastal Barriers Resources Act in 1982 to address problems caused by coastal barrier development. The act restricts federal expenditures and financial assistance, including federal flood insurance, in the Coastal Barrier Resource System. This system is made up of a defined list of undeveloped coastal lands and associated aquatic environments that serve as barriers protecting the Atlantic, Gulf, and Great Lakes coasts. The system currently includes 585 units, which add up to almost 1.3 million acres and about 1,200 shoreline miles. There are also 274 "otherwise protected areas," a category added by the 1990 Coastal Barrier Improvement Act for coastal barriers within lands reserved for conservation purposes. Fire Island is included in this system as an otherwise protected area.

Three important goals of this act are to:

- minimize loss of human life by discouraging development in high risk areas,
- reduce wasteful expenditure of federal resources, and
- protect the natural resources associated with coastal barriers

Federal monies can be spent within the system for certain exempted activities.

3.2.2 Socioeconomic Conditions

The following details the economic conditions in the Fire Island to Moriches Inlet study area. For more information refer to the HSLRR.

Income

There is significant variation in the per capita and family income among study area towns as shown in Table 3. Per capita income in most of the study area is slightly above the state average. Median family incomes in the study area towns are all higher than the median family income for New York State.

Table 3 – Per Capita and Family Income

Location	Per Capita Income	Median Family Income
New York State	$31,796	$69,202
Suffolk County	$36,588	$99,474
Town of Babylon	$31,255	$90,853
Town of Islip	$31,493	$92,482
Town of Brookhaven	$34,201	$97,520

Source: American Community Survey 2007-2011 5-year Estimate

Economy

The largest segment of the study area population is employed in the education, health and social services sector. Retail trade, professional/management services and manufacturing also employ a large portion of the population. More people are employed in agriculture towards the eastern end of the study area, while fewer people are employed in the retail and manufacturing sectors.

Overview of Economic Activity on Fire Island. Fire Island has a seasonal economy that extends from April and October, but with the peak economic activity occurring during the summer months of June, July, and August. The seasonal nature of Fire Island is evident in the island's year-round population of 399 individuals as compared with its significantly larger seasonal population of approximately 20,000 individuals ((U.S. Census Bureau, 2010 and NPS 2003).

The retail sector comprises the majority of economic activity, accounting for more than three-quarters of employment. Key businesses in the retail sector include restaurants, grocery stores, and liquor stores. These types of businesses are important to the local economy, given that Fire Island has a high proportion of seasonal renters and second-home owners whose objective is to enjoy the island's recreational and vacation resources. In addition, there is limited access to the bay shore of Long Island, which creates a more captive market and greater demand for convenient goods and services.

Economic Activity by Fire Island Villages and Communities

Economic activity on Fire Island is generally based around the ferry terminals and marinas on the

island, because these are the access points for residents and day visitors. Businesses tend to be located on the bay side of Fire Island, and along the primary routes from the bay to the ocean beaches, e.g., Broadway in Saltaire and Harbor Walk in Fire Island Pines. Some service sector businesses operate out of home offices, including real estate offices, accounting services, and desktop publishing.

Since private vehicles are restricted on Fire Island, transportation routes on Fire Island are limited to boarded and paved walks in the villages and communities and sand pathways in less developed areas. Travel between villages and communities is somewhat restricted on Fire Island, resulting in relatively isolated communities or clusters of communities. People travel on Fire Island by walking, riding bicycles, and taking water taxis. The water taxis transport people between communities and villages on Fire Island that otherwise would be too distant or difficult (due to sand pathways) to access by foot or bicycle. Personal belongings and purchases are transported from the ferries and local shops to residences via small wagons. The primary economic activity in the villages and communities is described below and is organized by ferry stops, the mode by which most individuals travel to the residential communities and visitor centers on Fire Island.

Kismet. Retail businesses in Kismet are clustered around the ferry stop, and include the Kismet Inn and Marina, The Out (a restaurant), a grocery store, a pizzeria, and a liquor store. Kismet is the closest community to the Fire Island Lighthouse Visitor Center and is a 15-minute walk from the Field Five parking lot at Robert Moses State Park. In addition, the 100-slip commercial marina at Kismet serves boaters from all over Fire Island and Long Island. As such, Kismet shops receive business from many sources. Kismet restaurants also serve neighboring Saltaire, since there are no such establishments in the village.

Saltaire. The commercial district in Saltaire is located on Broadway, the main thoroughfare between the ferry stop on the bay side and the ocean. Businesses in the commercial district include a grocery store with a sandwich counter, and a liquor store. The business district in Saltaire is limited due to strict zoning.

Fair Harbor. The Fair Harbor commercial district is located next to the ferry dock, and includes a restaurant, a general store, a liquor store, real estate offices, and a grocery store with ice cream, coffee, and candy sold to go. The restaurant and general store likely serve neighboring Saltaire as well due to the absence of these types of retail businesses in the village. Dunewood and Lonelyville, which share a ferry stop, as well as Atlantique residents, are likely to also shop at Fair Harbor businesses due to the absence of retail businesses in those communities.

Atlantique. Atlantique has little economic activity besides a town-operated 157 slip marina on the bay and a snack bar. The Atlantique Marina operates from Memorial Day until Labor Day, and employs a total of 10 seasonal workers. Docking is only permitted on a daily basis, with a maximum period of 17 consecutive days allowed. On weekends, only Town of Islip residents are permitted to dock, while residents and non-residents (at higher fees) are permitted to dock on weekdays. The Atlantique Marina is used predominantly by local day visitors. The 17-day cap is likely to discourage Atlantique residents from relying solely on the marina, and the weekend resident requirement precludes extended stays by non-Islip residents.

Ocean Beach. Ocean Beach features the largest concentration of retail businesses on Fire Island with nearly 50 establishments. The retail district is located along Bayview Walk, and includes nine restaurants, three cafes, two bars, two hotels, a local department store, four clothing stores, a small movie theater, a hardware store, a sporting goods store, a liquor store, a florist, five realty offices, and other establishments. Located at the center of Fire Island's developed communities, Ocean Beach provides goods and services for other neighboring communities and is accessible via water taxi. The ferry

docks from the mainland at the Village of Ocean Beach Marina. The village and the Town of Islip share jurisdiction over the marina. The marina has 130 slips and a jet ski docking area. It operates from May through October. Of the total slips, 17 are reserved for transient use and 113 are reserved for the season.

Seaview. In Seaview, commercial activity is limited to the Sea View Marina (with 50 slips), a grocery, a liquor store, and an ice cream shop. The small commercial sector is located adjacent to the marina and ferry dock. Seaview residents probably travel to Ocean Beach for on-island shopping and recreation amenities.

Ocean Bay Park. Ocean Bay Park features the Fire Island Hotel and the Seashore Motel, and Flynn's Marina and Restaurant (with 47 slips), as well as three other restaurants, and a market. The commercial district is primarily located along Bay Walk near the ferry dock, with the exception of the Fire Island Hotel located on Cayuga Walk. The presence of lodging and other services encourages weekend visitors.

Point O' Woods. Point O' Woods has a small commercial center that includes a grocery store and a candy store near the ferry stop. A small railroad transports people and goods from the ferry dock to the ocean. The small commercial sector exclusively serves the Point O' Woods community.

Sailors Haven Visitor Center. The Sailors Haven Visitor Center primarily supports a day visitor population; although some overnight visitors are accommodated at the marina. The marina provides overnight docking for up to seven consecutive nights. The marina, restaurant, snack bar, and gift store at Sailors Haven are federally operated concessions with 15 seasonal employees. The marina has a total of 47 slips, and operates from May 15 through October 15.

Cherry Grove. Cherry Grove has the second largest retail concentration on Fire Island, after Ocean Beach. There are a total of 28 business establishments at Cherry Grove predominantly located near the ferry dock on Bayview Walk, or on the primary route between the bay and ocean on Dock Walk and Ocean Walk. Cherry Grove has six hotels, and offers amenities for weekend visitors and residents. Business establishments include seven restaurants, four bars and dance clubs, three clothing boutiques, two florists, a jewelry store, a liquor store, and four real estate offices.

Fire Island Pines. Fire Island Pines, located east of Cherry Grove, has a total of about 23 businesses. The commercial district is located in the vicinity of the ferry dock and 85 slip marina. The shops are located on the boardwalk along the harbor, on Harbor Walk (one of the primary routes between the ferry and the ocean), and on Fire Island Boulevard, which runs east-west just south of the harbor. Businesses in Fire Island Pines include four restaurants, three bars/dance clubs, three clothing boutiques, a hotel, a grocery, a meat market, two liquor stores, a hardware store, a pet food store, and three real estate offices.

Davis Park. Davis Park is isolated from other Fire Island communities, with its nearest neighbor Water Island lying more than a mile to the west. As such, the economy is localized with little influx from other Fire Island communities. The commercial sector includes the Davis Park Marina, which is operated by the Town of Brookhaven, a grocery store, and the Casino (a restaurant, bar, and snack bar). The 250 slip town marina operates from May through October, and employs approximately 16 seasonal workers.

Watch Hill Visitor Center. The Watch Hill Visitor Center, located east of Davis Park, is a popular destination for day-trip visitors to Fire Island, and also for boaters docking for a relatively short period (less than seven days, due to length of stay limitations). The businesses at the visitor center are operated by a federal concessionaire, and include a marina, a restaurant and snack bar, a grocery store, and a gift shop. The 183 slip Watch Hill National Seashore Marina operates from Memorial Day to Labor Day.

Robert Moses State Park. Robert Moses State Park is located at the westernmost end of Fire Island. Annual park attendance is approximately 3.2 million people. The park is open year-round (closing only in inclement weather), but most visits occur between Memorial Day and Labor Day. The park contains one concession, which sells food and beverages. The concession is located south of the parking fields. It employs approximately 15 people. The concession provides food services for the day trip visitors to this part of Fire Island.

Smith Point County Park. Smith Point County Park, located at the eastern end of Fire Island, has an annual attendance of approximately 1.5 million people; most visits are between Memorial Day and Labor Day. There is one food concession at Smith Point. The concession is open mid-May to mid-September, and employs 20 to 30 people. Up to 60 workers may be employed for special events. Like the Robert Moses State Park concession, the Smith Point County Park concession provides food services primarily to day trip visitors.

3.2.3 Environmental Justice

Executive Order 12898 directs Federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. The population in the vicinity of FIIS was evaluated to determine the potential for the project to adversely affect minority and/or low- income populations. The two census tracts (1470.04 and 1595.10) that include Fire Island (excluding the west end of Robert Moses State Park) have a total year round population of 399 (U.S. Census Bureau, 2010). The population of the census tracts including Fire Island is largely white (85.4% - 97.2%) with few minorities (U.S. Census Bureau, 2010). The seasonal population during summer months is estimated at over 20,000 (NPS, 2003).

FIMI is located adjacent to one of the most densely populated areas within the U.S. Based on 2010 Census data and the income data presented above in Table 3, there are no significant concentrations of low-income populations or minority populations in the FIMI study area. Alternatives evaluated would not disproportionately affect socially or economically disadvantaged populations and no further evaluation of compliance with Executive Order 12898 is warranted.

Protection of Children From Environmental Health Risks and Safety Risks

Both the resident and tourists on Fire Island include a significant number of children and elderly, especially during the summer months. "Best Management Practices " would be used to keep people out of the areas where dredge material is being placed, and in some places, small tracked vehicles may be placing sand immediately adjacent to occupied houses. The work may be an attraction and the Best Management Practices (BMP's) will address potential risk. BMPs will be addressed more fully in a Health and Safety Plan and implemented during construction.

Executive Order 13045: A growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks. Therefore, to the extent permitted by law and appropriate, and consistent with the agency's mission, USACE will address EO 13045:

3.2.4 Transportation

On the bay side, the study area has a large network of roadways. A number of highways provide east-west access including the Southern State Parkway, Sunrise Highway (Route 27) and Montauk Highway (Route 27A).

There are no major roadways on Fire Island, except at the western end of the island, where the Robert Moses Causeway connects with Ocean Parkway and on the eastern end, where the William Floyd Parkway connects Fire Island with the mainland. Access to Fire Island is mainly by ferry service from Bay Shore, Sayville and Patchogue, as well as private boat access.

Most visitors to Fire Island arrive via ferry or private boat. Visitors to Saltaire, Fair Harbor, Dunewood, Lonelyville, Fire Island Summer Club, Corneille Estates, Ocean Beach, Seaview, and Ocean Bay Park utilize Fire Island Ferries from Bayshore. Visitors to Fire Island Pines utilize the Sayville Ferry Service, which departs from Sayville. Visitors to Davis Park utilize the Davis Park Ferry, departing from Patchogue.

Once on the island, visitors typically walk or ride bicycles to their destination. During summer months, walkways and beaches are crowded with visitors. Approximately two million people visit the island annually, most during summer months. Fire Island does not feature a network of highly developed roadways for transportation between communities. Dozens of wide walkways can accommodate vehicles when necessary, but the majority of transport on Fire Island is conducted along the beaches, including emergency response, essential services (utilities, garbage collection), residents, and contractors. Emergency response and essential service vehicles are permitted to drive year-round on the beach, although time of day restrictions are in place for all but emergency vehicles. Residents, contractors, and essential services are issued oversand vehicle permits for restricted driving on Fire Island. Transportation along the beaches is restricted for contractors and residents as follows:

- Driving permitted in lieu of alternate transportation from the day after Columbus Day to the Thursday before Memorial Day weekend.
- Driving is permitted on weekdays only in May.
- Driving is not permitted from the Friday of Memorial Day weekend through Columbus Day.

Recreation/Parks

Visitors appreciate Fire Island for its abundance of recreational land and water activities. Each community has a beach for bay or ocean swimming, and sometimes both. Thirteen communities have lifeguard-protected beaches on the ocean and seven have bayside lifeguard protection. Generally, the bayside beaches are roped-off swimming areas near the town marina or dock; therefore, these areas tend to attract families with children. In Saltaire and Ocean Beach, the beach areas are next to the village parks, bay beaches, and commercial areas. Other than swimming, popular water sports include surfing, sea kayaking, windsurfing, water-skiing, canoeing, and sailing. Area businesses rent windsurfing boards hourly, and stores on the mainland sell and rent other equipment, such as sea kayaks and jet-skis. Several Fire Island communities have organized sailing programs in which participants race each other and groups from Long Island throughout the season.

The project area features a wide array of fish species plus shellfish and crabs, each of which has a designated prime season. Consequently, sport fishing in the Great South Bay and Atlantic Ocean is an

activity for which the area is well known. In addition, several local charter companies and headboats on Captree Island and the mainland offer deep-sea fishing excursions in the Atlantic.

Fire Island has a variety of land sports facilities, such as tennis courts and softball fields. Bicycles are commonly used for community access and recreation. Along with the option of riding along the beach, bicyclists can use the concrete or sand paths connecting the communities. Bicycles are available for rental at local markets and hardware stores. Runners and walkers are provided with many opportunities for activity by the miles of beach, inland paths and boardwalks. Each residential community is generally self-sufficient regarding recreation. The convenience of local facilities suggests that residents rarely use the adjacent federal facilities. Following is a description of each public recreation area, and the facilities included in each.

Robert Moses State Park, at the west end of the island, has public beaches, picnic areas, comfort stations, and concessions. Full lifeguard protection is provided in the summer season, and fishing areas are designated outside the swimming area. Within the Fire Island National Seashore, three major recreational areas are open to the public: Sailors Haven, Watch Hill, and Smith Point. Sailors Haven is the site of the Sunken Forest, a 300-year-old preserve, which features an elevated boardwalk for public access. Sailors Haven has a 47-slip marina, snack bar, and souvenir shop. Picnic facilities and lifeguard protection are also provided. Watch Hill is the largest FIIS site, featuring a 183-slip marina, restaurant, grocery and souvenir shop. Along with lifeguard protection on its Oceanside Beach, Watch Hill has 25 camping facilities open from May through October. Along with these major recreational areas, a small public facility with a picnic area and restrooms exists at Talisman, the island's most narrow point.

East of Watch Hill is the Otis G. Pike Wilderness Area, which was established by Congress in 1980. Within this wilderness are several ecosystems through which visitors hike, canoe, kayak and camp. The National Park Service is currently proposing to designate additional property as part of the Otis G. Pike Wilderness Area and in the process has removed several residential and agricultural structures from these territories. Backcountry hikers and campers register at the Watch Hill visitor center. Smith Point County Park is to the east of the Otis G. Pike Wilderness Area and is within the boundaries of FIIS, but is managed by the Suffolk County Parks Department. The 6-mile long park has public beach access, a visitor center, and camping facilities for 75 vehicles. Most of the recreational areas are found in the vicinity of the terminus of William Floyd Parkway.

The Town of Islip manages several parks on Fire Island exclusively for Town residents. Atlantique Town Beach offers many amenities such as a 157-slip public marina, restrooms, grill area, basketball court, handball court, and playgrounds. Until recently, the Town also managed Barrett Beach, a facility near Tallisman with a marina, playground, and picnic facilities. In 1998, the title for this property was transferred to NPS. Long-term plans have not yet been determined for jurisdiction of the park. The Town of Brookhaven manages two public beaches, Leja Beach in Davis Park and Great Gunn Beach in Smith Point County Park. Leja Beach has a public marina, picnic area, swimming beach, and playground. Great Gunn Beach has a lifeguard-protected swimming area, playgrounds, and restrooms. The municipality of Bellport manages a beach within the Otis G. Pike Wilderness Area exclusively for its residents. The area has a private dock, visitor center/concession building, and oceanfront picnic deck. Access to Bellport Beach is provided by the Bellport ferry, a service exclusively for Bellport residents.

Marinas. Fire Island has 10 marinas that accommodate a total of 1,000 boats. About of the slips are leased on a transient basis, and the remainder are leased by the season. Six of the marinas are private and four are public concessions. Only two facilities, those at Robert Moses State Park and at Seaview, operate year-round. Half of the marinas, including both FIIS facilities, include amenities such as grocery or supply stores.

3.2.5 Cultural Resources

This section provides an overview of known and potential cultural resources and historic properties, including archaeological and architectural resources, within the Area of Potential Effect (APE). The Area of Potential effect for this proposed project extends the entire length of the Atlantic shoreline of Fire Island, from Fire Island Inlet to Moriches Inlet, extending seaward from the existing dune line into the nearshore sand placement area The APE also includes the source locations of sand from the offshore borrow areas. A number of cultural resource surveys of the FIMP study area have been prepared and are used as part of this assessment.

Coordination with the New York State Office of Parks, Recreation and Historic Preservation (NYS SHPO), the Advisory Council on Historic Preservation (ACHP), the National Park Service, other interested parties as well as the Shinnecock Nation, is ongoing. A Programmatic Agreement has been prepared (Attachment H) to assess potential effect, and develop strategies to avoid or minimize adverse effects of proposed project elements.

3.2.5.1 Tidal Zone, Near Shore and Borrow Areas

Submerged Archaeological Resources

Known and potential submerged archaeological resources, primarily shipwrecks, in the tidal zone, near shore and borrow areas along the south shore of Fire Island have been inventoried through a number of studies.

Tidal Zone and Near Shore Beachfill Area

A remote sensing investigation of the tidal zone and the near-shore beachfill area along portions of Fire Island. The survey was designed to determine the location, if present, of any targets that might represent potentially significant cultural resources or sites in the form of historic shipwrecks. The survey included a side scan sonar and magnetometer. The survey identified 26 magnetic anomalies that had characteristics potentially representative of significant submerged cultural resources. Most of the anomalies were buried beneath the seabed, with no associated, discernable above seabed side scan sonar returns. Four of the anomalies had both a magnetometer signature and an associated above seabed side-scan sonar return. These four anomalies will need additional investigation if located in an area where sand will be placed (Panamerican 2003).

Shipwrecks

Numerous shipwrecks have been documented along the Atlantic coast of Long Islandand the potential number of undocumented shipwrecks far exceeds the list of known shipwrecks.. Research conducted in 1998 identified approximately 155 documented wrecks in the near-shore and offshore area from Fire Island Inlet to Moriches Inlet. Some of these wrecks were later re-floated and/or removed or were wrecked at sea, offshore Fire Island; some more than 12 miles. A few were scuttled to form artificial reefs. These research identified approximately 46 vessels that were documented as having wrecked on or near the beach with locations identified as Fire Island, Fire Island Inlet, or opposite Moriches. The exact location of these vessels has not been identified but portions of wrecks have been periodically exposed or washed up along Fire Island. Based on initial historic research a number of these vessels, if identified, could be eligible for the National Register of Historic Places (Greeley-Polhemus Group 1998). In 1998

and 1999, USACE completed a remote sensing survey of much of the tidal zone and near-shore area of Fire Island to the east of Robert Moses State Park. The survey identified four anomalies with an associated above-seabed side scan sonar return located along the length of Fire Island that would require additional investigations to determine what the anomalies represent and, if any represent a potential historic property (Panamerican Consultants 2003).

The *USS San Diego*, an armored cruiser, also known as the *USS California* (Armored Cruiser No. 6) was added to the National Register of Historic Places in 1998. Launched in 1904 as the second *USS California* (ACR-6), it was renamed *USS San Diego* in 1914 and served as a flagship for the Commander-in-Chief of the Pacific Fleet. By 1918, she was ordered to the Atlantic Fleet to act as escort for convoys heading across the North Atlantic to Europe. The *San Diego* was sunk in July 1918 by a German mine. She currently lies in about 110 feet of water several miles off the Fire Island coastline and is a popular dive site.

Two additional dive sites, the *Drumelzier* and the *Gluckhauf*, are located within Fire Island. The *Drumelzier*, also known as the "Fire Island Wreck" was British steamship, which sunk in 1904 and is located offshore Robert Moses State Park. The *Gluckhauf*, a German tanker, ran aground in a storm in 1893. Portions of the wreck are spread over a wide area, with the stern as the most dived section.
In 2001, USACE completed a survey of 11 borrow areas located off-shore of Fire Island and Westhampton and Southampton Beaches. This included Borrow Area 2C, located south of central section of Fire Island. The survey, consisting of magnetometer and side scan sonar, did not identify any magnetic or acoustic anomalies within the borrow area.

Drowned Terrestrial Sites

No underwater, former terrestrial archaeological sites have been identified off-shore ofFire Island.

Borrow Areas

In 2001, a remote sensing survey of eleven borrow areas, including Borrow Areas 2C and 5B, was conducted to assess the potential impact of proposed activities on submerged cultural resources. A total of 10 magnetic and/or acoustic anomalies were identified as follows: one in Area 2A, four in 4A, three in 5A, one in 6A, and one in 7A. No magnetic and/or acoustic anomalies were identified in Areas 2B, 2C, 3A, 4B, 5B and 8A. No additional surveys will be required in Areas 2C and 5B, however Borrow Area 4C will require its own survey (Tidewater Atlantic Research 2001).

3.2.5.2 Onshore Portion of the Study Area

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Archaeological Resources

According to NY SHPO's archaeological site files, Site A103-05-000605, lies within Robert Moses State Park, was a recreational facility built for handicapped children in the early part of the 20th century. It is located within the dunes bordering Great South Beach and is considered to be potentially eligible for the National Register of Historic Places (John Milner and Associates 2000).

In 2005, the National Park Service completed a archaeological overview and assessment of sites within the FIIS (Gray and Pape 2005) The report relocated and assessed 13 previously identified archaeological sites within FIIS. Sites located on Fire Island include Whalehouse Point, Point O'Woods Refuse Midden, Blue Point Lifesaving Station, Smith Point Coast Guard Station, Forge River Life Saving Station, Fire Island Lighthouse Tract (two areas), the Razed Factory, the Greenburg House Site, Saltaire Dump and the Casino Site. Several of these sites, including the Blue Point Lifesaving Station, the Smith Point Coast

Guard Station, Whalehouse Point, and the Forge River Lifesaving Station are located or have features that are located in the dunes to the south of Burma Road (Gray and Pape 2005).

Architectural Resources

The Fire Island Light Station Historic District is located at the west end of the FIIS. Established in 2010, the District expanded the original Fire Island Light Station National Register property boundaries to include the Fire Island Light Station, consisting of the present Lighthouse, the Radio Compass Station, the First Lighthouse Foundation, Keeper's Quarters and the Old House, to incorporate the contributing landscape features of Burma Road, historic pathways from the Light Station to the shoreline, and the surrounding coastal grasslands, thicket zones and upper beach and dune vegetation. Significant views contributing to the historic district include the view to and from the Fire Island Light Station (NPS 2004) In architectural investigation identified several potentially eligible historic resources within the study area, which were related to the historical settlement and pre-resort development, vacation/resort industry, and maritime histories of the barriers. Reconnaissance field surveys identified 22 potentially eligible resources that meet the 50-year age consideration of the NRHP. Potentially affected architectural properties were considered to be only those visible from the beach itself. It is noted that a formal determination of eligibility requires additional research The properties recommended for additional consideration are:

- The Robert Moses State Park Tower as a landmark within the park and along the western end of the barrier island;
- Colonial Revival House, Corneille Estates, Ocean Beach vicinity, c. 1930s;
- Hip-roofed House, Corneille Estates, Ocean Beach vicinity, 1920s;
- Dutch Gable, Wood-framed House, Ocean Bay Park, c. 1930s;
- Gable-roofed house with shed dormers, Seaview, c. 1930s;
- Former Point O'Woods Life Saving Station (present Fire Island Hotel and Resort), Ocean Bay Park, c.1900;
- Point O'Woods, former Chautauqua community with numerous examples of Shingle-style architecture;
- Gable-front bungalow, Cherry Grove, c. 1920s;
- Two Eaves front bungalow, Cherry Grouve, c. 1920s;
- One and one-half story eaves front home, Cherry Grove, c. 1920s;
- Gable and hip-roofed house, Cherry Grove, c. 1920s;
- Eaves front house, Fire Island Pines, c. 1920s;

3.3 Physical Environment

3.3.1 Water Quality

There are limited data available for the surface water quality of the offshore waters of the Atlantic Ocean near Fire Island. The USACOE collected some water chemistry samples associated with a multispecies biological inventory in 2001 (USACE 2002). Sampling occurred offshore of the eastern project section, near the communities of Fire Island Pines and Cherry Grove, and west of Shinnecock Inlet. Water quality parameters sampled included surface and bottom temperature, salinity, dissolved oxygen, pH, conductivity, and light transmission/secchi depth. Temperatures ranged from 2°C at the ocean floor in January 2001 to ~20°C on the ocean surface in September 2000. Mean dissolved oxygen values at the ocean surface ranged from 5.2 to 11.5 mg/L with peak values observed in the winter months and

minimum values observed during the early fall.

Salinity values remained fairly constant ranging between 29.5-32.3 ppt. Peak salinity values were observed at the Cherry Grove sampling site in May. Light transmission/secchi depth fluctuated greatly at both the Shinnecock and Cherry Grove sites; ranging between 2.7 and 4.8 meters at Cherry Grove. Greatest values for light transmission were observed in September and minimum values were observed in December. Maximum and minimum monthly means from this study for several water quality parameters are outlined in Table 4.

Table 4 – USACE Water Quality Results for Samples Collected May-October Off Cherry Grove, Fire Island

Description	Low Value	High Value
Temperature	2.5°C (bottom)	22.3°C (surface)
Salinity	29.6ppt	31.9 ppt
Dissolved Oxygen	4.7mg/l (bottom)	11.1mg/l
pH	8.2	8.6
Light Transmission (Secchi)	2.0m (December)	4.8m (September)

3.3.2 Geology

Long Island is part of the Atlantic and Gulf Coastal physiographic province which lies along the eastern border of the United States and lies at the southern boundary of the late Pleistocene glacial advance in the eastern part of North America (Taney, 1961). The Ronkonkoma and Roanoke Point moraine deposits (i.e., mounds of unstratified glacial drift chiefly consisting of boulders, gravel, sand and clay) characterize the topography along the northern side of Long Island, while a gentler southward dipping gradient on the outwash plains makes up much of the southern side of the island (Schwab et al., 1999).

Fire Island is the longest (30 miles in length) of a chain of low-relief, sandy (fine- to medium-grained sand) barrier islands enclosing shallow back-barrier bays (Schwab et al., 1999). Fire Island is bounded on the east by Moriches Inlet and on the west by Fire Island Inlet. Great South Bay and Moriches Bay are located on the leeward side of Fire Island. Fire Island was formed by a combination of spit extension (westward) and offshore bar development. Great South Bay and Moriches Bay have historically been intermittently connected to the ocean by tidal inlets. In the normal course of events, inlets would be cut through the barrier island during storms, migrate over time to the west, and eventually close by natural processes (Taney, 1961).

The principal geologic features of the inner continental shelf offshore of Fire Island are summarized by Schwab et al. (2013):

> *(1) a regional unconformity separating Cretaceous-age coastal plain strata from overlying Quaternary sediment; (2) a Pleistocene glaciofluvial sedimentary deposit exposed at the seafloor over much of the inner continental shelf at water depths between ~15 and ~32 m, the seaward limit of the study area; and (3) a series of Holocene sand ridges on the inner continental shelf W of Watch Hill extending across the study area.*

West of Watch Hill, the Holocene (modern) sedimentary deposit is organized into a series of shoreface-connected sand ridges oriented at angles of 30° to 40° to the coast (Schwab et al., 2013). Seismic reflection data collected in 1996 and 2011 by the USGS (Schwab et al. 2013) indicate that the thickness of the Holocene sediment thickness is between 1 and 6 meters. The thickness of the sand ridges is greatest (approximately 6 meters) offshore of central Fire Island and gradually thins to the west (approximately 1

meter thick offshore of Fire Island Inlet).

3.3.3 Geomorphology

The Fire Island to Montauk Point study area is comprised of two distinct physiographic regions, specifically a barrier island portion extending from Fire Island Inlet to Southampton and a headland segment from Southampton to Montauk Point. The 50 mile long barrier beach segment is characterized by barrier islands fronting an estuary system consisting of three bays (Great South, Moriches and Shinnecock Bays) which are connected through narrow tidal waterways which are elements of the Long Island Intracoastal Waterway (ICW). Three inlets (Fire Island, Moriches and Shinnecock Inlets) connect to the Atlantic Ocean and separate the barrier segments. The barrier islands are generally less than 2,500 feet wide, and contain irregular sand dunes ranging in height to a maximum of about 30 feet. Dunes are characterized by ocean side slopes, which are generally steep, with vegetation sporadic along many segments due to frequent wave attack.

Barrier island overwashing occurring on Fire Island is indicative of low island elevations. Barrier island breaching may also occur when overwashing occurs in concert with a narrow island width, the presence of relatively deep water adjacent to the bay shore line of the island, and a limited supply of littoral material.

Geomorphology and Barrier Island Migration

Two differing theories have been advanced regarding barrier migration in the study area. Sanders and Kumar (1975) as well as Rampino and Sanders (1981) argue that an ancient barrier island system existed 8,500 to 9,000 years before present some 7 km (4.3 miles) offshore of the current barrier in a water depth of 24 m (79 feet). According to this theory, the ancient barrier island drowned in place during an accelerated period of sea level rise, skipped to a location 2 km (1.2 miles) from the present shoreline, and then eroded continuously over the past 7,000 years to its current position. Leatherman and Allen (1985), on the other hand, argue that the ancient barrier island migrated continuously to reach its present day position. Further, Leatherman and Allen (1985) argue that there are three mechanisms that facilitate barrier island migration: (1) overwash during storms, (2) wind, or aeolian transport, and (3) tidal inlet creation and subsequent closure by natural forces. They conclude that tidal inlet dynamics is the principal driver for Fire Island. Aeolian transport is insignificant. Overwash has served to increase the barriers vertically, but has resulted in minimal bayside area increases.

Over the past 2,000 years the evolution of Fire Island is best described by dividing the barrier island into three segments: an eastern segment east of Watch Hill, a central segment between Watch Hill and Point O'Woods, and a western segment west of Point O'Woods (Schwab et al, 2013). The evolution of these three segments is described by Schwab et al. (2013):

> *The eastern segment has migrated landward through inlet breaching, flood-tidal delta formation, and subsequent marsh accretion on the backbarrier side for the last few centuries (Leatherman and Allen, 1985). In contrast, over the past ~750-1,000 years, the central segment has been relatively stable (Leatherman, 1985; Leatherman and Allen, 1985; Rampino and Sanders, 1981). Geomorphic evidence and core data indicate that the western segment formed over the past 300–500 years as a prograding spit that was fed by westward alongshore sediment transport (Kumar and Sanders, 1974; Leatherman, 1985; Leatherman and Allen, 1985).*

3.3.4 Borrow Areas

A summary of the borrow areas are provided below. Further details are contained within the Borrow Area Appendix of the HSLRR. The beachfill material required for initial construction will be obtained from three offshore borrow sites: 2C , 4C and 5B (It should be noted during Plans and Specifications

phase of the project, less sand was identifies as available in Borrow Area 2C and Borrow Area 5B was selected as it was already physically and biologically screened). Borrow area locations are shown on Figure 3. The borrow areas are located within a system of extensive shoreface-attached sand ridges positioned just offshore of Fire Island National Seashore. Large sediment volumes are associated with these sand ridges (nearly 18 billion cubic yards) that extend up to 82,000 ft offshore on the continental shelf. Potential sand resources within the borrow areas account for a small fraction of the sand ridge volume with which they are associated and an even smaller part of the total ridgefield sand volume (NPS. 2008).

Borrow area 2C is located approximately 2 miles offshore of Point O' Woods and contains an estimated 9,000,000 cy of compatible sediment. In order to limit potential impacts to shoreface ridges containing modern Holocene sediments only the northeastern half of the borrow area will be dredged and utilized for the FIMI project. Sediment Suitability analyses were performed in 1998 and the texture of the material was found to be compatible with the native Fire Island sand (Appendix E of the HSLRR, Borrow Area Plan).

Borrow Area 4C area is located approximately 1.5 miles offshore of Pikes Beach and contains an estimated 2,000,000 cy of compatible sediment. But after futher investigation of the Sediment Suitability it was found that only 700,000 cys was found to be compatible with the native Fire Island sand. Borrow Area 5B area is located approximately 6.5 miles offshore of Westhampton Beach and contains an estimated 9,500,000 cy of compatible sediment. Sediment Suitability analyses were performed in 1998 and the texture of the material was also found to be compatible with the native Fire Island sand.

Originally it was thought that an average dredging cut depth of 20 feet in Borrow Area 4C, resulting in 2,180,000 CY of available sediment should be used. Upon further review of core data, it was determined that the acceptable dredging cut depth is 7 feet, resulting in 700,000 CY of available sediment. The sediment below 7 feet in Borrow Area 4C is not acceptable/compatible. Due to the lack of compatible sediment in Borrow Area 4C, it was decided to utilize the next closest Borrow Area, 5B. The sand required for initial construction will be obtained from three offshore borrow sites: 2C, 4C, and 5B. Borrow area 2C contains an estimated 9 million cubic yards of compatible sediment. Borrow area 4C contains an estimated 700,000 cubic yards of compatible sediment. Borrow Area 5B contains an estimated 9.5 million cy of compatible sediment. The total initial project fill volume would be 6,992,145 cy which represents the volume of sand necessary to achieve the design fill, advance fill, overfill, and contingency profiles for 19 miles of beach.

Material for initial construction is proposed as follows: approximately 5,000,000 cy of sand to be removed from Borrow Area 2C and placed in the fill areas between Fire Island Inlet and Davis Park. Approximately 700,000 cy to be removed from Borrow Area 4C, and approximately 1,300,000 cy to be removed from Borrow Area 5B for fill areas between Smith Point County Park and Moriches Inlet.

Point	Easting	Northing
4C1	1,348,923	223,361
4C2	1,350,473	223,962
4C3	1,351,023	222,411
4C4	1,349,473	221,811

Point	Easting	Northing
5B1	1,371,140	231,984
5B2	1,381,680	236,212

5B3	1,382,350	234,057
5B4	1,371,970	229,922

Point	Easting	Northing
2C2	1,232,757	170,383
2C3	1,238,607	166,176
2C4	1,243,037	165,887
2C5	1,242,906	163,358
2C6	1,230,537	164,441
2C7	1,228,127	169,962
2C8	1,231,477	171,262

The dredging of the borrow areas could potentially and directly impact the benthic communities present in the areas. Although this community would be disturbed, such disturbance would be of a temporary nature and would occur in dynamic/high energy environments where species have adapted to these: conditions. Preconstruction surveys would ensure that impacts to highly diverse areas containing substantial surf clam populations are avoided or minimized. The portion of borrow areas actively dredged for all the Federal projects located along the south shore represent a very small percentage of the total available habitat. These areas also are spatially distributed so that dredging impacts are not concentrated in any one portion of the Study Area. In addition, the borrow areas are sloped in a manner to prevent anoxic conditions. Finally, the substrate in the borrow areas is similar in composition to pre- and post-construction conditions, allowing for the recolonization of these areas, which should occur within 12 to 18 months following dredging operations. Thus the cumulative effect of dredging on the ecology of the Study Area would not be significant.

Sediment taken from the borrow area would be extracted to a depth no greater than 20 feet below the existing bottom. The USACE is currently working with NYSDEC to establish a monitoring plan which would include monitoring for sturgeon. Anticipated first field effort is in spring 2014.

Fire Island National Seashore received emergency Hurricane Sandy funds from the Federal Highway Administration's Eastern Federal Lands Division to dredge approximately 60,000 cubic yards from the Seashore's Watch Hill boat channel and marina. Currently, the plans are to undertake dredging during the channel's fall dredge window of 2014 (October 1 - December 15) which would coincide with the Stabilization Project's proposed construction schedule. While the Watch Hill project's objective is to re-establish the channel for safe passage by all users of the channel, it also outlines the beneficial use of the dredged material by either stockpiling or placement in permitted areas (FIIS, 2013).

NPS is proposing that the 60,000 cubic yards be beneficially placed to create a feeder beach with a berm elevation not to exceed 9.5 ft. NGVD on the first 1500 feet of the eastern end of Davis Park. This action will augment the Stabilization Project's need for sand within Davis Park. NPS is proposing that the pipeline from the channel to the placement site will be positioned on public land (Federally or locally permitted).

3.3.5 Marine Offshore Ecosystem

The Marine Offshore Ecosystem includes the Marine Offshore habitat, which consists of the deeper water areas of the Atlantic Ocean within the study area. The borrow areas are located in the Marine Offshore habitat (see Figure 3)

3.3.6 Natural Resources

The study area is a complex array of marine, coastal and estuarine ecosystems and habitats which are summarized in Table 5. An overview of each ecosystem and a description of each habitat, including a physical description and identification of associated flora and fauna, is provided in the following sections for more information reference the FWCAR appendix.

Table 5 – Summary of Ecosystems and Habitats

ECOSYSTEM/HABITAT	Summary Description
Marine Offshore Ecosystem	
Marine Offshore	*Subtidal marine habitat ranging in depth from 10 to 30 meters; includes pelagic and benthic zones*
Atlantic Shores and Inlets Ecosystem	
Marine Nearshore	*MLW to depth of 10 meters; includes pelagic and benthic zones*
Marine Intertidal	*Extends from MLW to MHW with a sandy and/or rocky substrate*
	Extends from the MHW line on the ocean side to the boundary of the primary Dune and Swale habitat within the Barrier Island Ecosystem; sandy substrate
Inlets	*Areas of water interchange between bay and ocean zones (e.g., Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet)*
Barrier Island Ecosystem	
Dunes and Swales	*Primary dune through most landward primary swale system*
Terrestrial Upland	*Extends from the landward boundary of the primary dunes and swales on the ocean side, to the MHW boundary of the Bay Intertidal habitat on the bay side of the island contains all upland habitats excluding the maritime forest; scrub/shrub are also included in this habitat, along with bayside beach areas*
Maritime Forest	*Forested area on barrier island defined by salt tolerant vegetation, high salinity and salt spray adapted soils and vegetation assemblages such as trees, shrubs, and herbaceous species (e.g. Sunken Forest)*
Bayside Beach	*Area between MHW to seaward limit of vegetation or "upland" boundary*
Backbay Ecosystem	
Bay Intertidal	*Extends from MHW to MLW on the bay side of the barrier island. Habitats such as Salt Marsh, and Sand Shoals and Mud Flats may also be present between MHW and MLW.*
Sand Shoals, Bare Sand, Mud Flats	*Found within the Intertidal Habitat and exposed at low tide; specific habitat type is defined by the substrate type*
Salt Marsh	*Bayside vegetation communities dominated and defined by salt-tolerant species; occurs from the landward limit of the high marsh vegetation, sometimes also MHW or slightly landward to the seaward limit of the intertidal marsh vegetation*
Bay Subtidal	*Bayside aquatic areas below MLW*
SAV	*Bayside submerged aquatic vegetation (SAV) communities found within the subtidal habitat*
Mainland Upland Ecosystem	

Mainland Upland	*Area generally extends from the landward limit of the Bay Intertidal MHW line to the landward limit of the study area (i.e., +16 ft. NGVD), which generally correlates with Montauk Highway (Route 27). On the Atlantic shorefront, Mainland Upland begins at the landward toe of the primary dune.*

Physical Description. The Marine Offshore habitat is an oceanic area with water depths ranging from 10 to 30 m. The habitat is relatively homogeneous throughout the entire southern Long Island coastline from Rockaway Inlet, through Fire Island National Seashore and east to Montauk Point. The habitat includes pelagic and benthic zones which support different assemblages of organisms. The pelagic zone refers to the water column and organisms within it, whereas the benthic zone refers to the bottom or substrate and includes sediments and other material present on the ocean floor. The benthic zone substrate is primarily sand within the study area. Through geo-morphological analyses, sand suitable for beach nourishment has been identified at nine locations. These locations, referred to as borrow areas, are located within the Marine Offshore habitat and are less than one mile offshore. Two of the identified borrow areas will be utilized for the FIMI project.

With the exception of sea turtles and birds, all biota associated with the Marine Offshore habitat are exclusively aquatic. Aquatic biota that utilize the Marine Offshore habitat primarily include primarily fish and benthic invertebrates, as well as marine mammals.

Marine Invertebrates. Marine benthic invertebrates are bottom-dwelling species that can be grouped into two categories: infaunal (i.e., benthic invertebrates living within the substrate) and epifaunal (i.e., benthic invertebrates living on the surface of the substrate). Benthic invertebrates are found in the substrate of potential borrow areas. Polychaetes (segmented worms with bristles) are an important component of the benthic infaunal community; epifaunal biota include amphipods, crabs, horseshoe crabs (*Limulus polyphemus*), echinoderms (e.g., sea stars, sand dollars), and bivalves (e.g., surf scallops [*Aequipecten sp*.], Atlantic surfclams [*Spisula solidissima*]). Marine invertebrates provide an important food source for bottom feeding fish and also include species that are commercially and recreationally important. The benthic invertebrates of the Marine Offshore habitat include a variety of taxa common to generally clean, well-oxygenated, coarse sandy marine habitats.

Finfish. The Marine Offshore habitat supports a variety of pelagic and benthic finfish, some of which are recreationally or commercially important. The pelagic zone contains few truly resident fish populations; rather it is dominated primarily by a variety of migratory and highly mobile species including hake (*Urophycis sp*.), scup (*Stenotomus chrysops*), Atlantic butterfish (*Peprilus triacanthus*), bluefish (*Pomatomus saltator*), and striped bass (*Morone sexualities*). Similarly, benthic fish species that occur in the Marine Offshore habitat are largely mobile and migratory; important benthic species include both summer flounder (*Paralichthys dentatus*) and winter flounder (*Pseudopleuronectes americanus*).

Marine Mammals. The pelagic zone also provides habitat for marine mammals. The harbor seal (*Phoca vitulina*), which is listed as a protected species by New York State is the only marine mammal expected to frequent the Marine Offshore habitat within the study area. Marine mammals such as the right whale (*Eubalaena glacialis*; Federally Endangered) and Pygmy- sperm whale (*Kogia breviceps*) may also use this habitat from time to time. Gray seals (*Halichoerus grypus*) may also be found in this habitat.

Reptiles. Several species of sea turtles, including Kemps ridley (*Lepidochelys kempii*; State and Federally

Endangered), green (*Chelonia mydas*; State and Federally Endangered), and loggerhead (*Caretta caretta*; State and Federally Threatened) may also pass through the Marine Offshore habitat from time to time.

Birds. The Marine Offshore is part of a flyway that is used by a wide array of avifauna during certain portions of the year. Waterfowl such as sea ducks and diving ducks use offshore areas in winter. Common waterfowl species observed in the area include white-winged scoter (*Melanitta deglandi*), surf scoter (*M. perspicillata*), oldsquaw (*Clangula hyemalis*), and red-breasted merganser (*Mergus serrator*).

3.3.7 Atlantic Shores and Inlets Ecosystem

The Atlantic Shores and Inlets Ecosystem extends from a depth of 10 m in the Atlantic Ocean of the study area past the mean high water (MHW) line to the line of vegetation or toe of the primary dune. The ecosystem includes the Marine Nearshore, Marine Intertidal, Marine Beach and Inlets habitats.

Marine Nearshore

Physical Description. The Marine Nearshore habitat is landward of the Marine Offshore habitat and consists of the area between mean low water (MLW) to 10m in depth. Similar to the Marine Offshore habitat, the Marine Nearshore habitat is divided into pelagic and benthic zones and the substrate is predominantly sand. Since the Marine Nearshore Habitat is a transitional area between the deeper offshore waters of the Marine Offshore habitat and the shallow, Marine Intertidal habitat, it includes biota that are common to both of these areas.

Marine Invertebrates. The benthic community of the nearshore environment includes a variety of benthic invertebrates, several of which are commercially and recreationally important. Within the Marine Nearshore habitat of the study area, there is a high degree of spatial and seasonal uniformity in both species composition and abundance (USACE 2004). Benthic invertebrate communities in the Marine Nearshore habitat are generally similar in distribution and composition to the Marine Offshore habitat and consist of a variety of taxa common to generally clean, well-oxygenated, coarse sandy, subtidal marine habitats. Dominant invertebrates include: segmented worms (phylum *Annelida*), snails, clams and squids (phylum *Mollusca*), crabs, lobster and shrimp (phylum *Arthropoda*, class *Crustacea*) and sea urchins and sea stars (phylum *Echinodermata*). Commercially important benthic species such as surf clams, American lobster (*Homarus americanus*) and long finned squid (*Loligo pealeii*) also use the Marine Nearshore habitat (USACE 2004).

Finfish. Fish communities are similar in distribution and composition to the Marine Offshore habitat. The pelagic zone contains few truly resident fish populations; rather it is dominated primarily by a variety of migratory and highly mobile species including commercially and recreationally important bluefish and striped bass.

Marine Mammals. Harbor seals are the most common marine mammal in the Marine Nearshore habitat and are found particularly on the eastern end of the study area. Gray seals may also be found in this habitat.

Reptiles. Several species of sea turtles, including Kemps ridley, and loggerhead, may also be found in the Marine Nearshore habitat from time to time.

Birds. Shallower Marine Nearshore waters provide feeding habitat for a variety of birds,

including osprey (*Pandion haliaetus*; State Special Concern), common tern (*Sterna hirundo*; State threatened), least tern (*Sterna antillarum*; State Threatened) and roseate tern (*Sterna dougallii*; State and Federally Endangered). The availability of prey fish and benthic invertebrates also attracts piscivorous (fish-eating) species such as the cormorant (Family *Phalacrocoracidae*). Recreationally important sea ducks also utilize the Marine Nearshore habitat. Waterfowl such as sea ducks and diving ducks use Marine Nearshore, as well as offshore, habitats in winter. Common waterfowl species observed in the area include white-winged scoter, surf scoter, oldsquaw, and red-breasted merganser.

Marine Intertidal

Physical Description. The Marine Intertidal habitat extends from the boundary of the Marine Nearshore at MLW to MHW. Within the study area, this habitat is predominantly sandy; however, there are also rocky areas in the east end of the study area, and areas with hardened shorelines, such as bulkheads. The area is typically highly turbid with very high wave energy and exhibits a varying pelagic zone due to the tidal cycle. Biota that use the Marine Intertidal habitat are adapted for life in physically stressful conditions and as a result, this habitat zone is characterized by fewer organisms.

Vegetation. Owing to the dynamic nature of high energy wave action in much of the Marine Intertidal habitat and the lack of surface for attachment, there is little aquatic vegetation in the FIMI project area.

Marine Invertebrates. Because of the alternate inundation and drying of this zone, the benthic community tends to have a lower species richness than the other marine habitats described. A variety of polychaetes, amphipods, isopods, bivalves and crabs are commonly found in sandy intertidal areas that typify the study area. Invertebrates adapted to the rocky intertidal zone that occurs in the east portion of the study area include barnacles (*Balanus spp.*), blue mussels (*Mytilus edulis*), common eastern chitons (*Chaetopleura apiculata*), hermit crabs (*Pagurus spp.*) and snails (e.g., common periwinkle, *Littorina littorea*). Other common taxa in the Marine Intertidal habitat include the polychaete (e.g., *Scolelepis sp.*), the bivalve (e.g., *Donax sp.*), and the mole crab (*Emerita sp.*) aquatic worms (Class *Oligochaeta*), and round worms (phylum *Nematoda)* are also present.

Finfish. The Marine Intertidal habitat provides limited habitat for fish depending on the tidal cycle; consequently the fish diversity in this habitat is relatively low.

Marine Mammals. The Marine Intertidal habitat also provides habitat to marine mammals such as harbor and gray seals.

Reptiles. The sea turtles that may be found in the Marine Offshore and Marine Nearshore habitats do not nest in the study area and therefore, are not likely to be found in the Marine Intertidal habitat.

Birds. The Marine Intertidal habitat is an important feeding area for shorebirds, colonial waterbirds, gulls and waterfowl. Shorebird species that forage on invertebrates along the beaches and intertidal zones of the study area include, but are not limited to: dunlin (*Calidris alpina*), sanderling (*C. alba*), red knot (*C. canutus*), semipalmated sandpiper (*C. pusilla*), piping plover (*Charadrius melodus*; State and Federally Endangered), semipalmated plover (*C. semipalmatus*), black-bellied plover (*Pluvialis squatarola*), lesser yellowlegs (*Tringa flavipes*), greater yellowlegs (*T. melanoleuca*), willet (*Catoptrophorus semipalmatus*), American oystercatcher (*Haematopus palliates*). Seabird species include least tern, common tern, roseate tern, and Forster's tern (*Sterna forsteri*; State protected).

Marine Beach

Physical Description. The Marine Beach habitat extends from the MHW line, or upper boundary of the Marine Intertidal habitat, to the line of vegetation or to the seaward toe of the primary dune. The Marine Beach habitat is made up of sand and is typically unvegetated or only sparsely vegetated and not subject to regular inundation. The Marine Beach habitat is generally low in biological diversity in relation to other study area habitats; however, this habitat does support several threatened and/or endangered plant and animal species, as presented in the following paragraphs.

Vegetation. In most areas, the Marine Beach habitat is not particularly suitable for the establishment and maintenance of vegetative communities. The poor nutrient content and moisture holding capacity of the sandy substrate restricts colonization by all but the most specialized forms. In undeveloped areas, the backshore of the beach (high tide line to dunes) can be sparsely vegetated by species such as sea-rocket (*Cakile edentula*) and seaside spurge (*Euphorbia polygonifolia*). In addition, seabeach amaranth (*Amaranthus pumilus*; State Threatened [S2], Federally Threatened) and seaside knotweed (*Polygonum glaucum*; State Rare [S3]) are adapted to the conditions in this habitat and can be found in the study area.

Wrack. Wrack is an onshore accumulation of washed up seagrasses and/or seaweed, and can play an important role in the sandy beach ecosystem, acting as both habitat and a food source. Several species of scavengers are known to feed upon beach wrack, including crustaceans and insects. Invertebrate species associated with wrack may also be preyed upon by shorebirds, such as Piping plovers. Removal of wrack, as a management practice, has been associated with a lower species abundance compared to sandy beaches where wrack remained and was allowed to be incorporated into the food web (Dugan et al. 2003).

Invertebrates. Dominant invertebrate groups collected in the wrack zone of the Marine Beach habitat include oligochaetes and nematodes (USACE 2005). The dominant invertebrate taxa collected using pitfall samplers were the crustacean beach fleas (*Talitrus spp*). A variety of beetles, ants and flying insects also are also present in this habitat. The major taxonomic orders include *Coleoptera* (beetles), *Diptera* (true flies) and *Amphipoda* (scuds). *Annelids* (segmented worms) are also common. Beach invertebrates were much more abundant in the Spring than in the Fall.

Terrestrial Mammals. Red fox (*Vulpes vulpes*) are known to use the Marine Beach habitat within the study area.

Birds. A variety of birds use the beach for resting, nesting, and feeding including several state and/or federally listed threatened and endangered species, including the least and common terns, and piping plover. These birds prefer dry, sandy, open beaches well above the high tide line breeding habitat. Grassless areas in remote beaches are traditionally utilized, although openings in grassy dunes as small as 200 to 300 feet wide may also be used (Wilcox 1959). Piping plover nests have been seen along the southern shore of Long Island in grassy areas at the edges of dunes, and sometimes behind dunes in blowout areas.

Herring gulls (*Larus argentatus*), great black-backed gulls (*L. marinus*), and ring-billed gulls (*L. delawarensis*) are common year-round in the study area and northern gannet (*Morus bassanus*) are frequently present in winter. Black-bellied plovers (*Pluvialis squatarola*) and sanderlings (*Calidris alba*) are also common shorebirds in the study area.

Inlets

Physical Description. There are two inlets within the study area, Fire Island and Moriches Inlets are areas of water interchange between the backbay and ocean zones. The tidal movement of water through these small gaps in the barrier island creates a zone of high water velocity and during storm events these conditions are enhanced. Inlet hydrodynamics affect sedimentation rates and movements, and distributions in the bays. These are unique habitats for many species, as well as being a transit zone between the bay and ocean for fish and other organisms.

Finfish. Inlets permit local movement and migration of commercially important fish species such as the winter and summer flounder, scup, tautog, butterfish, bluefish, herrings, striped bass, weakfish, black sea bass, and American eel (*Anguilla rostrata*).

Reptiles. In some areas, inlets provide a conduit for seasonal or periodic movement of Kemps- ridley, loggerhead and green sea turtles between the ocean and bays.

Birds. Recreationally important ducks including the scaup and black duck use inlets for the variety of prey items available for forage. Other less sensitive, more common birds such as gulls, grebe (Family *Podicipedidae*), cormorant, and common loon (*Gavia immer*; State Special Concern) also use this area.

3.3.8 Barrier Island Ecosystem

The Barrier Island Ecosystem extends from the landward boundary of the Marine Beach habitat of the Atlantic Shores and Inlets Ecosystem to the MHW boundary of the Bay Intertidal habitat of the Backbay Ecosystem on the bay side of the island. The Barrier Island Ecosystem includes the Dunes and Swales, Terrestrial Upland, Maritime Forest and Bayside Beach habitats of the barrier island proper.

Dunes and Swales

Physical Description. The landscape and plant communities of the barrier island ecosystem are highly variable both geographically and temporally. Due to water and aeolian sediment transport processes the landforms are often transitional. Breaching, overwash, and windblown deposits alter portions of the landscape over varying time scales. The native ecological communities are adapted to these changes and some species depend on them. The Dunes and Swales habitat is located between the landward edge of the Marine Beach and the Terrestrial Upland habitat of the Barrier Island Ecosystem. Dunes and Swales habitat typically has a sand substrate and is not regularly inundated by tides. Freshwater ponds, wetlands, and shrubby or forested vegetation communities may occur in between dunes and swales and are included in what is considered the Dunes and Swales habitat of the study area.

Vegetation. Different vegetation communities can be found within the Dune and Swale habitat, depending on site specific conditions. The maritime freshwater interdunal swale community, which occupies the low-lying and wet areas between the dunes, generally supports a variety of plants designated as rare or unique by the NYSDEC Natural Heritage Program and hence, has been designated as a Significant Habitat by NYSDEC.

American beachgrass (*Ammophila breviligulata*) is a pioneer plant that dominates the Dune and Swale vegetation community, especially in areas most exposed to wind and salt spray such as the ocean face of the foredune and crests of dunes. Just inland of this zone, at the toe of the dune, beachgrass occurs along with dusty miller (*Artemesia stelleriana*), beach pea (*Lathyrus japonica*), and saltwort (*Salsola kali*). On the primary dunes, beachgrass is dominant along with seaside goldenrod (*Solidago*

sempervirens); on the backside of the dunes, beach heather (*Hudsonia tomentosa*), bearberry (*Arctostaphylos uva-ursi*), and bayberry (*Myrica pensylvanica*) occur.

A shrub thicket typically develops on the lee side of the primary dune and covers the less exposed areas on the secondary dunes. Wetlands sometimes form in interdunal swales, where blowouts in the dunes intersect the water table. Typical wetland plants such as sedges, rushes, herbs, and low shrubs can become established in swales. Typical wetland swale species include twig-rush (*Cladium mariscoides*), purple gerardia (*Agalinis purpurea*), sundews (*Drosera spp.*), cranberry (*Vaccinium macrocarpon*), highbush blueberry (*V. corymbosum*), and bayberry. The upland transition zone at Atlantic Double Dunes has stands of shrublands/woodlands dominated by bayberry, shadbush (*Amelanchier sp.*), arrowwoods (*Viburnum spp.*), and pitch pine (*Pinus rigida*).

Terrestrial Mammals. Terrestrial mammals that use the Dunes and Swales habitat include white- tailed deer (*Odocoileus virginianus*), red fox and raccoon (*Procyon lotor*).

Reptiles and Amphibians. The Dunes and Swales habitat provide breeding areas for the Fowler's toad (*Bufo fowleri*) and the eastern hognose snake (*Heterodon platyrhinos*; State Special Concern). The fence lizard (*Sceloporus undulatus*; State Threatened), and Eastern box turtle (*Terrapene carolina*; State Special Concern) are also potential inhabitants of the Dune and Swale habitat (Wetlands Institute 2005). Diamondback terrapin (*Malaclemys terrapin*; Federal Species of Concern, State Special Regulations) also utilize this habitat.

Birds. Many of the shorebirds and waterbirds that utilize the habitats previously described may also utilize the Dunes and Swales habitat. In addition, piping plover, short-eared owl (*Asio flammeus*; State Endangered), horned lark (*Eremophila alpestris*), snow bunting (*Plectrophenax nivalis*) and snowy owl (*Bubo scandiacus*) may be found in this habitat.

Terrestrial Upland

Physical Description. The Terrestrial Upland habitat extends from the landward boundary of the Dunes and Swales habitat on the ocean side to MHW on the bay side of the barrier island. It includes primarily vegetated upland, as well as freshwater wetland communities.

Vegetation. Terrestrial Upland habitats of the barrier island may be vegetated with a variety of herbaceous, scrub-shrub and forest layer species that occur primarily in forests and shrublands. Vegetation communities include pitch pine, red maple (*Acer rubrum*) swamp forest, maritime scrub, and maritime oak/holly forest. Remnants of Pine Barren community types also occur in portions of the study area. Developed and disturbed areas are frequently colonized by non-indigenous vegetation such as common reed (*Phragmites australis*). The Maritime Forest is a unique vegetation community within the Terrestrial Upland habitat and, therefore, is described separately.

Invertebrates. Invertebrates of the Barrier Island Upland habitat include a variety of insects and spiders. Ants and burrowing spiders are common since they are able to construct deep underground tunnels to escape the hot summer temperatures.

Terrestrial Mammals. A variety of terrestrial mammals frequent both developed and non- developed vegetated areas of the Terrestrial Upland habitat. Small mammals known to use these areas include the white-tailed deer, red fox, raccoon, white-footed mouse (*Peromyscus leucopus*), voles (*Microtus spp.*) and moles (*Scalopus aquaticus*).

Reptiles and Amphibians. Reptiles and amphibians that use the Terrestrial Upland habitat, including the

Maritime Forest, include the diamondback terrapin, the Eastern mud turtle (*Kinosternon subrubrum*; State Endangered), Eastern box turtle, spotted turtle (*Clemmys guttata*; State Special Concern), Eastern hognose snake, and the tiger salamander (*Ambystoma tigrinum*; State Endangered).

Birds. A variety of birds use vegetated portions of the Terrestrial Upland habitat for nesting, and feeding, including several threatened and endangered species. More than 150 species of songbirds, about 40 different shorebirds, and various raptors utilize the barrier islands within the study area. The least and common terns, and piping plover are known to use the Terrestrial Upland habitats in certain portions of the study area. Raptors such as owls frequent forested areas. Migratory neotropical species and resident and migratory passerine species are also common components of the Terrestrial Upland habitats of the barrier island.

Breeding and wintering songbirds use the undisturbed grass/shrub communities of the study area. Some of the more common species observed include the Eastern towhee (*Pipilo erythrophthalmus*), northern mockingbird (*Mimus polyglottos*), America robin (*Turdus migratorius*), mourning dove (*Zenaida macroura*), common grackle (*Quiscalus quiscula*), common yellowthroat (*Geothlypis trichas*), prairie warbler (*Dendroica discolor*), song sparrow (*Melospiza melodia*), red-winged blackbird (*Agelaius phoeniceus*), northern bobwhite quail (*Colinus virginianus*), field sparrow (*Spizella pusilla*), and tree swallow (*Tachycineta bicolor*). Non-developed, upland portions of the barrier island provide important grounds for raptors migrating along the coast. American kestrels, merlins, peregrine falcons (*Falco peregrinus*; State Endangered), sharp-shinned hawks, and Cooper's (*Accipiter cooperii*; State Special Concern) hawks have been documented at Amagansett during migration. Snowy owls, short-eared owls , northern harrier (*Circus cyaneus*) and rough-legged hawks (*Buteo lagopus*) have also been documented during the winter months.

Maritime Forest

The Maritime Forest is a unique vegetation community within the Terrestrial Upland habitat. The only Maritime Forest within the study area is the Sunken Forest, which is a 40-acre, 200- to 300- year old *Ilex opaca* (American holly)-*Sassafras albidum* (white sassafras)-*Amelanchier spp* (shadbush) forest located in Sailors Haven, in the central portion of the Fire Island National Seashore section of the barrier island.

Shallow groundwater provides hydrology to support freshwater wetlands within the Maritime Forestthat in turn support hydrophytic vegetation such as ferns, mosses (e.g., *Sphagnum spp*.), cattails (*Typha sp.*), rushes, and other wetland species. In addition to the smaller wetlands dominated by native vegetation found throughout the Maritime Forest, one large common reed (non native) dominated marsh is also present.

Bayside Beach

The Bayside Beach habitat is a transitional zone located between the Terrestrial Upland and Intertidal Bay habitats. The Bayside Beach extends from MHW on the bay side landward to the Terrestrial Upland habitat. The border between the Terrestrial Upland and Bayside Beach habitats is formed by vegetation, drastic slope change and/or structural barriers. Within the study area much of the Bayside Beach has been eliminated due to bulkhead construction, immediate upland development and/or severe erosion.

Many of the biota that utilize the Terrestrial Upland habitat also can be found in the Bayside Beach habitat.

3.3.9 Backbay Ecosystem

Habitats within the Backbay Ecosystem include Bay Intertidal, Sand Shoals and Mudflats, Salt Marsh, Bay Subtidal, and Submerged Aquatic Vegetation Beds (SAV). This ecosystem includes all intertidal and subtidal areas below MHW from the barrier island to the mainland.

Bay Intertidal Habitat

Physical Description. The Bay Intertidal habitat includes areas between MHW and MLW on the bayside of the barrier island and on the bayshore of the Long Island mainland. The substrate is periodically exposed and flooded by semidiurnal tides (two high tides and two low tides per tidal cycle). Tidal action results in alternating periods of inundation and dryness and fluctuating salinity, making this area a naturally stressed habitat suitable only for biota that are adapted to these conditions. The Bay Intertidal habitat is influenced by hydrology and sediment transport and includes areas of natural shoreline, as well as areas of hardened shorelines, such as bulkheads and riprap revetments.

Vegetation. Vegetation within the Bay Intertidal habitat includes high marsh and low marsh areas, which are described separately in the Salt Marsh habitat section.

Benthic Invertebrates. Bayside intertidal invertebrate communities of the study area support a greater density and richness of invertebrate forms, especially in the intertidal zone, owing to the more stable nature of this area compared to the Oceanside habitats (USACE 2005). Dominant benthic invertebrate groups include polychaetes, such as the worm S*colecolepides viridis*, oligochaetes, nematodes and the gem clam, (*Gemma gemma*). Commercially important invertebrates found in the Bay Intertidal habitat include the horseshoe crab (*Limulus polyphemus*), blue crab (*Callinectes sapidus*), soft shell clam (*Mya arenaria*), and blue and ribbed mussels (*Geukensia demissa*).

USACE (2002d) performed backbay invertebrate sampling as part of a backbay finfish survey. Dominant species collected included shrimps (*Palaemonetes and Crangon sp*.), crabs, northern moon snails (*Lunatia heros*), American lobsters, and hard clams (*Mercenaria mercenaria*). Other taxa found in abundance include jellyfish and Ctenophore species, amphipods, segmented worms, isopods, sponges and tunicates.

Finfish. Numerically important fish species collected during study related sampling events included the striped killifish (*Fundulus majalis*), bay anchovy, American sand lance (*Ammodyte americanus*), mummichug (*Fundulus heteroclitus*), common pipefish (*Syngnathus fuscus*), and the Atlantic silverside. Examples of commercially and recreationally important finfish that utilize the Bay Intertidal habitat include tautog (*Tautoga onitis*), weakfish (*Cynoscion regalis*), bluefish, black sea bass (*Centropristis striata*), striped bass, and herring (family *Clupeidae*). The Bay Intertidal habitat is also important to anadromous species such as the alewife (*Alosa pseudoharengus*). The alewife is commercially important as a baitfish and as a forage species for striped bass and other piscviorous species. Other anadromous species include the rainbow smelt (*Osmerus mordax*) and sea lamprey (*Petromyzon marinus*).

Reptiles. The diamondback terrapin may use the Bay Intertidal habitat from time to time.

Birds. Terns and gulls forage for infaunal invertebrates in the intertidal habitats within the bay during low tide; during high tide, the birds forage for bait fish that frequent the flats. Species that can be found in the Bay Intertidal habitat include black skimmer (*Rhynchops niger*), osprey, piping plover and least tern. Additional shorebirds, wading and migratory species such as cormorant, saltmarsh sharp-tail

sparrow (*Ammodramus caudacutus*), seaside sparrow (*A. maritimus*) and American oystercatcher also use these habitats.

The entire backbay area from the western end of West Hempstead Bay east to Captree Point in Great South Bay, an area of approximately 25,000 acres, is an important area for shorebirds. Based on the USFWS 1997, Moriches Bay is one of the most significant shorebird congregation areas in the backbays. Highest densities of birds congregate in the Fall. The dominant species noted were semipalmated plover ,black-bellied plover lesser yellowlegs (*Tringa flavipes*), greater yellowlegs (*T. melanoleuca*), ruddy turnstone (*Arenaria interpres*), sanderling, semipalmated sandpiper, least sandpiper (*Calidris minutilla*), and the short-billed dowitcher (*Limnodromus griseus*).

Sand Shoals and Mudflats

Physical Description. Sand Shoals and Mudflat habitats consist of unvegetated areas in the intertidal zone with either sand or mud substrates. As with the intertidal zone, this habitat is regularly exposed at low tide. The configuration and distribution of Sand Shoals and Mudflats are greatly influenced by local hydrology and grain size deposition or distribution (i.e., mud, clay or sand).

Biota. Biota that can be found in the Sand Shoals and Mudflats habitat are the similar to those described for the Bay Intertidal habitat.

Salt Marsh

Physical Description. The Salt Marsh habitat occurs between mean higher high water (MHHW) and MLW and is regularly flooded by the tide. The Salt Marsh habitat consists of two vegetation communities, high marsh and low marsh. High marsh is located between MHHW and MHW and is irregularly flooded. Low marsh is located below MHW and is inundated twice daily.

Vegetation. High marsh is dominated by salt tolerant shrubs such as marsh elder (*Iva frutescens*) and groundsel tree (*Baccharis halimifolia*) on the landward side and herbaceous vegetation such as saltmeadow cordgrass (*Spartina patens*), spike grass (*Distichlis spicata*), and saltmeadow rush(*Juncus gerardii*) toward the water. Low marsh vegetation is predominantly smooth cordgrass (*Spartina alterniflora*).

Benthic Invertebrates. Key benthic species of tidal marshes include the mud snail (*Ilyanassa obsoleta*), the salt marsh snail (*Melampus bidentatus*) the ribbed mussel, blue mussel, the marsh crab (*Sesarma reticulatum*) and the fiddler crabs (*Uca pugilator* and *U. pugnax*) (New York Sea Grant Institute 1994).

Finfish. Intertidal habitats, such as tidal marshes, function as nursery areas for a variety of fish species. Atlantic silverside and mummichog are typical dominant fish of mid-Atlantic salt marshes (NYSGI 1994). During flood tides, low numbers of larger predatory species are present feeding on these prey species; predators include bluefish, striped bass and flounders. Commercially important fish such as the tautog, weakfish, bluefish, black sea bass, striped bass, and herring also utilize the Salt Marsh habitat for all or a portion of their lives

Birds. Common bird species of the tidal marsh include clapper rail (*Rallus longirostris*), willet, marsh wren (*Cistothorus palustris*) and the seaside sparrow (*Ammodramus maritimus*).

Bay Subtidal

Physical Description. The Bay Subtidal habitat extends from the MLW boundary of the Bay Intertidal habitat and includes the channels and deeper areas of the bay that are always inundated. Most subtidal areas are unvegetated; however, vegetated SAV habitat is a subtidal habitat that is described separately owing to its ecological importance and sensitivity. Mean depths in the study area bays range from 3 to 10 feet MLW.

Benthic Invertebrates. Benthic invertebrates of the Bay Subtidal habitat are characteristic of fine-grained sediments typical of this habitat. As with the Marine habitats, a variety of polychaetes, amphipods, isopods and bivalves are commonly found. A variety of crabs also inhabit portions of the Bay Subtidal habitats including the Jonah crab (*Cancer borealis*), rock crab (*C. irroratus*), lady crab (*Ovalipes ocellatus*), green crab (*Carcinus maenas*), spider crab (*Libinia emarginata*) and the blue crab. Several of the species, especially the blue crab, are commercially and/or recreationally important.

Finfish. There are a variety of finfish in the Bay Subtidal waters that retreat from the Intertidal habitat on an ebbing tide. Different species tend to be attracted to different subtidal depths and substrate types (e.g., shallow nonvegetated sand and mud, vegetated areas, mid-depth, etc.). Striped killifish, sheepshead minnow (*Cyprinodon variegatus*), white mullet (*Mugil curema*) and northern kingfish (*Menticirrhus saxatilis*), for example, have been reported as more numerous over sand bottoms (USFW 1998).

Birds. The large, open, relatively shallow waters of the Bay Subtidal habitat provide resting and staging areas for a variety of waterfowl. The study area lies within the Atlantic Flyway, and therefore, is particularly important to migratory waterfowl during the winter.

Submerged Aquatic Vegetation (SAV)

Physical Description/Vegetation. SAV habitat consists of subtidal areas that support submerged aquatic vegetation such as eelgrass (*Zostera marina*) or widgeon grass (*Ruppia maritima*). Within the project area, the dominant SAV is eelgrass, with widgeon grass found in areas of lower salinity.

Biota. SAV is one of the most important features of the Bay Subtidal habitat. It provides nursery areas for finfish and a niche for colonization of epiphytic algae and invertebrates. SAV beds provide a unique habitat for a diverse assemblage of invertebrates, including commercially important blue and ribbed mussels and blue crabs. Epiphytic invertebrates in turn provide a food source for a variety of fish including commercially and recreationally important tautog, weakfish, bluefish, black sea bass, striped bass, herring, summer flounder, winter flounder, and American eel.

3.3.10 Mainland Upland Ecosystem

The Mainland Upland Ecosystem extends from the landward limit of the Bay Intertidal MHW line to the landward limit of the study area. The Mainland Upland habitat is characterized by a mosaic of 'natural' areas interspersed with various forms and densities of human development. This habitat includes the upland areas, transitional habitats, and the fringing freshwater wetlands located above the spring high tide mark along the mainland south shore and the higher elevations of the eastern shore zone. The natural resources of the Mainland Upland would be not directly influenced by the potential storm damage management measures under review, and thus no focused investigations of the natural resources of the Mainland Upland were performed as part of the Reformulation Study.

3.3.11 Threatened and Endangered Species

Two Federal agencies, the Fish and Wildlife Service (USFWS), in the Department of the Interior, and the National Oceanic and Atmospheric Administration (NOAA) Fisheries, in the Department of Commerce, share responsibility for administration of the Endangered Species Act (ESA). The USFWS is responsible for terrestrial and avian listed species, as well as freshwater aquatic species. NOAA, through the Protected Resources Division of the National Marine Fisheries Service (NMFS) is responsible for marine aquatic species. In addition to species protected under the Federal ESA, the State of New York maintains a list of species that are Threatened, Endangered, Rare, or of Special Concern in the State. Table 7 provides the listed species that may occur within the study area, and their Federal and/or State status. Table 8 lists each species and presents a summary of the habitats that they may utilize within the study area.

Four species of whales: finback (*Balaenoptera physalus*), humpback (*Megaptera novaeangliae*), sei (*Balaenoptera borealis*) and right (*Eubalaena glacialis*), have the potential to pass through the waters above the borrow area. All four species are state and Federally listed endangered species. They are typically found significantly farther offshore, but have limited potential to enter the area during spring and fall migration periods. No records, present or past, indicate that the New York Bight is a high use foraging area for large cetaceans.

The New York District completed coordination with the USFWS regarding implementation of the Stabilization Project and receiving the Biological Opinion (Attachment D) on May 23, 2014. The USACE also coordinated under Emergency Consultation procedures with the NMFS for threatened and endangered marine species.

Based on habitat and life history assessments, it was determined that the Atlantic Sturgeon, Endangered, (not listed) is likely to occur in the FIMI Project Area :

Based on habitat and life history assessments, recommendations from the USFWS and a Biological Assessment (Attachment D) prepared by the USACE and the Biological Opinion, it has determined that the following Federally- listed species are likely to occur in the FIMI Project Area:

- Piping Plover (*Charadrius melodus*), Federally Threatened;
- Roseate Tern (*Sterna dougallii*), Federally Endangered;
- Rufa red knot (*Calidris canutus rufa*), Proposed; and
- Seabeach Amaranth (*Amaranthus pumilus*), Federally Threatened

These Federally listed species are found within essentially the same habitats. 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. The piping plover population in the project area (Fire Island) has supported as many as 54 pairs of piping plovers (in 2008), declining to 27 pairs in 2013. According to USFWS, Hurricane Sandy created approximately 200 acres of new potential overwash habitat located within the project area. Below are the recent figures of piping plover and seabeach amaranth within the project area (for more information, refer to the attached BO).

2013: Piping plovers: 11 nesting pairs, 7 fledglings
Seabeach amaranth: 15 individuals

2012: Piping plovers: 12 nesting pairs, 15 fledglings

Seabeach amaranth: 26 individuals

2011: Piping plovers: 14 nesting pairs, 14 fledglings
Seabeach amaranth: 40 individuals

2010: Piping plovers: 17 nesting pairs, 17 fledglings
Seabeach amaranth: 11 individuals

2009: Piping plovers: 19 nesting pairs, 13 fledglings
Seabeach amaranth: 78 individuals

https://irma.nps.gov/App/Portal/Home

3.3.12 Habitats of Importance

Essential Fish Habitat

The NMFS is responsible for enforcing the Magnuson-Stevens Fishery Conservation and Management Act (1996 amendments) (MSA), which is intended to promote sustainable fisheries. To implement the MSA, the NMFS and the eight regional Fishery Management Councils have identified and described Essential Fish Habitat (EFH) for each managed fish species. EFH can consist of both the water column (pelagic) and the underlying surface (seafloor) of a particular area. Areas designated as EFH contain habitat essential to the long-term survival and health of our nation's fisheries.

Several habitats within the study area, including Marine Offshore, Marine Nearshore, Marine Intertidal, Inlets, Bay Intertidal, Sand Shoals and Mudflats, Salt Marsh, Bay Subtidal, and SAV, have been designated as EFH for one or more managed fish species. The overall study area contains EFH for various life stages for 27 species of managed fish. In compliance with Section 305(b)(2) of the MSA, the Reformulation Study will include an assessment of the potential effects of the proposed alternatives on Essential Fish Habitat (EFH), including all pelagic and benthic fish habitat off of Long Island, 1,000 feet seaward of mean low water (MLW) and coastal and open Atlantic Ocean. In addition, a separate EFH assessment has been prepared specifically for the FIMI Stabilization Project and is included as Attachment B.

Fish occupation of waters within the project impact areas is highly variable spatially and temporally. Some of the species are strictly offshore, while others may occupy both nearshore and offshore waters. In addition, some species may be suited for the open ocean or pelagic waters, while others may be more oriented to bottom or demersal waters. This can also vary between life stages of Federally managed species. Also, seasonal abundances are highly variable, as many species are highly migratory.

Significant Habitats

The USFWS has identified Shinnecock Bay, Moriches Bay, Great South Bay, Montauk Peninsula, and South Fork Long Island Beaches as Significant Habitats and Complexes of the New York Bight Watershed. These areas have been recognized as regionally significant habitats and species populations. In addition, all of the backbay waters, including Bay Intertidal and Bay Subtidal habitats within the study area have been designated as Significant Coastal Fish and Wildlife Habitats (SCFWH) by the New York State Department of State (NYSDOS). All or portions of the following specific SCFWH areas are within the FIMI Stabilization Project area: Great South Bay, Democrat Point, Moriches Bay and Smith Point County Park.

Within the Dunes and Swales habitat, the maritime freshwater interdunal swale community, which occupies the low-lying and wet areas between the dunes, generally supports a variety of plants designated as rare or unique by the NYSDEC Natural Heritage Program and hence, has been designated as a Significant Habitat by NYSDEC.

The Sunken Forest is one of three locations where maritime forests persist on the eastern seaboard. The Sunken Forest is from 200 to 300 years old and is located within Fire Island National Seashore, near the Sailors Haven marina and visitor center. Because of its uniqueness as a maritime forest community, the Sunken Forest is of particular ecological importance and warrants special protection.

Submerged aquatic vegetation (SAV) is a unique vegetated intertidal habitat. The establishment of SAV is dependent on suitable water quality, substrate, depth and water currents. SAV is one of the most important features of the Backbay Ecosystem since it provides nursery areas for finfish and a niche for colonization of epiphytic algae and invertebrates.

Table 6 – Federally- and/or State-Listed Species that may occur within the Project Area

Common Name	Scientific Name	Federal Status	New York State Status
Mammals			
Harbor Seal	*Phoca vitulina*	Not listed	Protected
Finback Whale	*Balaenoptera physalus*	Endangered	Endangered
Humpback Whale	*Megaptera novaeangliae*	Endangered	Endangered
Right Whale	*Eubalaena glacialis*	Endangered	Endangered
Sei Whale	*Balaenoptera borealis*	Endangered	Endangered
Reptiles and Amphibians			
Diamondback terrapin	*Malaclemys terrapin*	Species of Concern	Special Regulations
Eastern Hognose Snake	*Heterodon platyrhinos*	Not listed	Special Concern
Fence Lizard	*Sceloporus undulatus*	Unlisted	Threatened
Green Sea Turtle	*Chelonia mydas*	Threatened	Threatened
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered	Endangered
Loggerhead Sea Turtle	*Caretta caretta*	Threatened	Threatened
Eastern Mud Turtle	*Kinosternon subrubrum*	Not listed	Endangered
Eastern box turtle	*Terrapene carolina*	Not listed	Special Concern
Spotted Turtle	*Clemmys guttata*	Not listed	Special Concern
Tiger Salamander	*Ambystoma tigrinum*	Not listed	Endangered
Birds			
Common Loon	*Gavia immer*	Not listed	Special Concern
Common Tern	*Sterna hirundo*	Not listed	Threatened
Cooper's Hawk	*Accipiter cooperii*	Not listed	Special Concern
Forster's tern	*Sterna forsteri*	Not listed	Protected
Least Tern	*Sterna antillarum*	Not listed	Threatened
Osprey	*Pandion haliaetus*	Not listed	Special Concern
Peregrine Falcon	*Falco peregrinus*	Delisted	Endangered
Piping Plover	*Charadrius melodus*	Threatened	Endangered
Roseate Tern	*Sterna dougallii*	Endangered	Endangered
Anadromous Fish			
Atlantic Sturgeon (New York Bight Distinct Population Segment)	*Acipenser oxyrinchus oxyrinchus*	Endangered	Not Listed
Shortnose Sturgeon	*Acipenser brevirostrum*	Endangered	Endangered
Plants			
Seabeach Amaranth	*Amaranthus pumilus*	Threatened	Threatened [S2]
Seaside Knotweed	*Polygonum glaucum*	Not listed	Rare [S3]

Table 7 -- Habitat Associations for Federally- and/or State-Listed Species that may occur in the Project Area

Common Name	Habitats That May Be Utilized
Mammals	
Harbor Seal	Marine Offshore Marine Nearshore
Finback Whale Humpback Whale Right Whale Sei Whale	Marine Offshore
Reptiles and Amphibians	
Diamondback Terrapin	Dunes and Swales Terrestrial Upland Bay Intertidal Bay Subtidal
Fence Lizard	Dunes and Swales
Green turtle Kemp's Ridley Loggerhead	Marine Offshore Marine Nearshore Bay Subtidal SAV Inlets
Eastern Box Turtle Eastern Hognose Snake	Dunes and Swales Barrier Island – Terrestrial Upland
Eastern Mud Turtle Spotted Turtle Tiger Salamander	Barrier Island – Terrestrial Upland
Birds	
Common Loon	Inlets Bay Intertidal Bay Subtidal
Common Tern Least Tern	Marine Nearshore Marine Intertidal Marine Beach Terrestrial Upland Bayside Beach Bay Intertidal
Cooper's Hawk Peregrine Falcon	Terrestrial Upland
Forster's Tern Roseate Tern	Marine Nearshore Marine Intertidal Marine Beach
Osprey	Marine Nearshore Marine Intertidal Bay Intertidal Bay Subtidal
Piping Plover	Marine Beach Terrestrial Upland Bayside Beach Bay Intertidal
Anadromous Fish	
Atlantic Sturgeon Shortnose Sturgeon	Marine Offshore Marine Nearshore
Plants	
Seabeach Amaranth Seaside knotweed	Marine Beach

3.4 Noise and Air Quality

Noise level measurements have not been obtained in the Project area. In lieu of field measurements, the noise levels in the Project area can be approximated using existing land uses. The dominant land use in the Project area is coastal beach and residential housing which has mean outdoor day-night sound levels range from 59 to 78 A-weighted decibel (USEPA 1978).

Based on the National Ambient Air Quality Standards (NAAQS), Suffolk County is currently classified as "marginal" nonattainment for the 2008 8-hour ozone standard and nonattainment of the 2006 particulate matter less than 2.5 microns ($PM_{2.5}$) standard. The county is part of the Ozone Transport Region. Ozone is controlled through the regulation of its precursor emissions, which include oxides of nitrogen (NOx) and volatile organic compounds (VOCs). Sulfur dioxide (SO2) is a precursor for $PM_{2.5}$. Because of these designations and since the project is a Federal Action taken by the USACE, this project will require a General Conformity Review under 40CFR§93.154.

3.5 Hazard, Toxic, Radioactive Waste

No assessment for Hazardous, Toxic, Radioactive Waste (HTRW) was required, since the borrow areas were not a concern of the U.S. EPA or NY State, nor are they part of the National Priority List under, Comprehensive Environmental Response, Compensation, Liability Act (CERCLA) or Resource Conservation and Recovery Act (RCRA).

Sand from the borrow areas is predominantly quartzose sand, which lacks the affinity for binding of contaminants. In addition, the extremely low organic carbon and clay content of the borrow area sediments makes the presence of contaminants highly unlikely other than at trace levels.

4.0 ENVIRONMENTAL IMPACTS

4.1 No Action Alternative

Under the No Action Alternative, the Corps of Engineers and the Federal government would take no action to reduce storm damages in the study area. It is recognized that in the absence of Federal action that Local Governments and non-Governmental groups, such as homeowner associations could take actions to protect themselves by undertaking their own construction projects to build up the beach and dune profiles. With the No Action Alternative, a large storm will likely result in major damage to structures and possibly human safety, since the entire FIMI reach lies within the 100 year flood plain. Therefore, even no action has negative environmental consequences, since during low frequency storm events, no action will probably mean a loss of property and potentially even human life. Since the No Action alternative does not meet the needs of the communities, it is not the socially preferred alternative.

The following subsections discuss the potential environmental consequences on the impact topics evaluated that would be expected to occur with the No Action Alternative.

4.1.1 Human Environment

4.1.1.1 Land Use/Communities

Under the No Action Alternative, beach change and erosion would continue in the study area,. This would result in reduced beach frontage, increased potential for structural damage and loss of homes and businesses. Should the barrier island breach, business and residential structures located in the area of the breach and in low- lying areas near the bay shore would experience increased flooding and tidal surges from storm events, potentially leading to extensive damages to the structures and their contents as well as possible utility service interruptions.

Storms analogous to historic trends, consisting of frequent minor to moderate events, are likely to result in moderate adverse impacts to land use and communities, with repeat damage to structures and followed by subsequent rebuilding. These impacts would be expected to be short to long term, depending on storm frequency and severity. (Reference the HSLRR for additional information).

4.1.2 Socioeconomics

As discussed previously, there are numerous businesses on Fire Island and on the bayshore, including restaurants, bars, marinas, and other commercial enterprises, and they would all have decreased activity. The No Action Alternative would not provide the protective benefits achieved through beach nourishment. Physical damage to businesses on both Fire Island and the bayshore, as well as lost revenues, would have negative economic and fiscal impacts on these commercial operations. Individuals would also suffer economic setbacks through either loss of property, loss of jobs, or both.

The No Action alternative would have a substantial adverse impact on the commercial enterprises in the project area.

Storms analogous to historic trends, consisting of frequent minor to moderate events, are likely to result in moderate adverse social and economic impacts, with repeated financial losses especially difficult. These impacts would be expected to be short to long term, depending on storm frequency and severity.

A single low-frequency storm event is likely to result in severe adverse social and economic impacts. These impacts would be expected to be long term.

4.1.3 Transportation

Under the No Action Alternative transportation on Fire Island could be substantially affected if a breach and/or flooding washed out portions of neighborhood streets, unpaved roads and/or beaches utilized for vehicular travel. In addition, parking areas and access roads at Robert Moses and Smith Point parks could be inundated or damaged, preventing access to those parts of the barrier island. The water access could be adversely affected if docking facilities on the bay side were damaged by a breach. However, it is unlikely that all docking facilities would be rendered unusable, and Fire Island could continue to be accessed via water, albeit at a reduced level.

Fire Island protects the south shore communities of the Long Island bayshore. Under the No Action Alternative, if a breach were to occur, low-lying bayshore areas would experience increased inundation and tidal impacts that could wholly or partially obstruct or damage portions of the road network in those areas. Buses, taxis, and other vehicles using low-elevation roadways that could be inundated would be adversely impacted.

In addition, the structures and parking areas associated with waterfront ferry facilities would also experience increased flooding and potential structural damage if a breach were to occur.

Storms analogous to historic trends, consisting of frequent minor to moderate events, are likely to result in moderate adverse impacts to transportation, with repeat damage to roadways and transportation facilities and associated inconvenience and/or hardship to residents and visitors. These impacts would be expected to be short to long term, depending on storm frequency and severity.

A single catastrophic storm event outside of the wilderness area, is likely to result in severe adverse impacts to transportation, including potential loss of roadways, travel routes, parking areas, and marinas, including ferry facilities. These impacts would be expected to be long term. Loss of essential transportation, including for emergency services, could have severe repercussions during an emergency situation and could severely hinder rebuilding efforts.

Recreation/Parks

Given the increased future vulnerability to breaching, portions of public beaches could be temporarily lost and/or difficult to access in portions of the study area, resulting in lost recreation opportunities for beach-goers. Furthermore, ferries, roadways and parking areas used by beach- goers may be damaged or rendered inaccessible due to a breach of the barrier island and flooding of the bayshore, further limiting accessibility.

The effects of a breach would probably have an adverse impact on recreational and commercial boating in the Great South Bay. Channels would likely be filled, hindering or preventing navigation in certain areas. Existing current and wave patterns could be changed and disrupted, leading to dislocated fishing and shellfishing grounds. As discussed above, certain docking facilities are likely to be damaged, as are recreational and commercial boats. Recreational boating, which is in great demand in the Great South Bay, would lose a portion of the existing marinas, and ferries would not be able to operate as they do under current conditions. However, the presence of a breach would provide new opportunities for kayaking, boating, fishing and bird watching. Other parks such as Cape Cod National Seashore have

experienced increased visitors to a breach.

Storms analogous to historic trends, consisting of frequent minor to moderate events, are likely to result in moderate adverse impacts to recreation, with repeated loss and disruption of recreational opportunities. These impacts would be expected to be short to long term, depending on storm frequency and severity.

A single low-frequency storm event is likely to result in severe adverse impacts to recreation. These impacts would be expected to be long term.

4.1.4 Cultural Resources

Terrestrial Archeological Sites. Thirteen historic-period sites have been identified on Fire Island. These sites include remains of life saving stations, refuse middens and stratified deposits, a farm boundary, and the remains of recreational facilities and residences. However, only two sites are located on the ocean side of the barrier island, the remains of a recreational facility built for handicapped children in the early 20th century, which was destroyed by the Hurricane of 1938, and the remains of structures used by the Coast Guard from the mid-19th century to the early 20th century (JMA 1998). Both these sites are considered potentially National Register-eligible. The No Action Alternative will not directly impact these sites; however, under the No Action Alternative the sites could be threatened with damage or loss due to natural beach dynamics.

Drowned Terrestrial Archeological Sites. Prehistoric archaeological sites dating to the Late Archaic period and later may have been preserved behind the barrier beach systems. Evidence of early coastal adaptations dating to the Paleo-Indian and Early and Middle Archaic periods, which are rare, could be buried under the barrier beach. These sites are at risk of exposure to coastal erosion. In the near shore zone, any preserved sites are likely to be located along former valley margins. Any sites that were situated at higher elevations would probably have been eroded, and the associated archaeological materials associated with them would have been dispersed from their original context (JMA 1998). The potential for these buried deposits along Fire Island is relatively high. However, areas of high potential are probably localized and can only be defined with additional investigation. The No Action Alternative will not directly impact these sites; however, under the No Action Alternative, the sites could be threatened with damage or loss due to natural beach dynamics.

National Register of Historic Places Sites and Other Architectural Resources. A reconnaissance survey of architectural resources resulted in the identification of a number of buildings and structures that can be associated with either the resort/vacation or maritime contexts of the project area. The survey included properties visible from the beach. A number of structures, each more than 50 years of age, which may possess the requisite characteristics and integrity to be eligible for the National Register were identified (JMA 1998). They are the Robert Moses State Park Tower; approximately ten houses in the communities of Corneille Estates, Ocean Bay Park, Seaview, Cherry Grove, and Fire Island Pines; the former Point O' Woods Life Saving Station; and the community of Point O' Woods (JMA 1998). The Fire Island Light Station is the only property within the FIMI study area that is listed on the National Register. The No-Action Alternative would not provide protection to community structures and infrastructure which could lead to damage of this structure due to natural beach dynamics.

Maritime Resources. Many of the former fishing facilities within the project area have been displaced for resort and vacation uses (JMA 1998). There are, however, submerged maritime resources (shipwrecks) associated with the historical development of the Port of New York located in the

waters along the Long Island Atlantic Coast. Although many wrecks have not been located or identified, the periodic appearance of timbers exposed or washed up on the beach indicates a potential for wrecks to be located along the Fire Island coast. However, no impact to maritime resources is expected with the No Action Alternative.

4.1.5 Physical Environment – Water Quality

No noticeable direct change in water quality of either the Atlantic Ocean or Great South Bay is expected with the No Action Alternative. With continuation of current trends related to shoreline management, water quality characteristics would be expected to remain the same, particularly with the continuation of current trends in storm patterns.

Indirect minor to moderate adverse impacts to water quality would be expected as a result of inadvertent storm induced discharge of household and commercial chemicals, materials and floatables, as well as potential release of untreated sewage in the event of damage to public utilities or marina pump-out facilities. For the most part, these impacts would be expected to be short term, dissipating quickly as a result of ocean currents and dilution. Temporary beach closures and restrictions on fish consumption may be experienced with release of untreated sewage. While not exactly a "water quality" impact, the visual and potential health effects associated with floatables would be long term.

It has been postulated that the occurrence of a breach or new inlet would improve circulation within the bay, thus increasing the flushing rate and thereby improving the water. Breaches occur very infrequently; if a breach were to occur within the communities under the No Action Alternative, it would be repaired within three months (within the Wilderness Area would be subject analysis and decision by Breach Contingency Team) pursuant to the approved BCP (1996). The long-term water quality conditions in the bay are not likely to be significantly altered by the short-term opening of a new inlet. Rather, bay water quality is expected to improve gradually independent of the No Action Alternative, as a result of wastewater treatment plant upgrades, improved septic system efficiency and improved municipal collection and treatment systems, and implementation of best management practices to help reduce nutrient and coliform loadings into the bays.

If a breach occurs within this section of the barrier, water temperature and salinity could greatly change from current conditions because of the proximity to the new inlet. Cooler ocean waters, ranging from 4 to 21 degrees Centigrade (USFWS, 1981), infiltrating into bay water, which ranges from 0 to 30 degrees Centigrade.

A breach would be likely to result in increased salinity and decreased residence time of water in the Great South Bay. It has been estimated that a breach would be expected to raise the average salinity of the Great South Bay from 25.9 to 29.5 ppt and residence time would be reduced by approximately half, from 96 to 40-52, days depending on the location of the breach (Conley 2000).

With the exception of increased risk of a breach discussed above, the no-action alternative is unlikely to have any greater than negligible adverse or beneficial impacts to the water quality of either the Atlantic Ocean or the Great South Bay. Similarly, it is unlikely that other potential beach management projects would have any moderate to major impacts to water quality.

4.1.6 Physical Environment – Geology/Geomorphology/Beaches and Dunes

Portions of the Fire Island barrier are particularly vulnerable to breaching (USACE, 1996). Breaching refers to the condition where severe overwashing forms a new inlet which permits the exchange of ocean and bay waters under normal tidal conditions. Under the No Action Alternative, it is assumed that shoreline erosion will continue, and that at some indeterminate time the Fire Island barrier will be breached and a new inlet created.

The "standard breach" includes two scenarios: 1) the initial breaching event that would result from a winter storm (northeaster), or 2) a summer tropical hurricane. In both cases, it is likely the breach would rapidly develop into an opening with a width of 1,000 feet and a depth of 10 feet, based upon projected growth rates derived in the BCP.

This analysis also assumes that any new inlet resulting from a breach occurring along the Fire Island barrier, exclusive of the FIIS Federal Wilderness Area, would be sealed within three months pursuant to BCP that is currently in place. Thus, all the disturbances related to the breaching event, inlet formation, and closure would be temporary. The short-term nature of such an event is described by the U.S. Fish and Wildlife Service (USFWS, June 1995): "The effects of a breach will be short term in any event, primarily because ecological succession will occur following the disturbance… the breach will be closed and the bay will eventually return to its pre-breach environmental condition."

USACE has identified fourteen locations within the study area where breaches are likely to occur, and rated these (low, moderate, high) as to their relative potential to form permanent inlets. These locations and ratings are summarized in Table 8 below.

Table 8 – Potential to Form Permanent Breaches

Approximate Location	Rating
Saltaire	Low
Fair Harbor	Low to Moderate
Atlantique	Moderate
Ocean Bay Park	Low
Sailor's Haven Visitor's Center	Low
Cherry Grove	Low
Fire Island Pines	Low
Barrett Beach	Medium to High
Water Island	Medium to High
Davis Park	Low
Long Cove	Low
Old Inlet	High
Smith Point County Park (2 locations)	Medium

Hurricane Sandy caused breaches at three locations as well as numerous overwash areas. The storm has left the barrier island vulnerable to future storms and although the coastal system subsequently began to show signs of recovery, including sand deposition on some of the beaches, the dunes will take years to rebuild (Hapke et al., 2013).

Under the No Action Alternative, continued erosion unchecked by sand bypassing or beach nourishment,

could result in changes to the shoreline and geomorphologic characteristics of Fire Island. The shoreline could be expected to recede at its average pre-nourishment rate of 1.5 ft./yr. overall.,. This would lead to progressive dune and shoreline retreat or degradation, which could lead to increased risk of overwash and breach in one or more of the community areas. A breach or overwash would have moderate to major impacts on littoral processes and beach and dune sediments over a period of five to ten years. Impacts would be moderate if a breach were closed with emergency measures, or could be major if it were allowed to remain open. Associated impacts to natural resources are discussed later in this EA.

4.1.7 Physical Environment- Borrow Areas

With the No Action, there would be no immediate impacts to the geological characteristics of the project and borrow areas. Impacts to the physical characteristics of the borrow areas would be expected to be minor and short term.

4.1.8 Natural Resources – Marine Ecosystems

The marine offshore and Atlantic shores and inlets ecosystems are included in the impact discussion for marine ecosystems.

No Action Alternative Impacts to Marine Invertebrates of the Marine Ecosystem

Marine invertebrates are found in the marine offshore, marine nearshore, marine intertidal and marine beach habitats. Species composition varies by habitat, however, the species characteristics and vulnerability to impacts is similar.

Under the No-Action Alternative, no sand will be harvested from the offshore borrow areas as a result of the project. The marine invertebrate community would remain in its present state with seasonal fluctuation, as is typically observed in benthic communities. Periodic extraction of sand from offshore habitats and corresponding placement in marine nearshore, intertidal and beach habitats associated with ongoing current beach/erosion management practices would continue, with minor adverse temporary impacts to the marine invertebrate community due to direct mortality from sand extraction and placement and loss of habitat. Re-colonization from surrounding undisturbed areas would occur; hence, impacts to the invertebrate community would be short term. Re-colonization of the borrow site after dredging is expected to be fairly rapid, since the borrow site is located in a relatively shallow, high energy environment. The re- colonization of marine sediments by benthic organisms following dredging operations has been shown to follow a distinct pattern of ecological succession. The species with the strongest colonization and reproductive capabilities appear first. Over time, other highly competitive species return (Cerrato, 1986).

No Action Alternative Impacts to Finfish of the Marine Ecosystem

Finfish are found in the marine offshore, marine nearshore and inlet habitats. Species composition varies by habitat, however, the species characteristics and vulnerability to impacts is similar.

Under the No-Action alternative, both resident and transient finfish species, including the Atlantic and Shortnose Sturgeon which are listed as Endangered, will continue to utilize the waters in the vicinity of the borrow area and sand placement areas, similar to current conditions. The seasonal passage of finfish through the project area will not be altered under the No-Action Alternative. As with existing

conditions, abundances are expected to fluctuate seasonally and in response to commercial and recreational fishing pressures and migration patterns.

No Action Alternative Impacts to Marine Mammals of the Marine Ecosystem

Marine mammals are found in the marine offshore, marine nearshore and marine intertidal and beach habitats. Species composition varies by habitat, however, the species characteristics and vulnerability to impacts is similar.

The No-Action Alternative is not likely to have any significant impact on the marine mammals that currently utilize the project area, since this condition represents a continuation of the status quo. However, the occurrence of a breach may provide at least temporary benefits to the bottle- nosed dolphin, harbor seals and hooded seals (all of them resident species). A breach through the barrier could temporarily deliver a more diversified food supply (e.g., finfish, shrimp and other crustaceans which normally remain in the bay waters) to dolphins and minke whales occupying the ocean waters closer to the barrier. The larger whale species (northern right, finback and humpback) are not likely to be affected because they generally remain much farther off-shore. Seals could also possibly benefit from the additional shoal areas created by the breaching process, as they could this habitat as haul-out areas.

No Action Alternative Impacts to Avifauna of the Marine Ecosystem

Birds are found in all of the marine habitats. Because of the species diversity and behavioral differences species associated with each ecosystem type in the study area are discussed separately.

Avifauna of Marine Offshore Habitat

The truly pelagic species are not likely to be affected by the No-Action Alternative, because their use of the project area is limited to feeding and resting activities. However, the non-pelagic birds (gulls, terns, and cormorants) may be affected by a breach resulting from this No-Action alternative.

Avifauna of Marine Nearshore, Marine Intertidal, Marine Beach and Inlet Habitats

The impacts of a breach resulting from this No-Action Alternative are likely to be beneficial for the avifauna utilizing the nearshore and intertidal marine habitats. The temporary formation of ebb tidal deltas resulting from a breach may provide additional resting/roosting areas for gulls and terns. If such deltas are created as a result of a summer storm and are large enough to be exposed at low tide, these may prove even more valuable as feeding and rearing areas for young birds that are learning to fish. They may also be used as staging areas by congregating terns prior to migration. Although the habitat may initially appear suitable for nesting by gulls and terns, oceanic shoals are not generally considered permanent, and any nesting attempts may prove to be unsuccessful.

No Action Alternative Impacts to Marine Reptiles of the Marine Ecosystem

Marine reptiles, specifically sea turtles, are found in the marine offshore, marine intertidal and inlet habitats. Potential impacts of the No Action Alternative to sea turtles, all of which are listed species, are discussed under the Rare and Endangered Wildlife Species section.

No Action Alternative Impacts to Rare and Endangered Species of the Marine Ecosystem

The Endangered Species Act (ESA) of 1973 mandates the protection from extinction of

uncommon or threatened wildlife and plant species. Section 7(a) of the ESA requires Federal agencies to evaluate their actions with respect to any listed or proposed species or listed/proposed critical habitat. Section 7(a)(2) of the Act requires Federal agencies to insure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species or will result in the destruction or adverse modification of its critical habitat. The responsible Federal agency must enter into formal consultation with the U.S. Fish and Wildlife Service or National Marine Fisheries Service if it determines that its action may affect a listed species or its critical habitat.(reference the BA/BO)

No additional action, outside of current emergency breach closure activities approved under the BCP, is proposed under this No-Action Alternative. Therefore, this scenario will continue the current level of protection that is afforded for rare and endangered species occupying the project area.

Resident Wildlife. As mentioned previously, the formation of ebb tidal deltas resulting from a breach may slightly benefit the sedentary population of double-crested cormorants by providing additional isolated nesting areas. It is not likely that cormorants would use such shoals for breeding purposes, because of the ephemeral nature of ebb shoals and the lack of vertical structure. Double-crested cormorants typically select coniferous or deciduous trees on protected sites to build their nesting platforms (Andrle and Carroll, 1988,).

Migratory Wildlife. As presented in the Affected Environment section, there are at least eleven (11) rare migratory bird species that may utilize the waters off-shore from the project area. As discussed previously, this No-Action Alternative is expected to have little beneficial to no impact on these species. The terns (least, roseate, common, black, Foster's, gull-billed, and Caspian) may make use of ebb tidal deltas for resting if they are present during the season when the species are found in the area. The common loon and black rail will likely be unaffected, while the cormorants may be slightly benefitted by the occurrence of the oceanic shoals.

Sea Turtles. The No-Action Alternative is not likely to have a significant impact on sea turtles that currently utilize the waters offshore from the project area, since this condition represents a continuation of the status quo.

4.1.9.1 Natural Resources - Barrier Island Ecosystem

No Action Alternative Impacts to Fauna of the Barrier Island Ecosystem

The barrier island ecosystem supports a variety of species, many of which utilize the varied habitats of this ecosystem, including the dunes and swales, terrestrial upland, maritime forest and bayside beach habitats. Numerous terrestrial invertebrates, terrestrial mammals, reptiles, amphibians, and birds utilize these habitats.

Under the No-Action alternative, there would be continuing shoreline erosion and a strong possibility of a breach or overwash occurring during a tropical or extra-tropical storm. The immediate effect of such an event generally entails direct burial or destruction of the existing vegetative communities, and associated secondary impact to wildlife. The extent direct impact to vegetation would depend on the width of the breach or overwash fan. The avifauna and mammals dependent on the impacted habitats would be displaced or eliminated in the immediate area of any overwash or breach. More mobile animals would be displaced, whereas less mobile species would be expected to experience higher percentages of direct mortality during a severe storm event and particularly a breach or overwash.

Ebb and flood tidal deltas, overwash fans, and sand spits are commonly created by breach and overwash

events. After breach inlet closure, the sediment that has accumulated in the ebb tidal delta is generally reworked by waves and re-introduced into the littoral drift, while the sediments deposited into the flood tidal deltas typically remain in place and serve as the substrate for future wetlands and eelgrass beds (Cashin Associates, 1993). According to the BCP (1996), a general increase in species diversity and numbers often follows such environmental perturbations. Many wildlife species are particularly attracted to these early successional habitats and physically dynamic areas. Such areas provide loafing, foraging, and nesting habitat for several species of shorebirds (USFWS, June 1995). Additionally, the areas on the barrier where overwash/breaching events are most likely to occur are typically characterized by low elevation dunes and interior areas, and gently sloping beaches. These areas are favored by piping plovers and their broods in search of easy access to the bay-side mud flats to feed (Cashin Associates,1994). Other flora and fauna considered protected, threatened, or endangered by New York State utilize the same environments. The flood tidal deltas created by past breaching events, and the dynamic sand spits and flats typically found near the bay inlets, provide suitable habitat for a variety of shorebirds, including least and roseate terns.

The seasonality of breach or overwash occurrence may limit the extent of the impact to the local ecology. For instance, most overwash events occur during northeaster (fall and winter) storms when the piping plovers have migrated elsewhere. In addition, the loss of beachfront habitat (e.g., Tiana Beach, a NYSDOS Designated Significant Fish and Wildlife Habitat) may negate the beneficial impacts of overwash habitat creation. Should the breach occur in the spring or summer due to a storm, the destruction of shorebird nests by wind and flooding would be a more negative impact than any presumed short-term overwash habitat gain. Similarly, low-lying degraded beaches are also at risk of experiencing overwash during much smaller storm events, and in turn threatening any shorebird nesting activities.

Predatory species may selectively benefit from the vegetational changes which may temporarily displace prey species typically found in their previously undisturbed communities. Such changes will also likely benefit the wildlife species which utilize earlier successional habitats. Damages to the maritime shrub and forest communities may negatively impact the migratory passerine (perching bird) species which rely on these areas to supply the necessary protective cover and food supplies during migratory passage through the project area.

No Action Alternative Impacts to Flora of the Barrier Island Ecosystem

The No Action Alternative would not result in any direct impacts on barrier island vegetation. However, the project area would be indirectly affected if breach and overwash events are allowed to continue. The impacts of such events would vary based upon the area affected, the type of vegetative community that is covered by deposits or lost by the storm, the depth of the deposit, and the season of occurrence.

Dune and Swale Habitat. By nature, the primary dune supports a pioneer community that is dependent upon or well adapted to changing substrate conditions. Dune grass relies on a steady supply of fresh sand to maintain vigor. Co-dominant species, such as beach pea and seaside goldenrod, tend to invade the dunes once the beach grass has become established. Thus, the primary dune vegetation, particularly beach grass, is typically well adapted to and maintained by overwash events.

The swale and lee-side of the primary dune which is generally covered with maritime shrub species is more susceptible to burial; however, it is still characterized by species which are generally tolerant of salt spray. In an evaluation of vegetation and elevation records of Nauset Spit, Massachusetts, (Zaremba and Leatherman 1986) found that shrub communities did not re- cover from overwash burial; however, some individual plants were able to survive partial burial. Thus, the impacts of overwash on the dune and swale community would vary based upon the vegetation that is affected and the depth of

sediment deposition. Impacts on the beach grass community are not expected to be significant, and it is likely that the vegetation would recover fairly quickly (between 1 to 3 years) following such an event. The greatest impact would be associated with a breach, where total loss of the community structure might occur. Some of this loss may be buffered by the re-vegetation of flood tidal deltas that are created by the breach.

Maritime Forest Habitat. The Maritime Forest habitat is characterized by later successional tree species. Ecological stability and protection from environmental extremes (wind, drought stress, etc.) have been essential factors in the development of such woodland communities. Thus, this habitat generally occupies the portions of the barrier which are fronted on the ocean side by a well-developed dune system, a high and wide beach profile, or some combination of both. This reduces the likelihood that a breach or severe overwash would occur in these areas. However, if such an event does occur, either adjacent to or through an established forest community, it is likely that all or a substantial portion of the woodland will be lost. The immediate effect would be direct destruction of the individual trees which are buried or eroded away. Over time, the canopy trees adjacent to those initially destroyed, and for some indeterminate distance leeward, would become stressed due to increased exposure, insects, disease, etc. and eventually die. Associated adverse secondary impacts would also occur to the wildlife species which are dependent upon this woodland habitat.

The ultimate vegetative structure of such an affected area would be governed by the type and depth of substrate left (in the wake of the overwash or breach closure activities) and the type of ocean-front protection provided under the BCP. Such a damaged woodland community is not likely to become re-forested naturally without extensive mitigation. If sandy substrates remain, the affected area would probably revert to an earlier successional habitat type (beach grass or *Phragmites*-dominated grassland or maritime shrubland).

Planted Exotic Lawn/Shrub. The construction of homes, infrastructure, and institutional buildings is the development matrix around which landscaping was established. It is anticipated that the impacts to human life and property resulting from a breach or overwash event would be the primary concern of the agencies, and that impacts to site landscaping would be insignificant in comparison. Ornamental and cultivated landscape plants and turfgrasses would generally be more susceptible to damages resulting from burial or destruction by breaches/overwashes than indigenous vegetation.

4.1.9.2 Natural Resources - Backbay Ecosystem

The backbay ecosystem includes bay intertidal habitats, sand shoals, bare sand and mud flats, bay subtidal habitats and SAV. Following a discussion of potential impacts of the No Action alternative to these physical and vegetative habitats, potential impacts to faunal species which utilize these habitats is discussed.

No Action Alternative Impacts to Habitats of the Backbay Ecosystem

Barrier Island Intertidal Marshes. In early reports by (Leatherman and Allen; 1982, 1985, 1989), it was noted that the majority of the marsh islands and back-barrier marshes in Shinnecock Bay and Great South Bay developed on old flood tidal deltas created by former inlets (Cashin Associates, 1993). However, major storm events could also destroy these same tidal marshes. In the event of a breach or major overwash, sands transported to the northern shoreline of the barrier island are likely to scour or smother the intertidal marsh grasses. The results may be temporary or long-term, depending on the size of the breach and the length of time until closure. While breaches remain open, flood shoals will potentially develop creating a platform for marsh development. In a study of the tidal wetland trends in

Shinnecock Bay from 1974 to 1995, NYSDEC found that extensive wetland areas were buried by overwash caused by the December 1992 northeaster (Fallon and Mushacke, 1996).

Environmentally beneficial deposition in shoals and bay platforms could create new habitat and improvements in water quality with secondary benefits to fish, shellfish and bird populations. The following discussion was extracted from the (USFWS Coordination Act Report for the BCP, June 1995). "Alterations of sedimentation and current patterns and rates, as well as tidal levels, due to a breach or new inlet may affect salt marsh development. Overwash events are also an important mechanism affecting salt marsh development. In an evaluation of aerial photography and vegetation and elevation records of Nauset Spit, Massachusetts (Zaremba and Leatherman, 1986) showed that back-barrier salt marshes exposed to frequent overwash or strong bay-side currents did not support salt marsh vegetation. In general, recovery of major low and high salt marsh plant species (i.e., *Spartina patens* and *S. alterniflora*) depended on the degree of burial and marsh elevation prior to burial. Salt marsh plants which experience deep burial (>33 cm) did not recover. Rather, those areas were re-colonized by beach grass".

No Action Alternative Impacts to Avifauna of the Backbay Ecosystem

Resident Species. The resident population of herons and great black-backed gulls will likely benefit from the impacts associated with breaching and overwash events. Both species favor nesting on isolated grassy beach areas, which may result from flood delta deposition and barrier island overwash deposits. In addition, both species are keenly adapted to foraging for food scraps which may result from storm damages and for preying upon other shorebirds which may attempt to nest in the new overwash and delta deposits.

The resident waterfowl populations of Canada goose, black duck, and mallard are likely to remain unaffected by the No-Action Alternative and potential breach/overwash events. Although these birds primarily seek coastal and brackish tidal marshes for breeding, their habitat is not particularly limited to the project area; they will utilize the entire bay complex for loafing, feeding, and rearing young.

Migratory Species. Numerous species of shorebirds forage along the beaches, marshes, and intertidal flats of the project area from spring through fall. While breaches and overwash deposits may temporarily disrupt feeding patterns for shorebirds, they will likely result in a net increase in available shallow water foraging habitat over the long term. Since there may be no net increase in area of vegetated salt marshes due to wetland burial and scour balanced against new marsh creation, there is not likely to be any associated benefit to shorebirds which utilize this habitat for breeding (e.g., American oystercatcher).

Raptors. Considered as a whole, the habitat changes resulting from barrier breaches/overwash events are likely to benefit the raptorial birds. As discussed earlier, the temporary displacement of small mammals from previous habitat areas, coupled with increased exposure in sparsely vegetated areas, makes prey species particularly vulnerable to foraging raptors. Thus, a breach or overwash event occurring during peak raptor migration periods would temporarily increase the raptor forage base. The conversion of more heavily vegetated shrubby or wooded areas to more grassland-dominated cover will also selectively favor the raptors that prefer hunting over open country, including the buteo hawks (red-tailed), the northern harrier, the kestrel, the peregrine falcon, and many owls (short-eared, barn, and saw-whet). Since ospreys feed exclusively on fish, the occurrence of a breach or overwash is not likely to affect this species. The various accipiter hawks (goshawk, Cooper's, and sharp-shinned) that may frequent the project area during migration will either remain unaffected or lose a portion of their foraging base which is typically associated with woodlands or heavily vegetated habitats.

Passerine Species. As discussed in the Affected Environment Section, the project area is extensively utilized by passerine birds, particularly during the spring and fall migration periods. The burial or loss of back dune and swale vegetation, shrub thickets, and woodlands could greatly decrease the ability of the affected area to protect and support these birds. In addition, should an overwash or breaching event occur immediately prior to or during active migration periods, the passerines that enter the project area may become disoriented by the physical changes, injured by the storm, or fall easy prey to raptors or other predators.

No Action Alternative Impacts to Wildlife of the Backbay Ecosystem

Large Mammals. The No-Action alternative could exacerbate the current problems associated with whitetail deer overpopulation on the Fire Island barrier. Since deer are fairly good swimmers and capable of traversing open water, they will not become isolated by barrier island breaches. However, they prefer to move within or proximal to well vegetated areas and may tend to avoid wandering into fully exposed overwash or breach areas. This may limit their feeding activity to the remaining vegetated portions of the barrier. Deer are also likely to be particularly attracted to foraging on the open edges of the shrubby habitat where new succulent vegetation is emerging. This selective feeding behavior can greatly affect the rate of re-vegetation in the overwash or breach closure areas.

If the overwash or breaching event occurs during the winter and destroys a winter bedding area or food source, the deer population may become concentrated in the remaining woodland areas, thereby increasing grazing pressure on the adjacent vegetative communities. A concomitant severe winter could potentially translate into increased deer mortality or into decreased reproductive success the following spring; however, damage to the vegetative community may have already taken place.

Small Mammals. The small mammal populations are likely to shift in response to the habitat changes induced by a breach or overwash event. As mentioned earlier, mammals that are not fatally injured by the event may be displaced to outlying areas, thus increasing intra- specific competition for limited cover and food resources. It is probable that the additional animals will fall prey to raptors or other predators until the populations level out to match the remaining available habitats. Concurrently, there may be an opportunistic increase in rodent populations that are capable of expanding into the new or enlarged grassland habitats.

Feral Species. The No-Action alternative is not likely to produce any significant change in the current feral dog and cat populations. These animals would be expected to continue to prey on wild species as well as scavenging for food scraps in dumpster areas.

Herpetiles. Of the nine reptile and amphibian species indicated as occupying the project area, only the spotted turtle is likely to be impacted by a breach/overwash event. This species prefers freshwater marshes, a habitat which is fairly limited on the Fire Island barrier. Should a breach occur in proximity of a known population, this turtle may be cut off from either its freshwater source or breeding habitat.

Insect Fauna. There is a paucity of published literature dealing with the effects of shoreline erosion (whether human induced or natural) on beach insect fauna. However, it is likely that severe erosion and/or a breach would result in the direct loss of burrowing insects and beach habitat. In the event that overwash deposits are delivered to the backbay and cover adjacent wetland areas, additional insect habitat is likely to be negatively impacted.

4.1.9.3 Rare and Endangered Wildlife Species

Numerous state and federally listed plants and wildlife are found on the barrier island and backbay ecosystems. The No-Action alternative would continue the level of protection that is currently provided to these species, since no additional federal action is proposed. Potential impacts of the No Action alternative to rare, threatened, endangered, protected and special concern species (collectively referred to as RTE Species) is discussed in the following paragraphs.

No Action Alternative Impacts to RTE Avifauna of the Barrier Island and Backbay Ecosystems

Piping Plover. The federally threatened Atlantic Coast population of piping plovers has been well documented as utilizing several locations on the Fire Island barrier for nesting (NYSDEC, Long Island Colonial Waterbird and Piping Plover Surveys. Elias-Gerken, (1994) studied piping plover use in the project area to identify any discernible trends in habitat suitability. She determined that certain habitat elements were lacking, particularly ephemeral pools for feeding. Coupled with the scarcity of open or sparsely vegetated sites, approximately 80 percent of the Fire Island National Seashore is not suitable for breeding habitat. The presence of open vegetation (median cover of 10 percent) was determined to be an important habitat element to support foraging piping plover chicks, in the absence of ephemeral pools and when easy access to bay mudflats is restricted. Thus, suitable habitat is limiting piping plover numbers on the Fire Island barrier. Elias-Gerken further suggested that storm-maintained, early successional stage habitats, such as created by overwash fans, provide optimal breeding conditions for piping plovers.

If a breach is closed or an overwash area is formed the winter prior to the shorebird breeding season (April 1 - July 1), piping plovers (in addition to other shorebirds) will immediately use the newly altered area for foraging. Gently sloping overwash fans that extend into the backbay marshes provide prime foraging habitat. Due to routine dynamic changes in washover or breach areas, the vegetation typically remains sparse. This provides optimal nesting habitat. The insects associated with the sparse vegetation (i.e., common ants and flies) also provide a food source for the foraging shorebirds. However, shorebirds may be subject to nest failure due to subsequent wash-overs at the same location.

In direct contrast to the benefits derived from overwash deposits, a barrier island breach and continued beach erosion could have negative impacts on piping plovers. A breach occurring during the nesting season could result in the direct loss of eggs, and mortality of chicks and/or adults. Flood tidal deltas resulting from a breach may provide additional foraging areas for piping plovers. However, this benefit must be weighed against the loss of beachfront nesting habitat. Continued erosion of the beach and fore-dune can create erosion scarps, thereby degrading existing or other potential plover habitat.

Roseate, Least, Common and Forster's Terns. While roseate terns prefer breeding on moderately vegetated sandy deposits in isolated island colonies, least and common terns utilize similar nesting habitat as piping plovers. Thus, the positive impacts of improved nesting potential on overwash deposits, breach closure areas, and sand spits are very similar for all of these species. Forster's terns nest in marshes (Alsop 2001) and would be negatively impacted by breaches or overwashes that smothered or displaced this habitat.

Common Loon. Except during nesting season, common loons rarely come on shore (Alsop 2001). Common loons would be negatively impacted by breaches or overwashes that occurred during the nesting season, but would likely move from the area during other seasons.

Osprey. Ospreys within the project area typically nest on man-made elevated platforms or at the tops of dead trees. In addition, this species feeds exclusively on fish. Neither the nesting nor feeding habitats for ospreys are likely to be affected by the No-Action Alternative.

Peregrine Falcon and Cooper's Hawk. Both the peregrine falcon and Cooper's hawk utilize the project area primarily during fall migration. The No-Action Alternative is thus not likely to affect either of these raptor species, except for the indirect benefits associated with increased prey availability potentially resulting from habitat changes, as discussed earlier.

Short-Eared Owl. The short-eared owl utilizes grassy marsh or dune areas for nesting as well as feeding. It has not been identified as likely to breed on Fire Island in the NYS Breeding Bird Atlas (Andrle & Carroll, 1988) and is likely to be present only during migration, utilizing the area for resting and foraging. While habitat disturbance from overwash or breaching could be detrimental, the net result of maintaining open grassy habitats would serve to perpetuate these species within the project area.

Red Knot. 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. As stated above, the Service is not aware of comprehensive monitoring of red knots on Long Island, New York, or within the action area. Some data are available from individual birders or associated with horseshoe crab monitoring. Individual birders have documented red knot presence at: Democrat Point (west end of Fire Island- August 2012 – 2 red knots), Robert Moses State Park (August 2013 – 8 red knots), and Smith Point County Park (September of 2011 – 4 red knots) (Ebird website- http://ebird.org/ebird/subnational2/US-NY-103/hotspots) (USFWS, 2014)

No Action Alternative Impacts to Reptiles and Amphibians of the Barrier Island and Backbay Ecosystems

Diamondback Terrapin. The Diamondback Terrapin, which is present in Great South Bay, is been known to nest on the back dunes of ocean beaches. The No Action Alternative would not directly impact these areas. Loss of habitats utilized by this species as a result of breaches and overwashes could have an adverse indirect impact. Impacts would likely be temporary, as the newly exposed sands would provide additional nesting habitat and bay intertidal and subtidal habitats would continue to provide habitat for this species.

Eastern Hognose Snake, Fence Lizard, Eastern Mud Turtle, Eastern Box Turtle, Spotted Turtle, Tiger Salamander. These reptiles and amphibians would not be expected to utilize the terrestrial (placement area) portion of the project site, or its vicinity. The No Action Alternative would not directly impact these species. Loss of habitats and direct mortality as a result of breaches and overwashes could have an adverse long term impact on populations of these animals.

No Action Alternative Impacts to Rare Plants of the Barrier Island Ecosystems

Seabeach Amaranth and Seabeach Knotweed. Seabeach amaranth and seabeach knotweed have an affinity for dynamic shoreline systems, and are typically associated with actively accreting beaches and sand spits. These species are threatened by destruction and adverse alteration of their habitat. While continued beach erosion and barrier island breaching, as might occur under the No- Action alternative, may initially destroy existing specimens, seabeach amaranth and seabeach knotweed would likely re-

colonize sandy washover areas that are devoid of other vegetation. Overwash sands from the foreshore area may also expose existing seed banks of seabeach amaranth in both the foreshore area and backbay elevated overwash areas.

Unrestricted recreational use of beaches is also known to threaten populations of seabeach amaranth. Pedestrian activity typically occurs during the active growing season for amaranth; however, individual plants are not generally damaged by foot-traffic because most people will walk around any plant when observed. Off-road vehicle (ORV) use during the growing season could have adverse effects if the vehicles are not routed around the plants. The stems of the plants are brittle and can be easily broken, thereby reducing potential seed production or killing the plant entirely. The impacts are not as significant if ORV use takes place during the dormant season, unless it degrades or alters the physical aspects of the habitat (USACE, July16, 1998).

No Action Alternative Impacts to Significant Habitats of the Barrier Island and Backbay Ecosystems

Maritime Holly Forest. The integrity of this old-growth forest community is extremely dependent upon the protection from wind, overwash, and salt spray afforded by the primary oceanfront dune system Reschke (1990). If this first line of defense is deteriorated or damaged by a breach or overwash event, it is likely to result in impacts to this globally rare and State endangered habitat.

Maritime Freshwater Interdunal Swale. These low-lying moist habitats nestled between the primary and secondary dunes provide a refuge for various songbirds, small mammals (cottontails, rodents, etc.), and amphibians (Fowler's toad). They also support several of the individual rare plant species reported as occurring within the project area. The integrity of this plant community is also tied to the protection afforded by a well-developed dune system. However, this community is well adapted to slight habitat modifications, shifting sands and fluctuating moisture conditions, which naturally occur within the dune complex. The dynamic nature of this community is thus not likely to be negatively affected by infrequent minor washover events. Major storm-induced changes, such as heavy overwash deposition or complete loss of the habitat through breaching, would, however, greatly impact this State imperiled community and the rare plants associated with it.

4.2 FIMI Selected Plan

4.2.1 Human Environment

4.2.1.1 Land Use/Communities

Under the FIMI Selected Plan, coastal storm risk on Fire Island would be offset in the areas proposed for beachfill. The placement of beach fill in the designated areas would manage risk to the residential, recreational, and commercial uses by increasing protective sand volumes. Effects on long-term barrir island geological processes are anticipated to be short-term and temporary. Implementation of the beach nourishment alternative wouldreduce the likelihood and magnitude of damages for residents and businesses in the coastal barriers during non- catastrophic events. The FIMI Selected Plan, would also afford increased protection to the communities along the bayshore by reducing the likelihood of coastal barrier breaching. Due to the reduced likelihood of breaching and inundation of the bayshore, residential, recreational and commercial structures are much less likely to be damaged or destroyed, access to homes businesses is less likely to be interrupted, and utility service is less likely to be disrupted. In the near term this additional protection will afford a window of opportunity for communities to undertake other adaptation actions to reduce the potential for flood and erosion damage. The coastal

barrier will resume processes of natural transition over time as the beach fill erodes, and implementation of other measures to ensure community resilience will be necessary to address storm risk and sea level rise. The proposed actions do not address flooding that may occur in bay shore communities due to water entering the existing inlets.

Storms analogous to historic trends, consisting of frequent minor to moderate events, are likely to result in minor adverse impacts to land use and communities, with repeat damage to structures and followed by subsequent rebuilding. These impacts would be expected to be short term, depending on storm frequency and severity.

A single catastrophic storm event is likely to result in moderate adverse impacts to land use and communities. The extent of damage would depend on the severity of the storm. Localized damages would be expected. These impacts would be expected to be short term.

4.2.1.2 Socioeconomics

Overall, the FIMI Selected Plan is expected to reduce the cost of damages to non-shorefront and shorefront structures by more than $15 million per year. Additional details on this analysis is contained within the HSLRR.

The south shore of Long Island would be negatively impacted if directly subjected to wave impacts and tidal surges, as would occur in the event of a barrier island breach. With the FIMI Stabilization Project, there is a reduced likelihood of a breach, and therefore mainland structures and contents would be less likely to experience damages due to flooding and tidal surges. Implementation of the beach nourishment alternative would protect residential, recreational, and commercial structures in the area. Due to the reduced likelihood of breach, structures are much less likely to be damaged or destroyed, access to the businesses is less likely to be interrupted, and utility service is less likely to be disrupted.

Storms analogous to historic trends, consisting of frequent minor to moderate events, are likely to result in minor adverse social and economic impacts. These impacts would be expected to be short term.

A single catastrophic storm event is likely to result in moderate adverse impacts to land use and communities. The degree of negative impact would depend on the severity of the storm. These impacts would be expected to be short term.

4.2.1.3 Transportation

With the Beach Fill Alternative, adverse effects to traffic, transportation, access, and circulation that are expected under the No Action Alternative would be reduced. The existing road network would continue to function. Boat access to Fire Island would remain available.

Storms analogous to historic trends, consisting of frequent minor to moderate events, are likely to result in minor adverse impacts to transportation, consisting primarily of inconvenience to residents and visitors due to minor roadway flooding. These impacts would be expected to be short term, depending on storm frequency and severity.

A single catastrophic storm event is likely to result in minor to moderate adverse impacts to transportation. While some flooding and minor road damage could occur, there would be no loss of transportation systems. These impacts would be expected to be short term and there would be no loss of essential transportation, including for emergency services.

4.2.1.4 Recreation/Parks

The proposed project would prevent loss or increase the amount of public beaches and maintain or increase access to the beaches in portions of the study area for beach users. Furthermore, ferries, roadways and parking areas used by beach-goers would be protected on the barrier island and portions of the bayshore.

The proposed project could have a positive impact on recreational and commercial boating in the Great South Bay. Channels would less likely be filled, maintaining navigation in certain areas. Existing current and wave patterns would remain unchanged maintaining existing fishing and shellfishing grounds. Docking facilities are less likely to be damaged. Existing marinas and ferries would continue to operate as they do under current conditions.

Storms analogous to historic trends, consisting of frequent minor to moderate events, are likely to result in minor adverse impacts to recreation, with loss and disruption of recreational opportunities limited primarily to post storm clean-up of fallen vegetation and debris. These impacts would be expected to be short term.

A single catastrophic storm event is likely to result in moderate adverse impacts to recreation. These impacts would be expected to be localized and relatively short term.

4.2.2 Cultural Resources

Submerged Archaeological Resources

As currently planned, within Robert Moses State Park, beach fill to create a berm within areas that have historically been eroded and where the State of New York has placed sand previously. No wrecks have been identified as part of these operations and it is anticipated that the proposed project would not have an effect on historic properties in this area.

The 1999 survey did identify four anomalies along Fire Island that had both a magnetic and acoustic anomaly. USACE will relocated these anomalies and determine if they are within the current project boundaries for sand placement. If they are located within the current sand placement areas, additional investigations, which may include but not be limited to underwater investigations. This work will be identified and included in a Programmatic Agreement developed for this project and coordinated with the NYSHPO, the ACHP, the National Park Service, the Shinnecock Nation and other interested parties (Attachement H).

Borrow Area 2C and 5B was included in the 2001 survey of borrow areas off the coast of Fire Island. No magnetic or acoustic anomalies were identified in this borrow area as part of this survey. Borrow Area 4C was not included in this survey or an earlier survey of borrow areas off of Westhampton Beach completed in 1993. Completing a magnetometer and side scan sonar of this borrow area has been included in the Programmatic Agreement. If anomalies are identified that have the potential to represent wrecks or other significant features, additional investigations, including diving, will be conducted and/or the areas of the anomalies may be avoided during construction.

Archaeological Resources

The archaeological sites identified within the FIIS are either located on the bay side of the barrier island or in the Federal Tract areas that are being avoided by this project. USACE will monitor the development of construction plans and specifications to ensure that the sand placement will not disturb

these sites. If plans change, USACE will conduct additional investigations to determine if the project will have an adverse effect on these sites.

Sand placement would not disturb the sites buried under the barrier island or in the near shore zone. The use of sand fill may help to protect these sites from being exposed and destroyed (JMA 1998). Therefore the proposed project is not expected to have an adverse impact on these sites.

Architectural Resources:

Fire Island Light Station National Historic District

As per the request of the National Park Service, sand will be placed along the shoreline south of Burma Road within the historic district. Placement of sand in this area will help protect the historic district and its contributing elements of Burma Road, the vegetated dune and pathways to the shoreline. As currently planned, the proposed project will not have an adverse effect on these resources, but rather serve to protect the historic district. USACE will monitor the development of construction plans and specifications to ensure that the sand placement will not adversely affect the historic district. If plans change, USACE will conduct additional investigations to determine if the project will have an adverse effect on these sites.

4.2.3 Physical Environment – Water Quality

Any impacts to water quality associated with the FIMI Selected Plan would be minor, localized and short term, limited to the construction phase of the project. Under natural conditions, periodic breaching of the coastal barrier results in flushing portions of the back bay and improved water quality, as demonstrated at the existing breach in the Wilderness Area. However, because the FIMI TSP is a short-term risk reduction project, it is not expected to have any lasting effect on long-term coastal barrier breaching and ocean-bay water circulation. Temporary increases in turbidity and potentially nutrient levels could occur during hydraulic dredging and placement of sand on the beaches. These impacts would be minor expected in view of natural turbid condition along shore zone. No noticeable direct change in water quality of either the Atlantic Ocean or Great South Bay is expected with the FIMI Selected Plan. With continuation of current trends related to shoreline management, water quality characteristics would be expected to remain the same, particularly with the continuation of current trends in storm patterns. The FIMI Selected Plan will shift the ocean-side high-water line offshore from its present location, but will not alter water levels.

At the offshore borrow area locations, there is potential for short-term impacts to water quality, particularly increases in turbidity as a result of turbulence caused by barge overflow, and dredging operations. Sand particles suspended by dredging are relatively dense and fall quickly back to the bottom, while the fine sediments stay in suspension longer than sand, sinking slowly. The net effect is wider broadcasting and dispersion of fine particles relative to sand and gravel. Dredging will cause a short-term reduction in water clarity down-current from the dredging activity (USFWS, June 1995). Surface sediments of the borrow area do possess a small percentage of silt which would be released into the water column. However, it is anticipated that the dynamic wave and current conditions of the project area would rapidly dissipate any suspended sediments. Any plume generated by the dredging operations will be restricted in size and duration, due to the sandy substrate and location of the borrow site. Additionally, it is not anticipated that there would be any release of pollutants or significant lowering of dissolved oxygen levels resulting from the project.

The potential for oxygen deprivation problems in borrow areas is a very real concern but no anticipated

reduction of DO is expected. Reduced water circulation and increased siltation and sedimentation of fine material can lead to hypoxic or anoxic conditions that may be lethal to organisms utilizing a borrow area. These adverse impacts have been found to be minimal in areas with strong currents where oxygen can be quickly replenished (Tubeville and Marsh, 1982). Proper design can alleviate the potential for oxygen deprivation problems by eliminating small deep borrow pockets; however, this generally entails modification of a larger surface area. The planned borrow area size and depth of sand removal for the FIMI Selected Plan Alternative have been set to avoid deep stratified pits and to minimize the creation of anoxic zones, while also keeping the size as small as feasible.

4.2.4 Physical Environment – Geology/Geomorphology/Beaches and Dunes

With the FIMI Selected Plan, sand will be placed over and along an approximate 31 mile stretch of the barrier island's Atlantic coastline to create the design beach and dune profile. Sand placement areas include beachfill tapers in federal tracts, including the Otis G. Pike Wilderness Area.

There are three major ways that the proposed beach fill could physically impact the coastal beach environment, as follows (Naqvi and Pullen, 1982):

1. the deposited material covers the existing beach sediments;
2. the deposited material modifies the beach (sand/water) interface; and
3. the deposited material frequently increases the turbidity of the near shore area

Impacts to living natural resources are addressed in latter sections of this EA. From a physical perspective, the project would alter the beach /dune profile substantially, reducing the potential for breaching and overwash during storm events and creating greater stability of the barrier island features. By changing the natural coastal barrier processes of shoreline retreat, inlet formation and shoal accumulation, the project could affect coastal processes, such as longshore sediment transport, cross island sediment transport, dune development and evolution, estuarine circulation, and bayside shoreline processes, that are vital to maintaining coastal features (i.e., beach, dunes and barrier island).

4.2.5 Physical Environment- Borrow Areas

With the FIMI Selected Plan, sand would be removed from the borrow areas, altering the bottom profile of the ocean floor. Sand taken from the borrow areas will be extracted to a depth no greater than 20 feet below the existing bottom. The total initial fill volume for the proposed action is estimated at approximately 7,000,000 cy. Following completion of the project, substrate characteristics are expected to be similar to existing conditions. In order to limit potential impacts to shoreface ridges containing modern Holocene sediments only the northeastern half of borrow area 2C will be dredged.

Assuming the large volume of offshore sand that is moving shoreward, removal of such small quantities in the borrow areas on sand ridges on the shoreface would not impact the morphodynamic system that occurs along Fire Island. In addition, given the immense size of the offshore sand ridges near our study area, relatively small borrow areas can provide ample sediments for nourishment projects with minimal or no impact to the onshore movement of sediments (NPS 2008).

Although infilling of the borrow area post-dredging is anticipated, monitoring of the borrow area will be conducted to confirm this is the case and better quantify and minimize potential impacts to borrow area substrates associated with future projects. Pre and post dredging borrow area monitoring might include

bathymetric surveys of the borrow areas, wave data collection, bottom current measurements, profile surveys and aerial photography of the shorelines. Adaptive borrow area management practices, would be implemented should any other than negligible impacts be quantified or confirmed by the monitoring. These practices may include dredging in shallow lifts, changing the order the ridge borrow areas are utilized, allowing further time in between operations at these areas to allow maximization of infilling, and minimizing surface area impacted in a borrow area.

FIIS' emergency dredging of the Seashore's Watch Hill boat channel and marina needed to provide safe access may potentially provide 60,000 cubic yards of sand to the eastern end of Davis Park. Marina dredge material will be tested for grain size and for hazardous materials prior to any dredging action.
No material will be utilized that does not meet standards for grain size nor if it contains hazardous materials. Material not meeting established criteria will be disposed of in the appropriate manner as determined by NYSDEC, NYSDOS, USACOE and NPS. (FIIS, 2013).

Impacts to the physical characteristics of the borrow areas would be expected to be adverse, minor to moderate and short term.

4.2.6 Natural Environment

Impacts to living natural resources associated with the FIMI Selected Plan would be associated with direct impacts related to sand removal from the borrow areas and corresponding sand placement along the ocean shoreline of Fire Island for dune construction and beach nourishment. Impacts to natural resources are discussed in the remainder of this section, with discussion grouped by ecosystem type.

4.2.7 Natural Resources – Marine Ecosystems

The marine offshore and Atlantic shores and inlets ecosystems are included in the impact discussion for marine ecosystems.

FIMI Selected Plan Impacts to Marine Invertebrates of the Marine Ecosystem

Marine invertebrates are found in the marine offshore, marine nearshore, marine intertidal and marine beach habitats. Species composition varies by habitat, however, the species characteristics and vulnerability to impacts is similar. The magnitude of the impact will vary, depending on the abundance and kind of organisms present, the quantity and quality of the material placed, the placement method used, and the time of year of placement. Potential for impact to macrobenthic invertebrates and shellfish are discussed separately in the following paragraphs.

Macrobenthic Invertebrates. The FIMI Selected Planwould result in the removal and direct mortality of all the macrobenthic organisms from the dredged locations within the borrow area. Re-colonization of the borrow site after dredging is expected to be fairly rapid, since the borrow site is located in a relatively shallow, high energy environment. The re-colonization of marine sediments by benthic organisms following dredging operations has been shown to follow a distinct pattern of ecological succession. The species with the strongest colonization and reproductive capabilities appear first. Over time, other highly competitive species return (Cerrato,1986).

The proposed borrow area has been surveyed during the spring and fall from 1996 to 1998 (RMC Environmental Services, 1996, and B.A. Vittor & Associates, 1998). Both studies clearly indicate that the macrobenthic community associated with the proposed borrow area is already dominated by

species with strong colonization and reproductive abilities. These species are generally the first to colonize areas of disturbed habitat. Disturbed habitat includes not only the area of active dredging, but also areas affected by storm waves, strong longshore and rip-currents, and tidal scour. These opportunistic organisms are comprised mostly of small, tubiculous, opportunistic polychaetes and amphipods.

Benthic communities are expected to re-establish in approximately 1.5 to 2.5 years, and should be similar to undredged conditions in respect to abundance, biomass and taxa richness in that timeframe (USACE. 2001a). Sand dollar populations are expected to one of the last species of the benthic assemblage to recover to pre-dredging conditions (USACE. 2001a).

Construction and maintenance of the protective dune and berm, is expected to have short-term direct impact on benthic resources. Initial sand placement would bury and kill some infaunal benthic organisms (organisms that live in bottom sediments) and epifaunal benthic organisms (organisms that live on the sediment surface), primarily in the intertidal zone. Adverse effects of construction would be temporary because benthic resources would begin to recolonize the nourishment area immediately following construction. The optimum time of year for beach nourishment is the fall and winter, prior to the spring recruitment and summer growth periods for benthic organisms. Recovery of the benthic community in the intertidal and nearshore habitats would probably occur in less than 1 year. Intertidal benthic communities on the outer New Jersey coast impacted by beachfill activities showed evidence of recovery within 2 months and impacts on nearshore sub-tidal benthic assemblages were not detected (USACE 2001a). In contrast, the same study revealed that dredging activities decreased the total abundance and biomass of benthic communities offshore borrow areas and recovery was estimated at 8 to 9 months. Smith and Brumsickle (1989) estimated benthic infauna recovery rates of 41 days in Barnstable Harbor, Massachusetts. Another potential impact to the macrobenthic community is the suspension of sediment particles which will increase the turbidity of the water and possibly blanket and suffocate additional benthic communities down current. This condition is not expected to occur at the borrow area, since the sediment from the borrow site has been determined to consist of 95 percent sand. Sand particles suspended by dredging are relatively dense and fall quickly back to the bottom (Woodhead, 1992).

Many macrobenthic invertebrates found in this environment are tolerant of periodic burial, and are capable of escaping. Through laboratory experiments it was determined that species such as the red-lined worm (*Nephtys incisa)* and the clam *(Mulinia lateralis)* are able to reach the surface through 21 centimeters (8.25") of sediment, and the mud worm *(Streblospio benedicti*) is capable of escaping through 6 centimeters (2.4") of sediment (Saloman et al., 1982). Many other macrobenthic species are expected to be able to do the same.

Shellfish. The proposed Project is also expected to have a direct, short-term, impact on shellfish within the Project area. Because shellfish are either attached to or live in the substrate, they would be buried during initial beach nourishment activities. Shellfish that inhabit the borrow areas would be removed by the dredge and placed on the new beach. Some hard clams, surf clams, and softshell clams would be able to rebury and survive, but species such as blue mussels that attach to bottom substrates would suffer higher mortality. Shellfish species that occupy sub-tidal habitats and cannot survive exposure at low tide would suffer higher mortalities than those that occupy intertidal and subtidal zones.

Due to the abundance of species such as blue mussels, hard clams, and surf clams in the vicinity of the Project area and the similarity in grain size of the beach nourishment sediment and the existing beach sediment, rapid recruitment and full recovery of any impacted shellfish resources would be expected. Because shellfish are filter-feeders, some short-term reduction in feeding efficiency and

localized mortality could result from the increased suspension of sand in the vicinity of the placement. No long-term adverse effects of project activities on shellfish resources are anticipated.

FIMI Selected Plan Impacts to Finfish of the Marine Ecosystem

Finfish are found in the marine offshore, marine nearshore and inlet habitats. Species composition varies by habitat, however, the species characteristics and vulnerability to impacts is similar. In addition to the impact assessment to general finfish in this section, a detailed assessment of potential project impact to Essential Fish Habitat (EFH) has been conducted. The EFH assessment is provided in Attachment B to this EA.

Construction of the protective dune and berm is expected to have immediate direct and indirect short-term impacts on some fish species in the Project area. During initial beachfill construction, most finfish occupying the nearshore coastal zone during construction would avoid burial by relocating to nearby unaffected areas. However, the potential for some fish mortality still exists. The most vulnerable finfish would be small, motile bottom fish. including small species such as small mouth flounder *(Etropus microstomus)* and juveniles of other species such as windowpane and winter flounder.

The most substantial indirect effect of beach nourishment on finfish species in nearshore zone would result from the burial and mortality of benthic prey organisms. Bottom-feeding fish might be temporarily displaced from the construction site until appropriate invertebrate prey species recolonize the area, a process that would most likely only take a few months. Placement of sand on the beach would of the construction area, another factor that would generally cause fish (e.g., oriented predators) to avoid the area, but not have any harmful environmental consequences. Although the species composition and relative abundance of finfish populations present on nearshore or offshore sand borrow areas differs from nearshore intertidal and subtidal, the potential environmental impacts on the offshore borrow area are expected to be similar to the effects of beach nourishment and construction activities. Smaller bottom fish would be removed by the dredge and deposited on the beach where they would either be eaten by predators such as seabirds or die as a result of being out of the water. Larger, more motile bottom fish and pelagic fish would not be impacted because they would be able to disperse and avoid the area. Dredging would also cause increased turbidity and remove benthic organisms that are preyed upon by bottom-feeding fish, causing some to relocate to nearby unaffected areas.

However, dredging activities also would cause many benthic prey organisms to become suspended in the water column where they would be eaten by fish attracted to the area. The USACE (2001a) conducted a biological monitoring program during and post construction and in the first year after construction of beaches along the Atlantic coast of New Jersey. Based on this study, the USACE determined that no long-term nourishment-related impacts occurred on surf zone finfish distribution and abundance patterns. Similarly, no evidence of long-term impacts on surf zone finfish feeding habits was observed. Holland et al. (1980) also examined the effects of beach nourishment on nearshore species in Florida and found a temporary increase in fish abundance along the newly created beach. The increase in fish abundance was presumably caused by the increased availability of prey organisms that were being washed into the water as sand was placed on the beach.

In general, the project is expected to have only limited, temporary effects on finfish assemblages in the nearshore and is not expected to impact finfish assemblages in the offshore habitats. No detectable changes in the feeding habitats of fish species in the project area are anticipated.

FIMI Selected Plan Impacts to Marine Mammals of the Marine Ecosystem

Marine mammals are found in the marine offshore, marine nearshore and marine intertidal and beach habitats. Species composition varies by habitat, however, the species characteristics and vulnerability to impacts is similar. The FIMI Selected Plan is not likely to have any significant impact on the marine mammals that currently utilize the project area due to the limited spatial extent and duration of the construction phase of the project and the highly motile nature of these species. More detailed discussions, by habitat type, are provided in the following paragraphs.

Marine Mammals in the Marine Offshore and Marine Nearshore Habitats

The marine mammals that may move through the offshore areas and proposed borrow pit location (northern right, finback, minke, and humpback whales, bottle-nosed dolphin, and harbor and hooded seals) are not likely to be affected by the FIMI Stabilization Project. This is primarily due to the fact that these species are highly mobile and feed upon prey species that are also pelagic. Given the slow-moving nature of a dredging vessel and the dredging operation, it seems likely that any marine mammals would be able to avoid the borrow site during active dredging periods.

The finback, humpback, and right whales are listed as State and Federally endangered species. The occurrence of whales in the borrow area, if any, is expected to be very low. With the exception of the minke whale, most of the whales are likely to occur further offshore than the southernmost extent of the borrow pit. All have limited potential to enter the project area during the spring and fall migration periods; however, the amount of time that a whale would spend in the study area would likely be very brief. If necessary, work could be stopped while whales were near the borrow area.

Marine Mammals in the Marine Intertidal Habitat

Harbor and hooded seals typically utilize the intertidal zone for haul-out locations, that is, areas where the animals emerge from the water to rest on land. During the winter and early spring, the seals tend to frequent the lower energy environment on the backbay side of the barrier. Haul-out locations in the vicinity of the project area are typically isolated and consist of rocky or other "structured" environments, such as the rock jetties located at Shinnecock Inlet. However, Conner (1971) mentions that harbor seals have historically made use of marshes, beaches, and sandbars on the south shore of Long Island. There are no known seal beach haul-out locations within the project area.

FIMI Selected Plan Impacts to Avifauna of the Marine Ecosystem

Birds are found in all of the marine habitats. Because of the species diversity and behavioral differences species associated with each ecosystem type in the study area are discussed separately. In addition, potential project impacts to listed avian species are discussed under the Rare and Endangered Species section heading.

Avifauna of Marine Offshore Habitat

Most of the offshore pelagic species belong to the family Alcidae (i.e., puffins, razorbills, murres, etc.) and are considered to be rare to uncommon winter visitors to Long Island waters (Levine,1998). These species are not typically encountered within 35 to 40 miles of the shore. Random sightings of these species from land generally occur after an easterly storm event. The occasional use of the project area by these species would not be impacted by the presence of a dredge at the borrow site. These birds

utilize the entire ocean, and their habitat would not be limited by the dredge.

The other dominant avian groups expected to utilize the offshore environment belong to the family Laridae (i.e., gulls, terns, etc.). These species utilize the shoreline for nesting and loafing, but forage offshore on large schools of bait fish species (i.e. herring, sand lance, etc.). These avian species are constantly on the move in search of the bait fish. The temporary presence of the dredge on the borrow area would not impact utilization of the offshore waters by these species. In fact, the dredged material pumped up onto the beach would provide an easy and abundant food source for these species since large numbers of macrobenthic invertebrates and shellfish could be deposited on the surface. The increase of ocean beach habitat created by the proposed beach nourishment would also benefit these species, the least terns in particular, by providing new nesting areas.

Avifauna of Marine Nearshore, Marine Intertidal, Marine Beach and Inlet Habitats

Perhaps the greatest disturbance associated with beach filling is destruction of nesting areas for shorebirds that may be onsite or on beaches adjacent to such an operation. Least terns and piping plovers commonly nest in the project area. As these are protected species, potential impacts are further discussed under the Rare and Endangered Species subheading .

FIMI Selected Plan Impacts to Marine Reptiles of the Marine Ecosystem

Marine reptiles, specifically sea turtles, are found in the marine offshore, marine intertidal and inlet habitats. Potential impacts of the FIMI Selected Plan to sea turtles, all of which are listed species, are discussed under the Rare and Endangered Species subheading.

FIMI Selected Plan Impacts to Rare and Endangered Species of the Marine Ecosystem

Section 7(a) of the ESA requires Federal agencies to evaluate their actions with respect to any listed or proposed species or listed/proposed critical habitat. Section 7(a)(2) of the Act requires Federal agencies to insure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species or will result in the destruction or adverse modification of its critical habitat.

Migratory Wildlife. As presented in the Affected Environment section, nine species of State and/or Federal listed migratory bird species that may utilize the waters off-shore from the project area. These include terns (least, roseate, common, black, Foster's, gull-billed, and Caspian), common loon and black rail, and others. Refer to Section 4.2.7.3 for a comprehensive discussion of the potential impact of the FIMI Selected Plan on these species for all ecosystems in the project area.

Sea Turtles. There is a potential for endangered Kemp's Ridley, leatherback, and hawksbill sea turtles, and threatened loggerhead and green sea turtles, to be present in the vicinity of the project borrow area during the summer and early fall months. Hopper dredges used during dredging operations could result in incidental taking and possible mortality of sea turtles, particularly the Kemp's Ridley and loggerhead turtles (NMFS and USFWS, 1991). Direct observations of sea turtles by Morreale and Burke (undated) indicate that juveniles generally attempt to flee once they visually recognize an approaching boat. Since the dredging equipment is slow-moving, turtles may avoid the active area altogether. However, some sea turtles may be attracted to the dredging equipment and, hence, may become entrained or impinged.

USACE has developed a protocol with NMFS which specifies special conditions that are to be incorporated into the Project Plans and Specifications and the construction contract to comply with the

NMFS agreement. Section 7 compliance for this PL 113-2 project is being considered as Emergency Exempt, per Section 7 of the Endangered Species Act (ESA) of 1973, as amended, and implementing regulations for this emergency response (see 50 CFR § 402.05).

Sturgeon. There is potential for Shortnose and Atlantic Sturgeon (both Federally listed as Endangered) to be present in the marine environment in the vicinity of the borrow areas. Sturgeon are benthic feeders and are relatively slow moving; therefore, if present in the borrow areas, there is potential for adverse impact to these species. However, as the species spawn in freshwater, only fully motile juveniles and adults are expected to be present in the saline waters in the project area. It is expected that the fish would vacate the area during dredging operations and any impacts would be negligible. Monitoring for sturgeon presence will be conducted and the potential for impact to these species will be more fully assessed through the Section 7 Emergency consultation process with NMFS.

4.2.7.1 Natural Resources - Barrier Island Ecosystem

FIMI Selected Plan Impacts to Fauna of the Barrier Island Ecosystem

The barrier island ecosystem supports a variety of species, many of which utilize the varied habitats of this ecosystem, including the dunes and swales, terrestrial upland, maritime forest and bayside beach habitats. Numerous terrestrial invertebrates, terrestrial mammals, reptiles and amphibians, and birds utilize these habitats. Many of the species characteristic of the coastal barriers and adjacent bays are adapted to the transitional and ephemeral processes associated with natural coastal processes such as periodic barrier overwash and breaching, inlet formation and shoal accumulation.

With the FIMI Selected Plan, construction activity on the adjoining marine beach habitat may disrupt normal activity of faunal species; however, this disturbance would be temporary. The long-term effect of active management of the coastal barrier by sand placement and dredging activities is uncertain. Certain species benefit from sand placement, particularly if the placement emulates specific habitat requirements, such as the creation of ephemeral pools, beach riffles and bayshore sediment platforms. These types of specific habitat restoration activities are not part of the design of the FIMI but should be considered in development of long-term management plans. The overall impact to the barrier island ecosystem that would result from the increased sand volumes under the FIMI would be temporary protection from storm damages with uncertain but temporary disruption of transitional barrier habitats.

Avifauna

Resident Species. Herring gulls and great black-backed gulls are the two primary species that are found in large numbers along the south shore of Long Island. While both species would benefit from a breach that would create potential nesting habitat, the increase in dune width and a more established beach front offered by the FIMI Stabilization Project would also result in additional potential nesting habitat.

Both gull species are expected to continue to thrive under the FIMI Stabilization Project. Beach nourishment would provide a readily available food source in the form of macrobenthic invertebrates, shellfish, and crustaceans that are pumped onto the beach with the sand. This would be welcome during the winter, when food is typically scarce.

The resident waterfowl populations of Canada goose, black duck, and mallard are likely to remain unaffected by the FIMI Stabilization Project. Although these birds primarily seek coastal and brackish tidal marshes for breeding, their habitat is not particularly limited to the project area. They would utilize the entire bay complex for loafing, feeding, and rearing young.

Migratory Species. The local species of shorebirds which currently populate the beaches, marshes, and intertidal flats from spring to fall in the project area would continue to do so during the FIMI Stabilization Project. With the possible exception of dunlins, greater yellowlegs, and sanderlings, the majority of the shorebirds are away from the project area during the winter when most of the construction is scheduled to take place. Similar to the gulls, the sanderlings are also likely to benefit from the improved feeding opportunities associated with the placement of dredged material on the beach. A ready supply of polychaete worms and shellfish would become available. The dunlins and greater yellowlegs are more likely to frequent the sand spits and inlets and back-bay marshes during the winter construction period. These species, therefore, are not expected to be affected by the FIMI Selected Plan.

Raptors. This avian group is most likely to be impacted by the any reduction in breaching and overwash events. Raptors are predominantly sight hunters, requiring open area with limited vegetation to easily spot their prey and make a successful hunt. By reducing the potential for breaches and overwashes, natural succession of the barrier island will tend towards a more heavily vegetated shrubby or wooded environment, thereby providing more protective cover for small mammal and passerine prey species. The most species most likely to be affected by the project are the red-tailed hawk, falcons (kestrel, merlin, and peregrine), the northern harrier, and many owls (short-eared, barn, and saw-whet). The various accipter hawks (sharp-shinned, Cooper's, and norther goshawk), along with the red-shouldered hawk, are better adapted for hunting in the wooded environment and less likely to be affected by the change in habitat.

Passerine Species. This avian group is dominated by the wood warblers, vireos, and sparrows that heavily utilize the coastal habitat during migration periods. The Long Island barrier islands are the first land some of these species visit after migrating over the ocean. The increase in woody vegetation associated with the stabilization of the upland environment will greatly enhance the food and cover value of this habitat for these species that feed by day and migrate by night.

Some of the passerine species that favor grassland habitats, such as vesper and grasshopper sparrows, might be precluded from the use of the barrier because of the successional woody growth. However, the savannah sparrow, which inhabits the dunes and back dune communities, probably would not be impacted by the FIMI Stabilization Project since this habitat is unlikely to change significantly over the next 15 years, unless there is a catastrophic event.

Wildlife. The FIMI Stabilization Project would provide a more stable upland environment, which would facilitate the natural successional process. However, given the harsh coastal environment of the Fire Island barrier, it is likely that succession will proceed at an extremely slow rate, never progressing over the next 15 years beyond a woody shrub/woody tree thicket habitat.

Most of the species that inhabit the project area (as discussed in the Affected Environment Section) are extremely adaptable and would adjust to the new habitat without difficulty. A discussion of how this succession would affect the major wildlife classifications follows.

Large Mammals. Whitetail deer inhabit the Fire Island barrier at numbers far above the carrying capacity of the habitat. The FIMI Selected Plan would provide a more stable upland environment resulting in a shift toward a more favorable deer habitat. This would provide improved browsing and protection from the harsh coastal conditions. Stabilization of the upland habitat would permit the deer to expand their current range and disperse, further increasing the population. Deer are a host species for deer ticks, which carry Lyme disease, therefore an increase in herd size and dispersal would likely increase the spread of the disease.

Small Mammals. The vast majority of the small terrestrial mammals such as moles and shrews, meadow vole, white-footed mice are extremely adaptive and can utilize a variety of habitats found on the island. These habitats include grasslands, old fields (meadows invaded by vines and shrubs), thickets, and fresh and tidal wetlands. The mature forest lacking understory (groundcover) growth is the habitat least utilized by these mammals. One species that exhibits a strong preference for grassland habitats, dune grass, old field, and Spartina marsh, is the meadow vole, but this species will utilize shrubby thickets as well. The FIMI Stabilization Project is likely to induce the greatest habitat change on the island interior area, which is expected to succeed to a more wooded, shrubby environment. The dune and intertidal marsh areas would remain virtually unchanged. Any dramatic shift in vegetative patterns on the Fire Island barrier would require significantly more time than the 50-year lifespan anticipated for the FIMI Stabilization Project.

The more aquatic species, muskrat and mink, will continue to utilize the saltmarsh habitat as they currently do, with little or no change to the population. The larger carnivore species, red fox and raccoon are both extremely adaptive species and are also expected to continue to thrive on the island.

Roosting habitat for bats, other than man-made structures is currently in limited supply on the island. Bats that presently utilize the homes will continue to do so, and the bats that forage on insects over the dunes and marshes during migration will also continue to do so. Undesirable alien species, such as the Norway rat and house mouse, which became established nearly two centuries ago (Connor, 1971), will also continue to utilize the various habitats found along the outer beach.

Feral Species. Unfortunately, a feral population of domestic cats and dogs has become established on the Fire Island barrier. The FIMI Selected Plan would have no impact on these species whatsoever. Populations are expected to increase through wild breeding and the release of new individuals each year by homeowners. These feral animals pose a serious threat to native wildlife species, particularly to ground-nesting birds, such as the piping plover. This problem will continue and result in greater losses of native wildlife if left unaddressed; however, this situation is unrelated to the proposed project.

Herpetiles. The FIMI Selected Plan would provide a more stable environment for the nine reptile and amphibian species occupying the project area. Their populations are expected to remain stable or increase slightly due to the habitat protection afforded by the project.

Insect Fauna. Sand deposition associated with the FIMI Stabilization Project would bury insects that presently inhabit the intertidal zone and the wrack line. Insect larval stages would be the most vulnerable to burial. Sand deposition would likely inhibit normal larval activity or result in injury or death to the individuals. Sand deposition would also render the insects of the intertidal zone and wrack line temporarily unavailable to other insects and shorebirds that depend on them as a food source.

Although there is little published information on the effects of beach nourishment on insect fauna, it is likely that insects would begin re-colonization almost immediately. The insects found in the project area are ubiquitous on the south shore of Long Island. Given the high mobility of adult insects and the ubiquitous nature of beach insects, there is no dearth of source populations for re- colonization.

FIMI Selected Plan Impacts to Flora of the Barrier Island Ecosystem

The FIMI Selected Plan would minimize direct impacts on barrier island vegetation because construction activities will be limited to the beaches and dunes. Vehicle traffic in placement and distribution of sand will bury or destroy vegetation and regrowth will be retarded within the

construction zone, however these plant communities are limited and are expected to recover. The project would sustain some vegetation communities on the interior of the barrier by reducing the frequency and severity of breaches and overwashes, thereby creating a more stable system.

Flora. The construction of an engineered beach, and enhancement of the existing dune system by increasing the length of the dune or raising the effective height of the dune over the existing beach profile, will all serve to reduce the potential for overwashes and breaches. These actions will also effectively enhance the protection afforded to all of the upland vegetative communities located behind the primary dune. These vegetative communities are likely to experience a slight decrease in wind speed and a concomitant reduction in potential wind shear from the offshore winds. The delivery of salt particles, either through direct overspray or aeolian transport, is likely to be modified slightly as a result of widening the beach and raising the dune height. Such actions are likely to benefit the growth of certain back-dune plant species, and reduce the current environmental stress on the woodland communities located behind the proposed dune construction.

Construction activities are likely to be concentrated between the upper beach and intertidal zone, thus posing a potential threat to plant species currently occupying this area. Damages to existing vegetation can be minimized by confining vehicle traffic to designated travelways, staying a minimum of 20 feet from the toe of any existing dune (whether vegetated or not), utilizing the same wheel ruts created by earlier vehicles, and provide adequate visual barriers around rare plant species as a warning to avoid traversing the area. In addition vehicle passes which traverse the dunes in a manner perpendicular to the shoreline should be avoided wherever possible, or aligned in such a way that they avoid prevailing wind directions to prevent future blowouts.

The following narrative is largely excerpted from the H.W. Art (1971) report that describes the importance of atmospheric salts in defining the maritime communities of the Fire Island barrier. This is provided as a framework to properly assess the impacts of the FIMI Stabilization Project on the barrier island flora. Art states that "with increasing proximity to sea coasts there is generally an increase in the quantity of chemicals contained in precipitation, not only chloride, sodium, and sulfate, but also nitrogen, magnesium and in some locations calcium and potassium. In coastal areas, the atmospheric load of oceanic salts is so great as to cause the restriction and zonation of ecosystems."

Winds along the Atlantic coast are predominantly from the north during the winter months, while during the summer months they are predominantly from the south and west. The Fire Island barrier also experiences onshore winds during the spring and summer. According to Art (1971), these onshore winds are primarily responsible for the production of salt spray aerosols. Salt spray aerosols are formed by the evaporation of droplets ejected from the sea surface by the bursting of air bubbles. Wind speeds in excess of 7 m/sec. cause whitecaps to form on the ocean, which greatly enhances the formation of salt spray aerosols. Wind speed, which increases with height above ground, is greatest at the windward crests of the dunes and lowest in the wind shadows just leeward of the dune crests. The salt spray aerosol concentration also rises with increasing wind speed, and is highest closest to the ocean and in areas of high topographic exposure (Art, 1971).

Dune and Swale Community. Changes to the dune and swale community that may be induced by the FIMI Selected Plan are hard to predict. This is due to the fact that the vegetative patterns which appear in the dune and swale community are governed by a complex of environmental gradients rather than a single factor, such as salt spray (Art, 1971).

Beachgrass plays a prominent role in the development of dune and swale topography. Wind speeds at or above 4 m/sec. will transport sand grains. When winds of this speed or greater encounter barrier island vegetation, they may slow down and deposit their load of sand around the bases of the plants.

"As the process is repeated, the height of the dunes increases to an equilibrium height dependent upon the characteristics of the sand, the intensity of winds, the bio- logic limits of the vegetation, and the frequency of storms" (Art, 1971).

The seaward fact and crest of the primary dune, where salt spray deposits and sand movement are greatest, is typically dominated by beachgrass. Beachgrass root growth is stimulated by sand burial; thus, activities that stabilize the substrate will lead to decreased beachgrass vigor. This phenomenon is readily apparent in natural systems on the lee side of the primary dune, where beachgrass abundance generally decreases as the abundance of woody species increases. Augmentation of the existing dune may slightly modify the localized wind patterns and salt spray deposition. These changes, however, are not expected to result in any significant changes to the existing vegetative patterns. The beachgrass community will likely establish on the foredune and crest of the new/enhanced dunes. Beachgrass covering the former fore dune areas, considered back-dune after project completion, may dwindle and eventually be outcompeted by woody vines and shrubs.

Woody shrub species (such as beach plum, bayberry, and poison ivy), which generally occur on the leeward slope of the primary dune and throughout the secondary dune system, also exhibit a limited capacity to respond to periodic sand burial. However, these species are more highly susceptible to salt spray injury than beachgrass and, therefore, typically remain out of immediate exposure to winds coming off the beach. Increasing the effective height of the foredune may allow these woody shrub species to establish at slightly higher elevations on the lee side of the primary dune as well as on the secondary dunes.

Art (1971) conducted vegetative transects across the Fire Island barrier and found that the percentage of vegetative cover and species diversity generally increased with distance from the ocean. In a similar fashion, slight increases in percent cover and species diversity are likely to be induced by the construction of an engineered beach and a heightened dune. This change is expected to have the greatest impact upon the more protective "shadow zones" that create favorable micro-climates for species that are less tolerant of salt and wind. This effect is likely to favor the swale communities.

Beach heather is a species that pioneers onto bare sands in blowouts and other erosional areas. The total area covered by this species, as well as others typically associated with blowout areas (i.e., seaside goldenrod, sand jointweed [*Polygonella articulata*], tall wormwood [*Artemisia caudata*], and panic grasses [*Panicum sp.*]) is likely to be reduced over time as a result of the increased erosion protection afforded by the FIMI Stabilization Project.

Maritime Forest Habitat. The integrity of this community is dependent upon protection from extreme environmental stresses. The FIMI Stabilization Project will increase protection to any existing woodland areas located north of the enhanced dune line. In addition, the micro-climate changes, reduction in wind speed and subsequent drying effect, anticipated for the lee side of the primary dune may promote establishment of woody growth in areas not currently supporting such habitat. Drastic community shifts, such as the conversion from grasslands to woodlands, are not expected to occur, because the process of natural succession is slow, particularly in the relatively harsh coastal environment, and is not likely to produce noticeable changes over the short duration of the FIMI Stabilization Project.

Art (1971) states that the "vertical growth of the Sunken Forest is severely restricted by the shearing effects of the salt-laden winds. Leeward of the secondary dune, the canopy rapidly assumes a relatively uniform height of 5.5 to 7.0 meters. The tops of the trees that are subjected to the shearing action of the salt-laden winds develop a smooth, closed canopy. Thus, the height of the trees is ultimately determined by the height of the secondary dune which governs flow patterns." Heightening the primary dune may

raise the effective elevation at which wind-shearing takes place. However, this may not affect any change on the maritime forest community, because the existing trees may have undergone irreversible physiological conditioning to withstand these conditions, such as shutting down potential apical growth on the exposed tips of the branches. In addition, the closed canopy produced by years of growth under wind-shear may effectively block sunlight from the forest floor, thereby maintaining the status of the forest and barring future succession.

Planted Exotic Lawn/Shrub. The landscape plantings associated with the developed portions of the barrier island, maintained residential communities and park properties, are likely to benefit from the FIMI Selected Plan. This is due primarily to the fact that the back-dune and upland areas will become more stable as a result of the dune enhancement activities scheduled for the beachfront. Establishing a wider and slightly higher dune elevation along the south shore is likely to cause a reduction in wind shear and aeolian salt deposition on vegetation growing lower than the effective height of the dune, especially immediately behind the dune crest. This could benefit turf grasses that are not highly salt tolerant, as well as ornamental shrub and tree species. It is not likely to create a competitive advantage for non-native species over indigenous vegetation since the overall growing conditions on the barrier will remain relatively harsh, and the duration of the FIMI Stabilization Project is relatively short.

4.2.7.2 Natural Resources - Backbay Ecosystem

The backbay ecosystem includes bay intertidal habitats, sand shoals, mud flats, bay subtidal habitats and SAV. The following is a discussion of potential impacts of the No Action alternative to these physical and vegetative habitats, potential impacts to the species which utilize these habitats is discussed.

FIMI Selected Plan Impacts to Habitats of the Backbay Ecosystem

Barrier Island Intertidal Marshes. Breaches in the barrier island which lead to the formation of inlets can create suitable habitat for marsh vegetation to colonize. The flood tidal deltas that form under these conditions were reported by Leatherman and Allen (1982, 1985, and 1989) to have caused the development of the majority of the marsh islands and back-barrier marshes in Shinnecock Bay and Great South Bay. However, unabated breach or major overwash events may also cause existing marsh areas to be covered with sediment (as discussed previously in the No Action Alternative section). Depending upon the thickness of the deposit, these overwash areas may become re-colonized by upland vegetation (such as beach grass), and ultimately result in a loss of salt marsh habitat.

Since the FIMI Stabilization Project would decrease the possibility of a breach or overwash event, the probability of losing existing marsh habitat due to storm surges would decrease, as would the probability of forming new tidal marshes. The reduced likelihood of inlet formation is also likely to translate into reduced formation of flood tidal deltas and potential tidal wetlands habitat. Thus, the project is likely to result in no net change to the total vegetated wetland area.

The 1997 NPS study of estuarine resources of the FIIS states that "Well developed or developing salt marshes are in those areas where shoreline structures effectively reduce currents and water flow, and where sedimentation rates exceed those of coastal submergence."

FIMI Selected Plan Impacts to Avifauna of the Backbay Ecosystem

Resident Species. The resident population of herring and great black-backed gulls are not likely to be noticeably affected by the FIMI Selected Plan.

The resident waterfowl populations of Canada goose, black duck, and mallard are likely to remain unaffected by the FIMI Selected Plan. Although these birds primarily seek coastal and brackish tidal marshes for breeding, their habitat is not particularly limited to the project area; they will utilize the entire bay complex for loafing, feeding, and rearing young.

Migratory Species. Numerous species of shorebirds forage along the beaches, marshes, and intertidal flats of the project area from spring through fall. As the extent of available habitat is likely to remain relatively constant with the FIMI Selected Plan, no impact to these species would be expected.

Raptors. No noticeable change to backbay ecosystem habitats would be expected with the FIMI Selected Plan. Consequently no impact to the raptor populations would be expected. Foraging areas for these species would remain similar to existing conditions. However, as mentioned under the Barrier Island Ecosystem discussion, the reduced frequency of breaches would remove the beneficial impact of this condition for those raptor species that hunt by sight. Due to the infrequent occurrence of breaches, no noticeable change in raptor population would be expected.

Passerine Species. As discussed in the Affected Environment Section, the project area is extensively utilized by passerine birds, particularly during the spring and fall migration periods. By providing protection to land based vegetation habitats, the FIMI Selected Plan would provide long term benefits to passerines that depend on these areas during migration.

FIMI Selected Plan Alternative Impacts to Wildlife of the Backbay Ecosystem

Large Mammals. FIMI Selected Plan impacts to large mammals in the backbay ecosystem would be similar to those described in the section discussing the Barrier Island Ecosystem.

Small Mammals. FIMI Selected Plan impacts to large mammals in the backbay ecosystem would be similar to those described in the section discussing the Barrier Island Ecosystem.

Feral Species. The FIMI Selected Plan is not likely to produce any significant change in the current feral dog and cat populations. These animals would be expected to continue to prey on wild species as well as scavenging for food scraps in dumpster areas.

Herpetiles. Of the nine reptile and amphibian species indicated as occupying the project area, only the spotted turtle is likely to be greatly impacted by a breach/overwash event. This species prefers freshwater marshes, a habitat which is fairly limited on the Fire Island barrier. Reduction in breach/overwash events would benefit this species.

Insect Fauna. There is a paucity of published literature dealing with the effects of shoreline erosion (whether human induced or natural) on beach insect fauna. However, it is likely that severe erosion and/or a breach would result in the direct loss of burrowing insects and beach habitat. As the FIMI Selected Plan would reduce breaches and overwashes, the project would benefit insect fauna.

4.2.7.3 Rare and Endangered Wildlife Species

Numerous state and federally listed plants and wildlife are found on the barrier island and backbay ecosystems. The FIMI Selected Planhas the potential to negatively impact one or more of these species.

USACE entered into Formal Consultation with the U.S. Fish and Wildlife Service on March 4, 2014 to evaluate the potential direct and indirect impacts on two Federally-listed threatened species, namely the Atlantic coast population of piping plover and seabeach amaranth. Potential impacts of the project to rare, threatened, endangered, protected and special concern species (collectively referred to as RTE Species), including the piping plover and seabeach amaranth, are discussed in the following paragraphs.

The Selected Plan Alternative Impacts to RTE Species of the Barrier Island and Backbay Ecosystems

Piping Plover. The federally threatened Atlantic Coast population of piping plovers has been well documented as utilizing several locations on the Fire Island barrier for nesting (NYSDEC, Long Island Colonial Waterbird and Piping Plover Surveys. Elias-Gerken, (1994) studied piping plover use in the project area to identify any discernible trends in habitat suitability. She determined that certain habitat elements were lacking, particularly ephemeral pools for feeding. Coupled with the scarcity of open or sparsely vegetated sites, approximately 80 percent of the Fire Island National Seashore is not suitable for breeding habitat. The presence of open vegetation (median cover of 10 percent) was determined to be an important habitat element to support foraging piping plover chicks, in the absence of ephemeral pools and when easy access to bay mudflats is restricted. Thus, suitable habitat is limiting piping plover numbers on the Fire Island barrier. Elias-Gerken further suggested that storm-maintained, early successional stage habitats, such as created by overwash fans, provide optimal breeding conditions for piping plovers.

If a breach is closed or an overwash area is formed the winter prior to the shorebird breeding season (April 1st - July 1st), piping plovers (in addition to other shorebirds) will immediately use the newly altered area for foraging. Gently sloping overwash fans that extend into the backbay marshes provide prime foraging habitat. Due to routine dynamic changes in washover or breach areas, the vegetation typically remains sparse. This provides optimal nesting habitat. The insects associated with the sparse vegetation (i.e., common ants and flies) also provide a food source for the foraging shorebirds. However, shorebirds that utilize washover areas for nesting may also be subject to increased predation, and to nest failure due to subsequent washovers at the same location.

In direct contrast to the benefits derived from overwash deposits, a barrier island breach and continued beach erosion could have negative impacts on piping plovers. A breach occurring during the nesting season could result in the direct loss of eggs, and mortality of chicks and/or adults. Flood tidal deltas resulting from a breach may provide additional foraging areas for piping plovers. However, this benefit must be weighed against the loss of beachfront nesting habitat. Continued erosion of the beach and fore-dune can create erosion scarps, thereby degrading existing or other potential plover habitat.

Conducting the beach fill operation outside of the least tern and piping plover nesting season is the easiest way to avoid adverse impacts (USFWS 1995). However, if sand placement occurs during the least tern nesting season from April 15 to September 1, least terns may be precluded from nesting in adjacent areas due to the disruptive construction activity. The least tern courtship, nesting, and brood rearing activities may be directly and adversely affected. The operation of dredging equipment immediately adjacent to a shoreline that is used by terns as a courtship, nesting, and brood rearing area has the potential to disturb terns to the point where they may not successfully nest and fledge young forcing the birds to seek appropriate habitat elsewhere. Operation of machinery used to move dredge pipeline and to grade the nourished beach can greatly disturb terns, their nests, and can endanger the lives of chicks. Additionally, the placement of sand within a known nesting area can adversely affect the quality of the existing least tern nesting substrate (USFWS 1995).

The period of concern for the piping plover and least tern in the proposed project area, extends from April 1 when the birds begin to arrive and establish territories, to August 31, when all of the young have fledged. Once the birds have arrived, construction activities should not be scheduled if such activities would disrupt their nesting rituals. When construction activities occur, shore birds may avoid the active construction site temporarily. Given the miles of shoreline and tidal flats on Fire Island outside of the project work areas, the availability of habitat is not a limiting factor and this temporary effect would not be significant, outside of the nesting area.

Creating additional beach width and elevation would provide more habitat for the plovers and terns. However, this may have little positive impact on their long-term success because they currently do not lack appropriate shorefront nesting habitat. The nourished beach, however, may decrease flooding of the shorebird nests, due to the increased elevation, during the hurricane season, and may provide some real but immeasurable benefit. Beach slope is also a critical factor for piping plover habitat selection and use.

As the proposed project will be constructed outside of the piping plover breeding season (April 1 – August 31), no adverse impacts to the piping plover will occur from the proposed filling activities. (refer to Attachment D).

Potential Indirect Effects of the Proposed Action. Potential indirect impacts are anticipated to piping plovers (and seabeach amaranth discussed below) and their habitat. Beach nourishment could have both beneficial and adverse effects on these beach-dependent species. If the result of the sand placement produces a higher, wider beach and more available, suitable habitat for both seabeach amaranth and piping plovers, there can be potential positive habitat impacts. This could reduce flooding and potential loss of individuals and progeny (young and seed bank) and provide additional habitat for more colonization.

On the other hand, creating additional habitat in heavily disturbed community areas could result in sub-optimal or nonfunctional habitat, which could also result in a population sink. Wider, higher beaches could attract and result in higher recreational use and an increase in predation with additional habitat available for predators. Numerous studies have documented the direct and indirect adverse effects of human disturbance on piping plovers (Burger 1987, Melvin et. al. 1992, Howard et. al. 1993, Elias-Gerken and Fraser 1994, and Strauss 1990). Since the ocean beaches already receive high public use and have protected areas for rare flora and fauna, no shift or change in existing use is expected. This is also the case with human induced predator impacts, as both beach conditions and predator populations fluctuate and cycle.

Further, construction activities would temporarily impact beach invertebrates and prey base of plovers as well as the potential habitat and seed bank of amaranth. Intertidal zone prey base would be affected, as project activities would place material below the high tide line. These impacts will be short term and minimal due to time of year placement and the amount of intertidal area along Long Island. Placement of sand on the dune could also bury rhizomes and affect the integrity of the plant community.

The construction of the beach and dune building could preclude natural overwash processes and early successional habitat formation in the short term. Nourishment would also bury or remove established beach vegetation and temporarily retard vegetative growth. It would provide a gently sloping beach and wider intertidal areas for increased plover breeding and foraging and invertebrate amaranth colonization. The project could also bury or temporarily remove the wrack line, an important source of prey for plovers.

Nourishment of the beach towards more stabilized conditions can preclude natural habitat formation,

including overwash and back-bay foraging sites. The habitat resulting from the activities will be temporarily changed, as well as available prey base (potential removal of wrack/beach invertebrates). These conditions may be positive or negative, as more beach will be available as breeding habitat, but natural habitat formation of overwash areas could be precluded. These manipulated conditions are expected to be temporary and localized and the affected area quickly recover and recolonize with prey. Effects of this project are recognized to not last through the dynamic winters the shoreline will returned to its natural configuration within five years. The project will allow for overwash in all the other areas outside the project area along Fire Island.

USACE has identified the following potential indirect adverse effects to listed species resulting from implementation of the project:

- Disturbance to prey base and temporarily reduced prey availability (destruction of beach invertebrates and wrack line);

- Reduction of potential for formation and maintenance of overwash or bayside piping plover breeding and foraging habitat;

- Disturbance to piping plovers through enhancing beaches to attract increased recreational activities on oceanside beaches;

- Increased potential predator populations/activity that could utilize habitat created by the project; and

- Changes in existing plover and amaranth habitats on FIIS (could be positive or negative).

USACE coordinated with the Department of Interior (NPS and USFWS), NYSDEC and Suffolk County and developed modifications to the proposed beach fill component of the Selected Plan that would provide increased protection and improved productivity for listed species, including the piping plover. In addition, USACE conduct pre-construction field surveys for active piping plover nesting areas.

Roseate, Least, Common and Forster's Terns. While roseate terns prefer breeding on moderately vegetated sandy deposits in isolated island colonies, least and common terns utilize similar nesting habitat as piping plovers. Approximately 65 percent of all common tern colonies nest on salt marsh islands (Andrle and Carroll, 1988). The only roseate tern breeding colony on FIIS is on West Inlet Island, which means roseate terns forage in Great South Bay, off the ocean beach around Smith Point County Park, and probably into the eastern portions of the wilderness area (NPS 2008). Roseate terns usually nest in association with common terns, in areas of slightly denser vegetative cover (80 percent). The placement of sand on the barrier beach has the potential to benefit both the least and common terns which show a distinct preference for nesting on open shorelines, barrier beach dunes, and dredge spoils where the vegetation accounts for less than 10 percent of the ground cover (Andrle and Carroll, 1998).Thus, the positive impacts of improved nesting potential on overwash deposits, breach closure areas, and sand spits are very similar for these species. Forster's terns nest in marshes (Alsop 2001) and would be negatively impacted by breaches or overwashes that smothered or displaced this habitat, hence Forster's terns would benefit from the project. Roseates may also benefit from a reduction in breach or washover events, which would allow beachgrass and other herbaceous vegetation to fill in. Conversely, the decrease in potential breaches may result in a reduction of the specialized feeding habitat provided by tidal rips, sandbars, and bay inlets (Andrle and Carroll, 1988) that roseate terns require. Thus, the overall impact of the FIMI Stabilization Project on roseate terns has not been specifically determined. Terns use of the offshore environment for feeding is not likely to be negatively impacted by the dredging operations because these species will seek schools of baitfish

elsewhere along the coast.

Common Loon. Except during nesting season, common loons rarely come on shore (Alsop 2001). Common loons would be negatively impacted by breaches or overwashes that occurred during the nesting season, but would likely move from the area during other seasons.

Osprey. Ospreys within the project area typically nest on man-made elevated platforms or at the tops of dead trees. In addition, this species feeds exclusively on fish. Neither the nesting nor feeding habitats for ospreys are likely to be affected by the FIMI Selected Plan.

Peregrine Falcon and Cooper's Hawk. Both the peregrine falcon and Cooper's hawk utilize the project area primarily during fall migration. The FIMI Selected Plan is thus not likely to affect either of these raptor species.

Red Knot. Red knots are expected to occur in the project area during the spring (April-June) and fall (August-October) months. Construction activities are likely to disturb foraging and roosting red knots along the ocean shoreline where they may occur and, in particular, bayside habitats where piping plover habitat restoration/creation may occur. However, as stated above, the proposed action will avoid the important bay shore horseshoe crab spawning/red knot foraging areas at the FIIS Lighthouse tract, FIIS Wilderness Area, FIIS at Davis Park, and FIIS at Talisman, as well as Democrat Point, a location where red knots were documented to occur (USFWS, 2014).

Atlantic sturgeon. Five Distinct Populations Segments (DPS) of Atlantic sturgeon were listed as threatened or endangered under the Endangered Species Act, including a NYB DPS. Known spawning populations for the NYB DPS exist in two rivers: the Hudson and Delaware Rivers. However, since the marine range for all DPSs extends from Canada to Florida, this assessment is applicable to all DPSs. In the Hudson River estuary, spawning, rearing, and overwintering habitats were reported to be intact by Bain (1997), supporting the largest remaining Atlantic sturgeon stock in the U.S., however, a population decline from overfishing has also been observed for this area (Bain 1997, Bain 2001, Peterson et al. 2000). Like all anadromous fish, Atlantic sturgeon are vulnerable to various impacts because of their wide-ranging use of rivers, estuaries, bays, and the ocean throughout the phases of their life. General factors that may affect Atlantic sturgeon include: dam construction and operation; dredging and disposal; and water quality modifications such as changes in levels of dissolved oxygen (DO), water temperature and contaminants (ASSRT, 2007, as cited by USACE-NAP 2011). Atlantic sturgeon also exhibit life history characteristics that make them particularly vulnerable to population collapse from overfishing (Boreman 1997, as cited by Bain 1997), including: "advanced age and large size at maturity, eggs that are numerous and small in relation to body size, and spawning that is episodic and seasonal" (Winemiller and Rose 1992, as cited by Bain 1997). Other threats to the species include vessel strikes.

Dredging in the nearshore and offshore areas has the potential to impact aquatic ecosystems by removal/burial of benthic organisms, increased turbidity, alterations to the hydrodynamic regime and the loss of shallow water or riparian habitat (which is not within the habitat being assessed in this EA). Hydraulic dredges can directly impact sturgeon and other fish by entrainment in the dredge (ASSRT 2007, as cited by USACE-NAP 2011). According to Smith and Clugston (1997, as cited by USACE-NAP 2011), dredging may also impact important habitat features of Atlantic sturgeon if these actions disturb benthic fauna, or alter rock substrates (which does not occur in the project area). Indirect impacts to sturgeon from either mechanical or hydraulic dredging include the potential disturbance of benthic feeding areas, disruption of spawning migration, or detrimental physiological effects of resuspension of sediments in spawning areas.
Atlantic sturgeons have been harvested for years. Many authors have cited commercial over-harvesting as the single greatest cause of the decline in abundance of Atlantic sturgeon (Ryder 1890, Vladykov and

Greely 1963, Hoff 1980, ASMFC 1990, and Smith and Clugston 1997, as cited in ASSRT 2007 and USACE-NAP 2011). Even though the fishery has been closed coast-wide since 1995, poaching of Atlantic sturgeon continues and is a substantial threat to the species, but the magnitude of the impact is unknown (ASSRT 2007, as cited by USACE-NAP 2011). Although little is known about natural predators of Atlantic sturgeon, there are several documented fish and mammal predators, such as sea lampreys, striped bass, common carp, minnow, smallmouth bass, walleye, grey seal, and fallfish (ASSRT 2007). There are some concerns that predation may adversely affect sturgeon recovery efforts in fish conservation and restoration programs, and by fishery management agencies (Brown et al. 2005, and Gadomski and Parsley 2005, as cited by ASSRT 2007; ASSRT 2007); however, further research is needed. Atlantic sturgeon may compete with other bottom feeding species for food, although there is "no evidence of abnormally elevated interspecific competition" (ASSRT 2007), and it has been suggested by van den Avyle (1984, as cited by Gilbert 1989) that "non-selective feeding of juvenile and adult sturgeons may reduce the potential for competition with other fish species".

Direct potential impacts linked to dredging at FIMI include physical injury or mortality of adult or sub-adult Atlantic sturgeon due to drag head strikes, entrainment or vessel strikes. Other direct impacts may include avoidance behavior due to noise disturbance or impacts associated with increased turbidity from re-suspension of sediments. Re-suspension of sediments has the potential to cause respiratory impacts (gill abrasion). There would be no dredging related impacts to spawning activities since the closest known spawning site is in the Hudson River (Dovel and Berggren 1983), which is up-current from the project. Given the substantial spatial buffer the project would have no direct impacts to spawning areas.

It is possible for Atlantic sturgeon to be entrained in a dredge via physical contact with a hopper dredge's drag-arm and impeller pumps. A minimum take of 0.6 Atlantic sturgeon per year in the Atlantic and Gulf coasts was estimated based on hopper dredge takes since 1995 and assuming dredging efforts were relatively similar among years (USACE-NYD 2006, as cited by ASSRT 2007). Dickerson (2006, as cited by USACE-NAP 2011) summarized sturgeon takes from Atlantic and Gulf Coast dredging activities conducted by the USACE between 1990 and 2005, which documented takes of 24 sturgeons (2 – Gulf, 11- Shortnose, and 11-Atlantic). The majority of the interactions were with a hopper dredge: sixteen takes with a Hopper dredge; five takes with a cutterhead dredge; and three takes with a mechanical dredge. Fifteen of the sturgeons were reported as mortalities, eight as alive, and one as unknown. These documented takes occurred during dredging operations in rivers and harbors, mainly in waterways along the eastern coast that, from the map in the report, appear to be more narrow than the wide pathways available to Atlantic sturgeon in the Raritan and Lower Bays and Atlantic Ocean off the coast of NJ and NY (i.e., compared to Delaware River, Savannah Harbor, etc). However, the risk still exists for Atlantic sturgeon to become entrained in a hopper dredge during mining of sand at the borrow area. The borrow area occupies a small percent of the ocean floor compared with the surrounding area, as well as a small percentage of the open water habitat available for migration.

Although the ASSRT (2007) reports that dredging activities impact sturgeon by disrupting spawning migrations and through dredge noise disturbance, it does not clearly state what the cause and rationale are for this threat, or specify the type of dredging equipment; however, this seems more relevant to narrow channels and rivers. The Hudson River population of Atlantic sturgeon is considered one of the healthiest populations in the U.S. (ASSRT 2007). Therefore, it would appear that Atlantic sturgeon are still finding and utilizing pathways through to the New York Bight, including the Lower Bay off the coast of Fire Island to reach spawning grounds in the Hudson River. This is likely because the waterways available for migration extending from the mouth of the Hudson River to the marine environment are sufficiently deep enough and wide enough to permit Atlantic sturgeon to avoid potential dredging-related disturbances, including active dredges and any associated noise, and any short-term impacts to their habitat and food source are not adversely affecting the population.

FIMI Selected Plan Alternative Impacts to Reptiles and Amphibians of the Barrier Island and Backbay Ecosystems

Diamondback Terrapin. The Selected Plan Alternative would not directly impact the diamondback terrapin. Protection of backbay habitats utilized by this species would benefit this species.

Eastern Hognose Snake, Fence Lizard, Eastern Mud Turtle, Eastern Box Turtle, Spotted Turtle, Tiger Salamander. The TSP Alternative would not directly impact these species. Protection of backbay habitats would benefit them.

Sea Turtles. The Riverhead Foundation for Marine Research and Preservation (RFMRP) directs an active marine mammal and sea turtle stranding program on the eastern end of Long Island. According to RFMRP, a green turtle attempted to nest on the ocean beach in Amagansett, approximately 40 miles east of the project area, during the summer of 1998. The nest, however, was destroyed during a storm and no eggs were ever recovered (Durham, November 18, 1998). This was an extremely unusual event, since green sea turtles have only been recorded as nesting as far north as North Carolina (NYSDEC, Undated).

Juvenile Kemp's Ridley, loggerhead, and green sea turtles have been well-documented as utilizing the nearshore coastal waters and estuaries on Long Island. Adult sea turtles are rarely found in close proximity to the coastline. An occasional adult loggerhead, leatherback, or green sea turtle may be encountered; however, they typically utilize waters 40 miles or more offshore (Morreale and Burke, Grey Lit; Sadove and Cardinale, December 1993). Therefore, the nesting attempt may be considered an anomaly. It is highly unlikely that beach nourishment activities proposed by the FIMI Selected Plan would impact the beachfront breeding habitat for sea turtles.

FIMI Selected Plan Impacts to Rare Plants of the Barrier Island Ecosystems

Seabeach Amaranth and Seabeach Knotweed. As discussed previously in the Affected Environment Section under Rare Plants of the Barrier Island, two species in particular are dependent upon the dynamic beachfront habitat and other sandy deposits that typically result from overwash and breaching events. These sediments provide substrate for seabeach amaranth (a Federally and State listed threatened species) and seabeach knotweed (a State listed rare species) germination. Since the FIMI Stabilization Project will reduce the likelihood of breach formation and subsequent development of potential habitat for seabeach amaranth and seabeach knotweed, and involves the movement of construction vehicles and placement of fill material within a zone of potential growth for these species, these species are likely to be impacted by the proposed project.

Potential Direct Effects of Proposed Action on Seabeach Amaranth. The proposed activities would cause short-term impacts to seabeach amaranth by directly covering the seeds or plants. However, as noted above, seabeach amaranth is limited to inhabit the Project area. In addition, similar to the recommendations provided by NYSDEC and USFWS for the piping plover, USACE will implement several measures in an effort to minimize potential adverse impacts to existing seabeach amaranth populations if found during construction (USACE 1998, USFWS 1999, USFWS, 2014). These impact minimization measures include the following: pre and post-construction surveys of the Project area to determine the presence/absence of seabeach amaranth; education of residents, landowners, beach visitors, and beach managers; and the use of physical deterrents to deter human use of potential seabeach amaranth habitat. Because seabeach amaranth has not been identified as occurring in the majority of the Project area and because measures will be taken to minimize access to areas that are shown to have amaranth, Not Likely to Adversely Effect determination was made on populations of seabeach amaranth related to the implementation of these actions.

Construction of the Project is likely to increase overall habitat suitability for seabeach amaranth along the affected beachfront. Although the planned beach berm is designed for an elevation of 9.5 ft NGVD, 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.

USACE has proposed a management plan aimed at reducing the potential impacts on seabeach amaranth *(see Surveying, Monitoring and Adaptive Management below)*

FIMI Selected Plan Impacts to Significant Habitats of the Barrier Island and Backbay Ecosystems

Maritime Holly Forest. The integrity of this old-growth forest community is extremely dependent upon the protection from wind, overwash, and salt spray afforded by the primary oceanfront dune system Reschke (1990). Since the Maritime Forest Community primarily occupies the portions of the barrier which are already fronted on the ocean-side by a well-developed dune system, a high or wide beach profile, or some combination of both, the FIMI Selected Plan is not likely to affect this community.

Maritime Freshwater Interdunal Swale. The integrity of this plant community, as discussed in the No Action Alternative section, is also tied to the protection afforded by a well-developed dune system. As this habitat is well adapted to slight habitat modifications, it would continue to tolerate some degree of sand shifting and moisture differences which could be expected following project implementation. The provision of a larger, more extensive foredune fronted by a nourished beach under the FIMI Selected Plan would enhance the present habitat and provide greater protection for this State imperiled community and the rare plants associated with it, when compared to the No Action Alternative.

Significant Coastal Fish and Wildlife Habitats (SCFWH). All of Great South Bay and many adjoining marshes and natural areas are designated as SCFWH by NYSDEC. All or portions of the following specific SCFWH areas are within the project area: Great South Bay, Democrat Point, Moriches Bay and Smith Point County Park. Additional SCFWHs are located on the northern coastline of Great South Bay; however, these will not be directly affected by the project. The proposed FIMI Selected Plan will affect these habitats through the filling of shallows, grading, and shoreline alteration activities which are integral to the proposed project. These activities are necessary as stabilization measures for storm damage protection. The project will create enhanced beach area and dunes and will minimize breaching and overwashing and consequent damage to habitats and communities on the barrier island and along the south shore of Long Island. There will be no change in existing tidal exchange patterns, only a continuation of the non-storm induced conditions and no long term negative consequences to these SCFWHs are expected.

4.2.8 Noise and Air Quality

Noise Quality Impacts

Sources of noise for the proposed Project include dredging equipment, several bulldozers (or similar equipment), and a pump-out station (if used). Construction activities would result in short- term minor increases in noise generation as a result of the operation of construction equipment. No long-term significant impacts would occur.

The FIMI project would comply with the General Conformity (GC) requirement (40CFR§90.153) through the following options that are under coordination with the New York State Department of Environmental Conservation (NYSDEC): statutory exemption, Surplus NOx Emission Offsets (SNEOs) generated by the Harbor Deepening Project, the purchase of Environmental Protection Agency (EPA) Clean Air Interstate Rule (CAIR) ozone season oxides of nitrogen (NOx) allowances, State Implementation Plan (SIP) accommodation. This project, as scheduled, is not *de minimus* under 40CFR§90.153, therefore one or a combination of these options would be usedto meet the GC requirements. The project specific option(s) for meeting GC will be detailed in the Statement of Conformity (SOC), which is required under 40CFR§90.158, which will be issued prior to construction.

Air Quality Impacts

The FIMI project will temporarily emit emissions associated with diesel fuel equipment relating to dredging activities. The localized emission increases from the diesel powered equipment will last only during the project's construction period and then end when the project is over, thus any potential impacts will be temporary in nature.

Based on the National Ambient Air Quality Standards (NAAQS), Suffolk County is currently classified as "marginal" nonattainment for the 2008 8-hour ozone standard and nonattainment of the 2006 particulate matter less than 2.5 microns ($PM_{2.5}$) standard. The county is part of the Ozone Transport Region. Ozone is controlled through the regulation of its precursor emissions, which include oxides of nitrogen (NOx) and volatile organic compounds (VOCs). Sulfur dioxide (SO2) is a precursor for $PM_{2.5}$. The combination of these designations and since the project is a Federal Action taken by the USACE, this project will require a General Conformity Review under 40CFR§93.154.

The General Conformity-applicable emissions associated with the FIMI Stabilization Plan are estimated as part of the General Conformity Review and are summarized below, by calendar year.

General Conformity-applicable emissions per calendar year

Pollutant	2013	2014	2015	2016
NO_x	0.0	425	792	0.0
VOC	0.0	13	25	0.0
$PM_{2.5}$	0.0	19	35	0.0
SO_2	0.0	0.3	0.5	0.0

The emissions levels for NOx exceed the ozone deminimis trigger levels for General Conformity while all other pollutants are below their respective trigger levels. Therefore, only NOx will need to be fully offset during the project (see General Conformity determination in Attachment C for further information on offsets). Project emissions of VOC, PM2.5, and SO2 are all below their respective trigger levels and therefore, by rule are de minimis and will have only a temporary impact around the construction activities with no significant impacts. NOx will be fully offset, by rule, and therefore the net NOx emissions will

be zero and therefore no significant impacts.

4.2.9 Coastal Barrier Resources Act

The eastern portion of Robert Moses State Park is located in Fire Island Unit NY-59 (the 5 identifier or designation under the Coastal Barrier Act Resources (CBRA). The majority of Fire Island, however, is located within the Fire Island Unit NY-59P, which is an "otherwise protected area" not within the CBRA. The incorporated villages of Saltaire and Ocean Beach are excluded from the "otherwise protected area" designation, as are the communities on Fire Island, including Kismet, Fair Harbor, Lonelyville, Atlantique, Robbins Rest, Seaview, Ocean Bay Park, Point O' Woods, Cherry 10 Grove, Fire Island Pines, Water Island, and Davis Park. CBRA and its amendments prohibit the spending of new federal expenditures that tend to encourage development or modification of coastal barriers that are within the defined Coastal Barrier Resource System (CBRS). Based on New York District review, only one unit of the CBRA, is located within the proposed project area: Robert 15 Moses State Park, CBRS map NY-59, Fire Island Unit. However, the proposed project would meet the provisions of Section 6 of the CBRA, which provides exceptions for expenditures of federal funds within CBRA units. The FIMI Selected Plan nonstructural sand placement to strengthen the natural protective features of Fire Island for coastal storm damage protection; it does not seek to encourage encroachment of development or alterations to the coastal barriers. This activity falls under the CBRA's exception for "nonstructural projects for shoreline stabilization…designed to mimic, enhance, or restore a natural stabilization system." 16 U.S.C. §3505(a)(6)(G). The proposed project meets §505(a)(6)(G)'s precondition that it be consistent with the CBRA's purposes:

- The project minimizes the loss of human life by replacing the beach to its original pre- Sandy condition in order to avoid further erosion and loss of Fire Island, and to reestablish the functionality of these beaches as part of the coastal barriers that contribute to the resiliency of upland communities. Additional loss of the beach could result in the damage to structures on Fire Island, damage and loss to structures within the backbay communities of the mainland of Long Island and potentially resulting in the loss of life.
- The Project involves renourishing a beach with sand and not the development of buildings or structures that the CBRA seeks to avoid. By keeping Fire Island National Seashore and Smith Point County Park as a public beach, no further residential development in this coastal area will occur;
- The proposed project minimizes damage to fish, wildlife, and other natural resources. Without the Project, the beach can continue to erode, impacting the wildlife and natural resources of the project area.

4.3 OTHER ENVIRONMENTAL CONSIDERATIONS

4.3.1 Irreversible and Irretrievable Commitment of Resources

The FIMI Stabilization Project consists of sand placement along the barrier island. Sand removed from the borrow areas will be permanently utilized for this project, however the sand volume is a small fraction of the available sand offshore. Berm and dune restoration involves the utilization of time and fossil fuels, which are irreversible and irretrievable. Impacts to the benthic community would not be irreversible, as benthic communities would reestablish with cessation of placement activities. No other irreversible or irretrievable commitment of resources will occur as a result of this project.

4.3.2 Cumulative Impacts

The cumulative impact assessment of federal nourishment projects on the south shore of Long Island indicate that federal project actions would occur in dynamic environment whose inhabitants have adapted to these conditions. Studies indicate that borrow area and sand placement areas re-colonize shortly after construction activities are completed. Additionally, BMPs will lessen temporary impacts. Several other Federal projects are located along the Atlantic and south shore coast of Long Island. The four (4) civil projects within close proximity to the proposed FIMI are: 1) Shinnecock Inlet Navigation Project, 2) the Westhampton Interim Project, 3) the Moriches Inlet Navigation Project, and 4) the West of Shinnecock Project. Farther to the west, three Federal projects are under way: 1) Rockaway Inlet to Norton Point (Coney Island), 2) East Rockaway Inlet to Rockaway Inlet (Rockaway Beach), and 3) Jones Inlet to East Rockaway Inlet (Long Beach). To determine the potential cumulative impacts from these projects under the No Action Alternative, the areal extent of the borrow areas was calculated, and the results are shown in Table 9. The acreage includes all borrow areas between the 18- and 60-foot contours from Breezy Point to Montauk Point. The used and proposed borrow areas in the No Action Alternative would disturb about 2.3 percent of the total nearshore and offshore areas that could be used.

Table 9 -- No Action Alternative - Borrow Area Size by Project

Project	Status	Acres
Coney Island	Constructed	528.0
Rockaway Beach	Constructed	521.1
Long Beach	Proposed	1,193.8
Westhampton Interim[1]	Constructed	308.5
West of Shinnecock[1]	Constructed	3,294.6
Used and Proposed Borrow Area Total		5,846.0
Available Borrow Area on the South Shore		183,655.0
Note: [1] Interim projects can be subsumed by the Reformulation Project.		

Suffolk County periodically dredges local channels for maintenance purposes. This dredging is conducted under permits issued by the USACE and NYSDEC. The dredging takes place mostly in the bays and not on the open Atlantic Ocean coast. The dredged materials are used as beach fill whenever the materials are suitable, and the placement is cost effective.

Cumulative Impacts of the No Action Alternative. With the No Action Alternative, the use of the nearshore and offshore borrow areas for ongoing Federal and State projects could have a cumulative impact on these resources. As discussed above, about 2.3 percent of the available acreage would be disturbed over the 50-year life of these projects. In any one year, the disturbance would be far less. It has been shown that these borrow areas can quickly recolonize after the disturbance. Because of the low percentage of disturbance and the recolonization potential, no cumulative impact from these projects is expected. The borrow areas would be physically changed. However, natural forces are constantly moving sand and changing the form of the sea bed. Therefore, these cumulative physical changes are not considered to be impacts.

Cumulative Impact of the Preferred Alternative. Relative to the categorization provided within Council on Environmental Quality guidance, the cumulative impacts of the Federal projects in the Study Area are uncertain. The coastal barriers were originaaly created by natural processes without human intervention. These natural processes redistribute sand in the nearshore environment in response to gradual erosion and storm events. Once coastal barriers are manipulated by human interventions, which Fire Island has undergone through maintenance of the inlets at either end of the island, they are no longer able to maintain their natural equilibrium. In combination with sea level rise, lower shoreface erosion, bayshore inundation and continuing natural sediment transport processes, the long-term effect of sand placement and prevention of breaches on the coastal barriers is uncertain. The impacts are also interactive in that the stabilization of barrier beaches and mainland shoreline may alter/prevent early successional communities such as maritime beach from evolving in overwash areas. The natural barrier beach environment exists in a continually changing state of "dynamic equilibrium" that depends on the size of the waves, changes in sea level relative to the land, the shape of the beach, and the beach sand supply. When any one of these factors changes, the others adjust accordingly. Development patterns that have built up over the years took place prior to research on coastal barrier behavior and sea level rise. Under the cumulative effect of natural processes acting on an environment altered by human intervention the proposed FIMI Selected Plan mediates between managing risk and natural processes. The additive damages to homes, businesses, the area's recreational resources, and its economy would be reduced by the FIMI Selected Plan. The use of natural and nonrenewable resources in the salvage, repair, and reconstruction in the aftermath of storm damage would also be reduced. The FIMI Selected Plan maintains the opportunity for long-term management plans in the project area to incorporate natural processes and sea level rise adaptation within risk reduction and community resilience strategies.

Measures to Minimize Cumulative Impacts. Measures proposed to minimize the cumulative effects of the federal nourishment projects are listed as follows:

The majority of unavoidable impacts are likely to occur within the borrow areas. Measures to minimize dredging impacts include dredging in a manner so as to avoid the creation of deep pits, alternating locations of periodic dredging, conducting dredging during months of lowest biological activity when possible and the use of pipelines to lessen turbidity impacts within the water column. Post-construction benthic monitoring documents the level of recovery to identified sensitive areas.

The proposed activities will provide long-term protection of potential habitat for the listed species (Piping plover and seabeach amaranth) that utilize in the upper beach and primary dune areas. To further reduce potential indirect impacts, USACE will conduct pre and post construction field surveys for plovers and seabeach amaranth. Beach fill material would not be placed within 25 ft of the perimeter of population clusters or individual stems of seabeach amaranth. Outside of the communities work will be done from September 1 through April 1 on any given year as well as many other conservation measures mention below.

4.3.3 Conservation Measures/Environmental Features

To minimize adverse impacts on the listed species, USACE coordinated with the Department of Interior (NPS and USFWS), NYSDEC and Suffolk County and developed modifications to the proposed beach fill component of the TSP that would provide increased protection and improved productivity. The project modifications generally include dune relocation more landward and are (Appendix H):

1. Moving the dune between Fields 2 and 3 in Robert Moses State Park became not necessary as there are currently no dunes planned for that location since the backshore elevation is already at a high elevation;

2. Revised dune tapers as discussed in Section 3 of the EA above;

3. At the Federal Lighthouse Tract approximately 3800 feet of dune will be built to a 1 on 10 slope (refer to Figure 3 above) (Consultation under Section 106 of the National Historic Preservation Act of 1966 (NHPA) is required to finalize this modification). The tolerances for the berm height (set at 9.5 feet NGVD) will also be reduced from one to one-half foot to minimize heights immediately following construction;

4. In the area between Atlantique and Robins Rest approximately 900 feet of dune will be realigned north to the vegetation line west of Robins Rest to increase the amount of early successional overwash habitat preserved. The area east of Robins Rest currently has an access road to the beach and is heavily used and would thus be unsuitable for productive use by plovers. The tolerances for the berm height will also be reduced from one to one-half foot to minimize berm height after construction; and no planting would occur;

5. Within Smith Point County Park it is not feasible to eliminate the proposed dune system or vary its height without compromising coastal storm risk management or severely curtailing county park management, operations and use. Instead, at the four primary overwash areas in the park (in the areas of New Made Island, the recently closed Smith Point County Park breach, Pattersquash Island and Great Gunnn), from 75 feet north of the landward toe of the dune system will de-vegetate to more closely mimic conditions suitable to plovers. In addition, the plan will also include a commitment to monitor and adaptively manage these habitats on the bay side of the three overwash areas and ocean side of Great Gunn should they begin to fill in with vegetation, or otherwise undergo succession to a habitat unsuitable to plovers:
    a. approximately 40 acres {16.5 hectares} at New Made Island;
    b. approximately 27 acres {11 hectares} at the recently closed Smith Point County Park breach, and Pattersquash Island); and
    c. a commitment to restore up to approximately 84 acres {34 hectares}of a now heavily vegetated area at Great Gunn Beach to early successional habitat, and monitor and maintain as noted above. Additionally, in the area of New Made Island, up to 6 hectare of bayside habitat will be created by lowering a portion of the exisiting dredge disposal dike to adjacent grades (+4 feet NGVD regarding the existing substrate, and covering with 2 ft of clean sand (Appendix H)).

USACE believes the aforementioned modifications to the project will protect the available bayside, maintain habitats that might otherwise deteriorate over time, and will create new habitat from areas currently unsuitable. We believe that such modifications will, collectively, provide for more suitable habitat over time and potentially increase overall plover productivity of the area and advance the recovery of the species.

In addition to the Environmental Features (Project Modifications) discussed above, USACE will also follow recommendations provided by the NYSDEC and USFWS previously (USACE 1998, USFWS 1999, USFWS, 2014) and described below. These measures are expected to minimize potential adverse indirect impacts on other species that may use coastal habitats in the project area, including several state-listed shorebird species.

As stated earlier, except within the boundaries of the Communities, construction activities will not occur during the piping plover breeding and nesting season. To minimize indirect impacts, USACE will conduct surveys during the spring/summer, and prior to construction activities, to identify nesting plover in the Project area and to document all known locations of piping plover. In addition, the USACE will document any other Federal or state-listed wildlife species observed in the Project area during survey and will initiate consultation with appropriate state and Federal agencies.

The proposed project description includes a number of conservation measures that will be implemented for ten years. The intended purpose of these conservation measures is to avoid or minimize adverse effects of the beach nourishment project to Federally-listed species.

Project Design Features

- Dune planting at low densities (18 in. on center) on the dune/upper beach interface, reducing the density of beachgrass plantings on the south face of the dune.

- Contacting USFWS upon initiation and completion of construction activities. Pre-construction meetings with all project staff will be held to provide all information on resource protection and terms of the project .

- Providing all project personnel, construction staff, etc. with information regarding the conditions of the project (including all conservation measures).

- Time-of-Year Restrictions, which will provide for no activities between April 1 and September 1 to protect piping plovers and May 1 to October 15 to protect seabeach amaranth. If breeding piping plovers are not observed in a proposed project area, or are not within 1000 meters of the project area by July 15, then project activities may commence, following consultation with the USFWS, FIIS and NYSDEC.

- Provisions for the project to only undertake low impact construction activities, such as beach surveying during the piping plover breeding season, utilizing a 300-ft protective buffer zone.

4.3.4 Surveying, Monitoring, and Adaptive Management

Surveying and monitoring for threatened and endangered species during the spring and summer nesting seasons will be implemented for 10 years as well as mammalian controls will be undertaken. The monitoring will be completed in coordination with the FIIS, Suffolk County and the USFWS. Monitoring will include identification of suitable habitat, nesting areas, symbolic fencing, and signage (appendix H).

- Surveying and Monitoring will be undertaken by a designated biologist(s). Biologists shall also work on the threatened and endangered species management activities (e.g., coordinating with local communities and agencies, as well as organizing the pre-season planning) in community beach nourishment project areas.

- The biologist(s) will also recommend and implement changes in the location and configuration of symbolic fencing and warning signs and gauge the effectiveness of management actions. Biologists will be educated about the biology of listed species and required to attend a piping plover management course organized by the USFWS, the

NYSDEC, and The Nature Conservancy (TNC), prior to undertaking surveying, monitoring or management actions.

- Protection of breeding piping plovers on all suitable habitats from human disturbance (e.g., Off-road vehicles (ORVs) and recreational activities) and predation (see Predator Management Plan below) will be undertaken following the conditions outlined below. These conditions are also intended to offset impacts of habitat degradation and to assist in the recovery of the species.

- Suitable habitats within the project area shall be protected through the placement of symbolic fencing and warning signs.

- Symbolic fencing is intended to avoid or minimize accidental crushing of nests and repeated flushing of incubating adults, as well as provide an area where chicks can rest and seek shelter when people are on the beach. Therefore, prior to the piping plover breeding or seabeach amaranth growing seasons, coordination with the land manager(s) and the Service biologists to design a "symbolic fencing plan" will be conducted.

- Coordination on the placement of symbolic fencing will incorporate field population and habitat data for the project area and visual assessment of all oceanside and bayside habitats each year. Habitats will be deemed suitable if piping plovers and seabeach amaranth were observed at the site in previous years or the beach width, slope, cover material (shell fragments), etc., are deemed adequate by the Service.

- Consistent with current FWS management measures, breeding and growing areas shall be protected with symbolic fencing using steel or Carsonite™ fiberglass posts placed approximately 33 ft apart and connected with string or twine. Fluorescent flagging material will be tied to the string every 1.6 ft to increase visibility and piping plover or seabeach amaranth habitat warning signs shall be placed on every second or third post. Posts stretch from the toe of the dune seaward to about 40 ft south of the toe of dune line. As sand accretes through the season, posts and fences may need to be moved seaward to maintain symbolic fencing at this distance.

- All pedestrian and ORV access into, or through, the breeding or growing areas shall be prohibited. Walkways may be permitted after an assessment by a qualified biologist and with the permission of the Service. Only persons engaged in monitoring, management, or research activities shall enter the protected areas. These areas shall remain symbolically fenced for piping plovers until at least July 15, and as long thereafter as viable eggs or unfledged chicks are present. If no breeding piping plovers or their chicks are observed in the symbolically fenced areas, the fencing may be removed or reduced in scale provided that the seabeach amaranth is not present or the site is not suitable for seabeach amaranth. Symbolic fencing erected to protect seabeach amaranth shall be in place until the plant dies, or until October 15, whichever comes first

- Productivity and population surveys will be conducted each year. Population survey information shall include the total number of breeding pairs; the total number of piping plovers, paired and unpaired, within the action area; and detailed mapping of breeding (courtship, territorial, scrapes, egg-laying, incubating, and brood-rearing) and foraging use habitats in the action area. Productivity information shall include the total number of nests, the total number of fledged chicks per pair, and quantification of take, if observed,

including eggs, chicks, and adults that occurred, including reasons for take and actions that were taken to avoid take.

- Surveys will be recorded and summarized, and plover locations will be recorded on maps, indicating areas surveyed and habitat types. Information collected will include the following:

    - date;
    - time begin/end;
    - weather conditions;
    - tidal stage;
    - area of coverage;
    - ownership of site;
    - number of adults observed;
    - number of pairs observed;
    - habitat type;
    - nearest known plover occurrence;
    - banded plovers; and
    - predator trail indices

Prior to implementation of the monitoring program, USACE will consult with, and obtain agreement from, the Service on the methodologies and reporting frequencies to be utilized. Surveys would be conducted three times weekly with observations evenly distributed over a minimum time period (to be determined). Survey time periods shall be conducted during daylight hours from 30 minutes after sunrise to 30 minutes before sunset and should include a wide range of tidal conditions and habitat types. Areas should be surveyed slowly and thoroughly and should not be conducted during poor weather (e.g., heavy winds greater than 25 miles-per-hour (mph), heavy rains, and severe cold), since birds may seek protected areas during these times.

- *Seabeach Amaranth Surveys*: If any beach nourishment activities are scheduled to occur during the growing season of seabeach amaranth (defined as May 15 to October 15), qualified, biologist hired by the applicant will survey the project area(s) for this species twice a month from June 1 to October 1, and also immediately prior to any construction or other work. Plant locations, numbers, and sizes will be recorded.

- *Fencing and Avoidance of Seabeach Amaranth*: If construction personnel or ORVs will be present in, or may pass through, seabeach amaranth growing areas, symbolic fencing will be erected encompassing a 10-ft protective buffer around the plants if practical. All construction activities will avoid all delineated locations of seabeach amaranth where feasible. The applicant will undertake all practicable measures to avoid any adverse impacts to plants.

- *Transplantation of Seabeach Amaranth Likely to be Destroyed*: In the event that seabeach amaranth is present in the action area, and it is likely that the plants will be destroyed, the applicant will transplant the individual plants to a similar habitat near, or within, the action area to lessen the impact. Transplantation will include removal of a sufficiently large and intact volume of sand to include the full extent of the roots. Transplanted individuals will be monitored until their deaths, and the monitoring results will be provided to the Service.

- *Seed Collection and Other Measures*: In consultation and cooperation with USFWS, beginning in 2014, the applicant will develop and implement a plan to compensate for plant mortality and burial of the seed bank, involving collection of a portion of the seabeach amaranth seeds produced in all areas to be nourished or renourished where the plant is present. Seeds will be sent to a qualified greenhouse. A portion of the collected seeds will be stored under controlled conditions appropriate for the species (e.g., temperature, humidity, and light) and later redistributed within the action area.

  Qualified practitioners will attempt to germinate the remainder of the seeds. If successful, germinated plants will be replanted in suitable habitats within the action area, according to plans coordinated with USFWS. If the number of wild plants bearing seeds is insufficient to collect an adequate amount of seeds, individual plants will be sent to a qualified greenhouse and propagated to produce additional seeds to be used for the purposes described above. Removal of a portion of the seed bank through "scraping" and stockpiling the top layer of sand prior to placement may also be included in the plan to compensate for adverse effects to plants and to seeds.

  - Based upon the best available scientific data, USFWS will determine an acceptable course of action to compensate for seed bank burial, including the amount of seeds to be collected; thresholds for collecting and propagating plants for production of additional seeds; the proportions of collected seeds to be stored versus germinated; protocols for collection, storage, germination, and reintroduction of plants and seeds into the project area; and procedures for scraping and re-spreading sand, if deemed appropriate.

  - These actions will be undertaken to offset the anticipated adverse impacts to the seed bank and individual plants whose destruction cannot be avoided.

- *Evaluation of Seabeach Amaranth Conservation Measures:* In consultation and cooperation with USFWS, USACE will evaluate the success of measures to protect seabeach amaranth and will revise these protective measures as appropriate In the event that seabeach amaranth is present in the action area, and it is likely that the plants will be destroyed, the applicant will transplant the individual plants to a similar habitat near, or within, the action area to lessen the impact. Transplantation will include removal of a sufficiently large and intact volume of sand to include the full extent of the roots. Transplanted individuals will be monitored until die-off, and the monitoring results will be provided to the Service.

- *Adaptive Management*

  - Vegetation Management: USACE will coordinate with the Service in the preparation of a de-vegetation plan within the identified three primary overwash areas in the park (the areas of New Made Island, the recently closed Smith Point County Park breach, Pattersquash Island and Great Gunn). The de-vegetation plan will be required for ten years.
  - Predator Management: USACE will coordinate with USFWS in the preparation of a predator plan (mammalian) for pre-season and in-season predator monitoring program for all project areas. The predator monitoring plan will include measures needed to protect piping plovers, nests, and chicks. The plan will be set forth for ten years of activitiy.

The BO accepted the above and recommended Reasonable and Prudent Measures as noted below:

- The development and implementation of a coordinated mammalian predator management strategy across all major landowners, inlet to inlet, on Fire Island to reduce the threat predators pose to piping plovers for the 10 year expected life of the project;
- The development and implementation of a coordinated piping plover monitoring program, inlet to inlet, on Fire Island, to assess the current and future status of plovers on Fire Island;
- The maintenance of buffers around construction sites (1000m) and breeding piping plovers before July 15) and other human activities, including ORV use, (generally 200m) and breeding piping plovers;
- The maintenance of nesting and foraging habitat through vegetation management on the three overwash areas and the two restored areas;
- The creation and maintenance of foraging habitat in the Great Gunn Beach area through the design and implementation of lowered berms to support the creation of ephemeral pools discussed above. These lowered berms will be adaptively managed through the life of the project;
- The creation of plover foraging and nesting habitat within the area of the dredge disposal site south of New Made Island;
- The creation by the Corps of an interagency team (that includes the Service) that will develop and implement a coordinated effectiveness monitoring program whose purpose is to document the performance of the restored and created plover areas.

Cumulative Impact Conclusion. The cumulative impact assessment of federal nourishment projects on the south shore of Long Island indicate that federal project actions would occur in dynamic environments whose inhabitants have adapted to conditions. Studies indicate that borrow areas and sand placement areas re-colonize shortly after construction activities are completed. Additionally, the mitigative measures described above will lessen temporary impacts. Therefore, it is concluded that since this project is designed to minimize adverse environmental impacts, the cumulative impacts to occur on the south shore of Long Island are not significant to the human environment/communities present within this region.

Within both the no-action and recommended alternatives, cumulative impacts to the study area may result from the potential impacts of other projects, including the potential implementation the Fire Island Inlet to Montauk Point Project and the maintenance dredging of Moriches Inlet with Smith Point County Park as a placement site. Since this project is designed to minimize adverse environmental impacts, it is anticipated that this project will not contribute significantly to the impacts occurring on the south shore of Long Island.

Also, given the conservation measures and adaptive management plans summarized above and detailed in the earlier sections, and the local implementation of existing USFWS protection measures, impacts to either piping plovers or seabeach amaranth associated with the proposed projects will be minimized. The precautions taken will allow dredging or upland source placement of fill and continuous operation, thereby providing the most cost-effective and expeditious operation, while minimizing long-term plover and seabeach amaranth impacts. These conditions are consistent with the findings during previous beach nourishment and breach filling activities.

5.0 CONSULTATION AND COORDINATION

The USACE is coordinating with the NYSDEC to obtain a Section 401 Water Quality Certificate, and has received a consistency determination from the New York State Office of Coastal Zone Management. The USACE coordinate with NYSDEC and the USEPA regarding nonattainment for NOx air emissions. In addition, the USACE received a Report from the USFWS pursuant to Section 2(b) of the Fish and Wildlife Coordination Act. Section 7 of the Endangered Species Act (ESA) consultation with USFWS was completed on May 23, 2014. In addition, the USACE has consulted with the National Marine Fisheries Service under Emergency Consultation procedures in accordance with Section 7 of the ESA as well as coordinating under Section 305(b)(2) of the MSFCMA. All applicable Federal, State, and local policies will be complied with during review and implementation of the proposed Project. The following is a list of various entities that the USACE consulted and/or coordinated with on this project. Copies of pertinent communications are provided in Attachment E.

- U.S. Fish and Wildlife Service
- Long Island Field Office
- New York Field Office
- National Marine Fisheries Service
- Department of the Interior, Office of the Regional Solicitor
- Federal Emergency Management Agency/State Emergency Management Office
- New York State (NYS) Department of Environmental Conservation
- NYS Department of State
- NY State Historic Preservation Office
- Advisory Council on Historic Preservation
- National Park Service
- Shinnecock Nation
- Town of Babylon
- Town of Islip
- Town of Brookhaven

6.0 PERMIT/REGULATORY REVIEW REQUIREMENTS

Compliance of the FIMI Selected Plan with applicable federal statutes and executive orders is outlined in the Tables 10 and 11. For those statutes where compliance necessitates submittal of an application or consultation document to the agency with jurisdictional authority, the review agency and required permit/authorization is listed in Table 12.

Table 10 – Effects of FIMI Selected Plan on Resources of Principal National Recognition

Type of Resource	Principal Source of National Recognition	Measurement of Effects
Air Quality	Clean Air Act, as amended (42 USC 185h-7 et seq.)	Minor construction effects.
Areas of Particular Concern within the Coastal Zone	Coastal Zone Management Act of 1972, as amended (16 USC 1451 et seq.)	Potential effect: Beach berm will be restored along 12-mile project shoreline; littoral drift to west will be improved. Coordination complete.
Endangered and Threatened Species	Endangered Species Act of 1973, as amended (16 USC 1531 et seq.)	Received Biological Opinion with Reasonable and Prudent Measures to minimize impacts to the piping plover and seabeach amaranth. Emergency Exemption granted for aquatic species by NOAA-NMFS
Fish and Wildlife Habitat	Fish and Wildlife Coordination Act (16 USC Sec. 661 et seq.)	Short-term effect: Loss of benthos in the borrow and placement areas. Long-term effect: Creation of offshore borrow areas; restoration of beach berm and slope; maintenance of coastal habitats.
Floodplains	Executive Order 11988, Floodplain	No effect.
Historic and Cultural Properties	National Historic Preservation Act of 1966, as amended (16 USC Sec. 470 et. seq.). Abandoned Shipwrecks Act of 1987.	Programmatic Agreement signed by NY District.
Prime and Unique Farmlands	CEQ Memorandum of August 1, 1980: Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA.	Not present in project area.
Water Quality, Water Pollution, Public Health	Clean Water Act of 1977 (33 USC 1251 et seq.)	Local short-term effects on sedimentation and turbidity. No measurable long-term sedimentation or turbidity effects; increased public safety.
Wetlands	Executive Order 11990, Protection of Wetlands, Clean Water Act of 1977 (33 USC 251, et seq.)	Not present in project area.
Wild and Scenic Rivers	Wild and Scenic Rivers Act, as amended (16 USC 1271 et seq.)	Not present in project area.
Wilderness Areas	The Wilderness Act of 1964, Otis G. Pike Wilderness Area, Public Law 95-585.	No effect. The project is consistent with the FIIS Wilderness Management Plan (NPS 1983).

Table 11– Compliance with Environmental Requirements and Protection Statutes

FEDERAL POLICIES COMPLIANCE	
Archaeological and Historic Preservation Act, as amended	Full
Clean Air Act, as amended	Full
Clean Water Act of 1977, as amended	Full
Coastal Zone Management Act of 1972, as amended	Full
Coastal Resources Barrier Act	Full
Endangered Species Act of 1973, as amended	Full
Estuary Protection Act (PL 90-454)	Full
Federal Water Project Recreation Act, as amended	N/A
Fish and Wildlife Coordination Act, as amended	Full
Land and Water Conservation Fund Act of 1965, as amended	Full
Marine Protection, Research, and Sanctuary Act of 1969, as amended	Full
National Environmental Policy Act of 1969, as amended	Full
National Historic Preservation Act of 1966, as amended	Full
Organic Act of 1916	Full
Fire Island National Seashore Act (PL 88-587)	Full
Wilderness Act (PL-88-577)	Full
Fire Island Wilderness Act (PL-96-585)	Full
Rivers and Harbors Appropriation Act of 1899, as amended	Full
Watershed Protection and Flood Prevention Act, as amended	N/A
Wild and Scenic River Act, as amended	N/A
Floodplain Management (E.O. 11988)	Full
Protection of Wetlands (E.O. 11990)	N/A
Toxic Substances Control Act (PL 94-469), as amended	N/A
EXECUTIVE ORDERS, MEMORANDA, ETC.	
Floodplain Management (E.O. 11988)	Full
Protection of Wetlands (E.O. 11990)	Full
Environmental Effects Abroad of Major Federal Actions (E.O. 12114)	N/A
Impacts on Prime and Unique Farmlands (CEQ Memo 8-30-76)	N/A
STATE AND LOCAL POLICIES	
The proposed project will comply with all appropriate State and local policies.	

Table 12 – List of Permit / Approvals

Review Agency	Permit Type
USACE	Clean Water Act Section 404 Individual Permit (a 404(b)1 assessment is provided in Attachment F)
USFWS and NMFS	Biological Assessment – Endangered Species Act Compliance
NPS FIIS	Special Use Permit
NMFS	Essential Fish Habitat (EFH) Assessment (an EFH Assessment is provided in Attachment B)
NYSDEC	Clean Water Act Section 401 Water Quality Certificate (WQC) Tidal Wetlands Permit State Environmental Quality Review Act (SEQRA) Compliance
NYSDOS	Federal Consistency (Coastal Zone Management/Waterfront Revitalization Program) (a Federal Consistency Assessment Form (FCAF) and supporting document on policy consistency is provided in Attachment G)
Town of Babylon	To be determined
Town of Islip	To be determined
Town of Brookhaven	To be determined
Village of Ocean Beach	Local Waterfront Revitalization Program (LWRP) Consistency

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