DOWNTOWN MONTAUK

DOWNTOWN MONTAUK STABILIZATION PROJECT

HURRICANE SANDY LIMITED REEVALUATION REPORT

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

MAIN REPORT

U.S. ARMY CORPS OF ENGINEERS

New York District

October 2014

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I. EXECUTIVE SUMMARY

The Downtown Montauk Stabilization project is designed to provide coastal storm risk management from coastal erosion through construction of 3,100 ft of reinforced dune within the hamlet of Montauk, New York. The proposed dune extends west to east from South Emery Street to Atlantic Terrace motel and tapers into high dunes at both ends of the project area, which will provide protection to the shorefront existing commercial buildings in downtown Montauk.

As a consequence of the severe coastal erosion during Hurricane Sandy in October 2012, the protective beach was largely eroded causing damage to the commercial buildings in downtown Montauk. The buildings were left vulnerable to additional damages from future storms.

The plan for the Downtown Montauk Stabilization was developed using background material and existing information and data from the Fire Island to Montauk Point (FIMP) Reformulation Study to expedite the Hurricane Sandy Limited Reevaluation Report (HSLRR) in accordance with approach approved by Headquarters, USACE in a memorandum dated 8 January 2014 (Appendix H) and consistent with The Disaster Relief Appropriations Act of 2013 (Public Law. 113-2; herein P.L. 113-2).

This Stabilization Project is a one-time, stand-alone project with its own independent utility. As developed, this project does not limit the options available in the FIMP Reformulation Study or pre-suppose the outcome of the Reformulation Study.

The Stabilization Project has been evaluated over a 15 year period. As a stand-alone project, long term erosion will reduce the width of the beach and lead to a reduced level of risk management Continued maintenance by the Non-Federal sponsor over the effective project life is required to maintain the sand dune cover and increase the longevity of the GSCs.

The project's total annual benefits and annual costs were updated to FY 2014 price levels and are $1,237,000 and $918,000 respectively. The updated Benefit to Cost Ratio is 1.4 (at 3.50% FY14 Discount Rate). The project is economically justified and the New York District, USACE recommends that the Stabilization Project be constructed at a first cost of $8,860,000 and a fully funded cost of $8,900,000.

The Draft HSLRR and Environmental Assessment (EA) were released for public review 26 August 2014. The reports have been revised to account for public comments received on the project, as well as agency input received through coordination and consultation that occurred concurrently with public review of the EA.

II. PERTINENT DATA

Pertinent project information is summarized below.

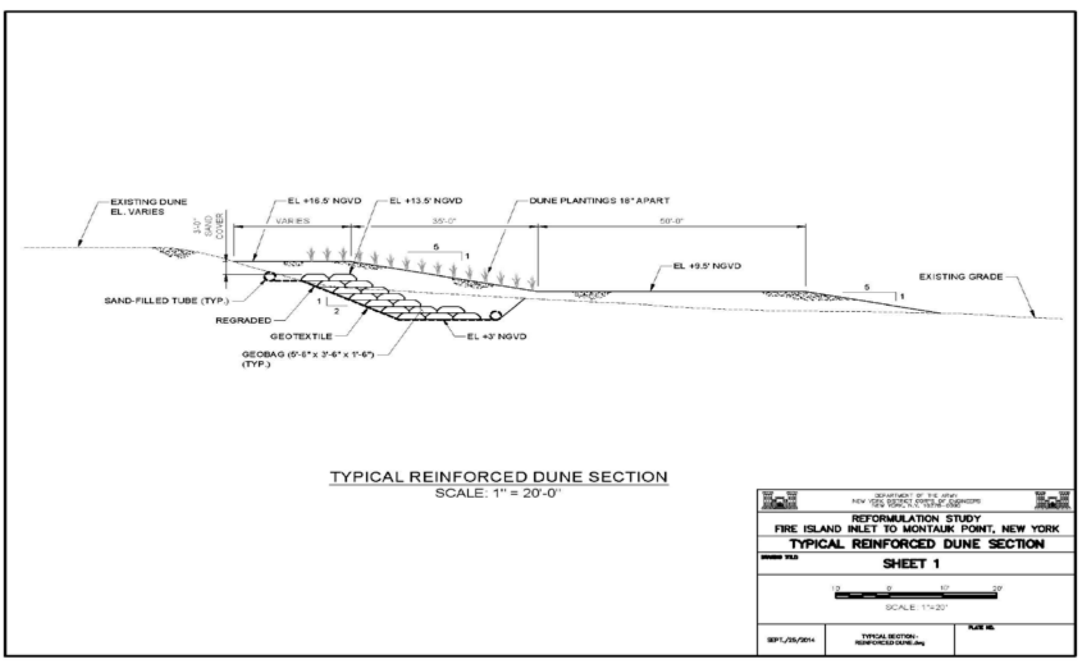
1. Project Design and Layout

The proposed dune design includes approximately 3,100 ft of reinforced dune extending from South Emery Street to Atlantic Terrace motel in downtown Montauk and tapering into existing high dunes at both ends of the project area. The extent of the proposed plan was selected to provide protection to all of the shorefront commercial buildings in downtown Montauk. The alignment closely follows the existing dune (+12 ft NGVD) contour. The Project will provide protection to the shorefront commercial buildings in downtown Montauk.

The core of the dune consists of 14,171 Geotextile Sand Containers (GSCs) with filled dimensions of about 5.5 ft long, 3.5 ft wide and 1.5 ft tall, each weighing 1.7 tons. The GSCs are stacked along the existing dune at a 1V:2H slope and extend from a toe elevation of +3 ft to a crest elevation of +13.5 ft NGVD.

A total of 71,000 cubic yards of sand are required to construct the reinforced dune (51,000 cy trucked from an upland source and 20,000 cubic yards from on-site excavated material). The dune will be planted with dune grass on 18 inch centers on the dune crest and face. Sand fencing will be installed at the seaward toe of the dune to retain wind-blown sand.

In order to increase the resiliency of the design and reduce the potential for undermining, the proposed design includes a 50 foot wide berm cap at +9.5 ft NGVD increasing the berm elevation by 3 feet of sand cover. The additional sand will provide protection to the toe of the structure and decrease the likelihood of exposure of the GSCs during small storm events.



2. Vertical Datum

	NGVD29	NAVD88
Existing Tie-In Dune Elevation (varies)	+12 feet	+11 feet
Toe Elevation	+3 feet	+2 feet
Crest Elevation	+13.5 feet	+12.5 feet
Berm Elevation	+9.5 feet	+8.5 feet
Final Elevation (includes 3 feet of sand cap)	+16.5 feet	+15.5 feet

3. Sand Borrow Area Locations

A total of 71,000 cubic cards (CY) of sand are required to construct the reinforced dune. Approximately two-thirds of the sand fill will be used to fill the GSCs or placed in the dune. The remaining one-third will be used to construct the berm cap. About 20,000 CY will be obtained from excavation and re-grading of the existing dune, with the remaining 51,000 CY obtained from upland sand sources. The material excavated from the existing beach will be used as a top-cover to more closely match the pre-project and post-project sand appearance.

4. Real Estate Requirements

No property acquisitions or structural relocations are required for the project. Two types of easements are required for the Stabilization project:

Perpetual Easements - in locations where beachfill and reinforced dune will be placed to allow for construction, operation, maintenance, patrol, and repair and replacement of the beach berm and dune.

Temporary work area Easements – to allow right of way, in, over and across the land for the planned construction schedule.

5. Costs (100% Federal Funding)

Construction (Beach and Reinforced dune)	$7,014,000
Lands and Damages	$507,000
Planning, Engineering and Design	$749,000
Construction Management	$587,000
Total Project First Cost (FY 2014 PL)	$8,860,000
Fully Funded Cost	$8,900,000

6. Economics

	Discounted at 3.50% over a 15-year period – FY14
Annual Project Cost	$918,000
Total Average Annual Benefits	$1,237,000
Benefit to Cost Ratio	1.4

COST ALLOCATION (FIRST COST – HSLRR Plan)

Federal (100%)	$8,860,000
Non-Federal (0 %)	$0
TOTAL	$8,860,000

7. Construction is scheduled to extend from January 2015 (Notice to Proceed) to May 2015. The total construction duration is approximately 4 months.

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1.0 INTRODUCTION

The Fire Island Inlet to Montauk Point, New York, Combined Beach Erosion Control and Hurricane Protection Project (FIMP) was authorized by the River and Harbor Act of 14 July 1960. The project is being reformulated to identify a comprehensive long-term solution to reduce 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.

The ongoing FIMP reformulation study is evaluating alternatives to reduce the risk of storm damages, 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 damage reduction needs in the Study Area.

Prior to the Fall of 2012, the most recent effort in the FIMP Reformulation Study had been the refinement of the plan alternatives developed in 2009 and presented by the federal agencies to state and local officials in 2011, as a Tentative Federally Supported Plan (TFSP) in preparation for finalizing the overall study's recommendation in the form of a General Reevaluation Report (GRR).

However, on 29 October 2012, Hurricane Sandy made landfall approximately five miles south of Atlantic City, NJ, where it collided with a blast of arctic air from the north, creating conditions for an extraordinary and historic storm along the East Coast with the worst coastal impacts centered on the northern New Jersey, New York City, and the Long Island coastline. Hurricane Sandy's unusual track and extraordinary size generated record storm surges and offshore wave heights in the New York Bight. The maximum water level at The Battery, NY peaked at 12.4 feet NGVD, exceeding the previous record by over 4 feet. Further east, at Montauk Point, the maximum water level reached 6.6 feet NGVD, 1.4 feet less than the previous storm of record (Hurricane Carol in 1954). Coastal erosion and damages within the FIMP Study Area as a result of Hurricane Sandy were severe, substantial and devastating, particularly along Fire Island and in downtown Montauk. During Hurricane Sandy, the protective beach in downtown Montauk was eroded leaving many buildings vulnerable to additional damages from future storms. Figure 1 and Figure 2 show the eroded beach conditions at downtown Montauk the day after Hurricane Sandy. Emergency actions by local property owners have restored a portion of the dune that eroded during Hurricane Sandy; however, the area still remains vulnerable to future storms.

Consistent with the Disaster Relief Appropriations Act of 2013 (Public Law. 113-2; herein P.L. 113-2), the USACE has proposed an approach to expedite implementation of a one-time stabilization project at downtown Montauk in advance of the completion of the Reformulation study. It is recognized that the timeframe to complete the FIMP Reformulation Study would leave vulnerable portions of the hamlet of Montauk exposed to future damages. This approach is strongly supported by the State of New York, Suffolk County, N.Y., and the Town of East Hampton,. This approach is also consistent with USACE policy guidance (Memorandum dated 8 January 2014 approval from Steven L. Stockton, P.E., Director of Civil Works, Appendix H – Pertinent Correspondence).

The recommended plan utilizes information and data from the ongoing FIMP study to develop a one-time stabilization project that does not limit the options being considered or presuppose the outcome of the Reformulation study.

Figure 1: Post-Hurricane Sandy at Ocean Beach Resort

Figure 2: Post-Hurricane Sandy at Royal Atlantic Resort

1.1 Report Purpose

This report has been prepared to satisfy the requirements of Public Law 113-2 (P.L. 113-2). This report will serve as the USACE decision document to support the justification for the implementation of a project for the downtown Montauk area as a post-Sandy stabilization project that does not limit the options being considered or presuppose the outcome of the Reformulation study. The efforts described in this report are limited to a stabilization project with an estimated 15-year project life.

Additionally, the report includes an Environmental Assessment, per the requirements of the National Environmental Policy Act (NEPA) and USACE implementing regulation as contained in ER-200-1 to provide environmental analyses and determination of whether a Finding of No Significant Impact (FONSI) is appropriate or if an Environmental Impact Statement (EIS) would be required for the stabilization effort.

This report also addresses necessary changes in the implementation of the authorized but unconstructed (ABU) FIMP project in accordance with the Disaster Relief Appropriations Act of 2013 (P.L. 113-2). Specifically, this report addresses:

1. The costs and cost-sharing to support a Project Partnership Agreement (PPA) for the Plan for Coastal Storm Risk Management.

2. Acknowledgement of the changes in the applicability of Section 902 of the Water Resources Development Act (WRDA) 1986, as amended.

3. The requirements of P.L. 113-2 to demonstrate that the project is economically justified, technically feasible, and environmentally acceptable.

4. The requirements of P.L. 113-2 to demonstrate resiliency, sustainability, and consistency with the North Atlantic Coast Comprehensive Study (NACCS).

This report is arranged to provide the following information:

Chapter 1 provides an introduction to the Downtown Montauk Project, the project authorization, an overview of the FIMP Study Area and history of construction, and an overview of the project partners.

Chapter 2 provides an overview of the existing conditions within the Downtown Montauk Project Area, socio-economic conditions, and environmental resources.

Chapter 3 outlines the problem identification, including a detailed description of the damages expected in the future without project conditions, and the methods used to develop these damages.

Chapter 4 introduces the planning considerations used in developing alternatives for the project, including the goals, objectives and constraints.

Chapter 5 provides an overview of the formulation of plans that was undertaken to arrive at the recommended plan, presents the economic justification for the selected Stabilization Project, and provides the specific details associated with the recommended plan.

Chapter 6 provides a brief overview of the physical, environmental and cultural effects associated with the project. Full discussion of these effects is contained in the accompanying Environmental Assessment.

Chapter 7 provides a detailed description of the selected stabilization plan.

Chapter 8 provides an overview of how the recommended plan meets the requirements of P.L. 113-2.

Chapter 9 provides the details of the implementation required for the Project.

Finally, Chapters 10 and 11 provide the conclusions and recommendations that are being made for this Stabilization Project.

1.2 Study Authority

The Fire Island Inlet to Montauk Point (FIMP), NY, Combined Beach Erosion Control and Hurricane Protection Project was originally authorized by the River and Harbor Act of 14 July 1960 in accordance with House Document (HD) 425, 86th Congress, 2d Session, dated 21 June 1960, which established the authorized overall FIMP project.

The authorized project provides for beach erosion control and hurricane protection along five reaches of the Atlantic Coast of New York from Fire Island Inlet to Montauk Point by widening the beaches along the developed areas to a minimum width of 100 feet, with an elevation of 14 feet above mean sea level, and by raising dunes to an elevation of 20 feet above mean sea level, from Fire Island Inlet to Hither Hills State Park, at Montauk and opposite Lake Montauk Harbor. This construction would be supplemented by grass planting on the dunes, by interior drainage structures at Mecox Bay, Sagaponack Lake and Georgica Pond and the construction of up to 50 groins, and by providing for subsequent beach nourishment for a period of ten years, as amended.

This authorization has been modified by Section 31 of the Water Resources Development Act (WRDA) of 1974 (P.L. 93-251), and Sections 103, 502, and 934 of the WRDA of 1986 (P.L. 99-662), which principally impact cost-sharing percentages and the period of renourishment. The project presented in this is also report considering the cost-sharing provisions within Public Law (PL) 113-2 of January 29, 2013, Disaster Relief Appropriations. The initial construction cost in accordance with the provisions of P.L. 113-2 is 100% Federal. PL 113-2 states that “the completion of ongoing construction projects receiving funds provided by this division shall be at full Federal expense with respect to such funds.”

The authorized project was developed along five reaches. These reaches are used in the description of the implementation of the project, and are as follows and as shown in Figure 3:

Reach 1 – Fire Island Inlet to Moriches Inlet (FIMI)
Reach 2 – Moriches Inlet to Shinnecock Inlet
Reach 3 – Shinnecock Inlet to Southampton (Quogue to Agawam Lake)
Reach 4 – Southampton to Beach Hampton (Agawam Lake to Hook Pond)
Reach 5 – Beach Hampton to Montauk Point (Hook Pond to Montauk Point)

1.3 Study Area

1.3.1 Overall FIMP Study Area

The FIMP Study Area extends from Fire Island Inlet east to Montauk Point along the Atlantic Coast of Suffolk County, Long Island, New York. The Study Area includes the barrier island chain from Fire Island Inlet to Southampton inclusive of the Atlantic Ocean shorelines, and adjacent back-bay areas along Great South, Moriches, and Shinnecock Bays. The FIMP Study Area also includes Atlantic Ocean shoreline of Long Island from Southampton to Montauk Point.

A total of 83 miles of Atlantic Ocean shoreline and over 200 miles of estuarine shorelines lie within the Study Area. The Study Area is shown in Figure 3.

This overall FIMP Study Area consists of a complex mosaic of ocean fronting shorelines, barrier islands, tidal inlets, estuaries, and back-bay mainland area. It functions as an interconnected system driven by large scale coastal processes with respect to hydrodynamic and sediment exchange that support diverse biological and natural resources.

1.3.2 Montauk Reach and the Hamlet of Montauk

The Montauk Reach is the eastern most of the five designated Reaches within the overall FIMP Study Area (Figure 3). It extends from Hook Pond in East Hampton to Montauk Point, a distance of about 20 miles.

The unincorporated hamlet of Montauk is in the eastern portion of the Montauk Reach and is a major tourist destination with many hotels, restaurants and shops in the downtown area, many of which suffered significant damages as a result of Sandy. There are 43 buildings in downtown Montauk that fall within the modeled 100-yr floodplain (storm with a 1% probability of occurring in any given year). The Downtown Montauk Reach Project Area is shown in Figure 4.

This Stabilization Report addresses the immediate actions necessary for the Downtown Montauk portion of the overall FIMP Study Area.

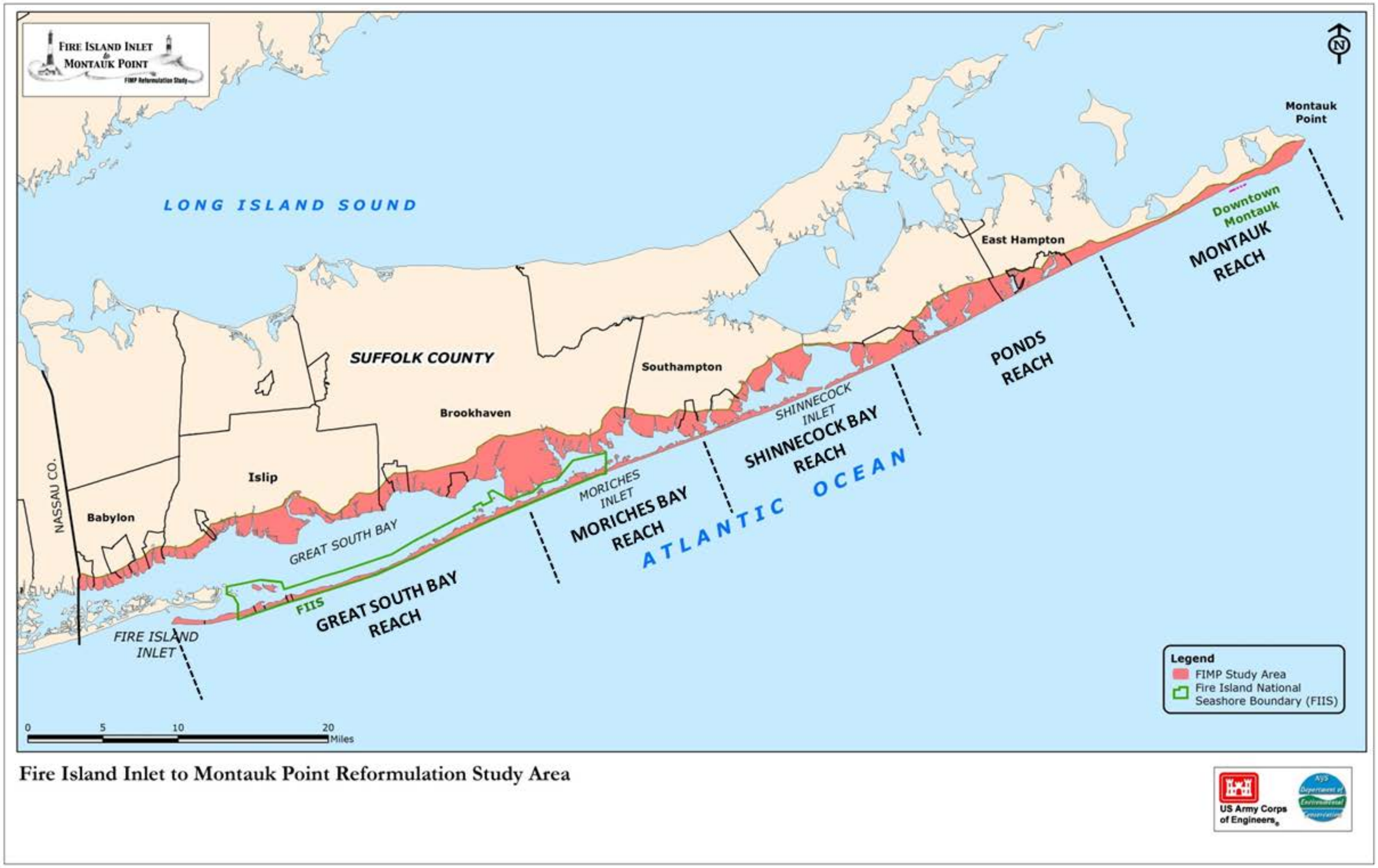


Figure 3: FIMP Study Area

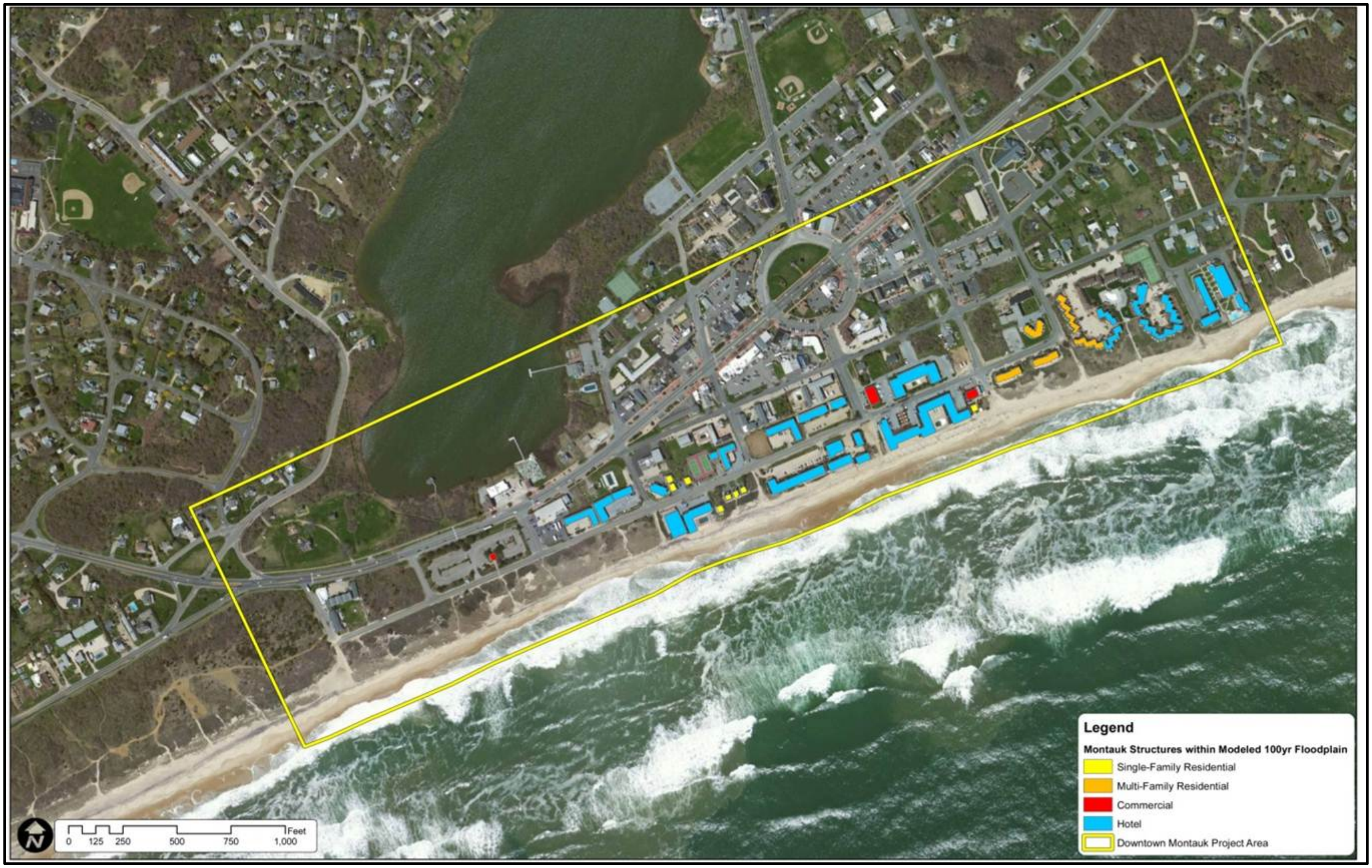


Figure 4: Downtown Montauk Project Area

1.4 Project History

1.4.1 1960's Project Implementation

Following the original FIMP project authorization in 1960, several design memoranda (reports) covering portions of the project were prepared. General Design Memorandum (GDM) No. 1, covering the portion of the project between Moriches and Shinnecock Inlets, was approved by the Chief of Engineers on 9 January 1964 and recommended construction of 13 groins and placement of dune and beachfill concurrent with groin construction. The plan was subsequently modified to provide for construction of 11 groins in the Westhampton Beach area, and beach fill to be added as necessary but not sooner than 3 years after groin completion. The design for two groins at East Hampton, in the vicinity of Georgica Pond (Reach 4), was addressed in a special report of design memorandum scope dated July 1964. Construction of 11 groins in Reach 2 was completed in September 1966. Construction of two groins in Reach 4 was completed in September 1965.

In the years following construction of the eleven groins in Reach 2, erosion was evident in the area west of the eleven groins. In February 1969, Supplement No.1 to GDM No. 1 (Moriches to Shinnecock Reach) was prepared. That document recommended the construction of four more groins and placement of beach fill backed by a dune at an elevation of 16 ft above mean sea level (M.S.L.) in the 6,000 ft section of beach west of the 11 groin field. The four new groins were filled with 1.95 million cubic yards of sand to construct a beach and dune. This groin construction was completed in July 1970, bringing the total number of groins in Reach 2 to fifteen. Dune and beach fill was placed between October 1969 and October 1970.

1.4.2 Renewed Interest in 1978

Because of renewed interest by the New York State Department of Environmental Conservation (NYSDEC), an EIS was prepared in 1978 for the FIMP Study Area. The Council on Environmental Quality (CEQ) indicated that the plan formulation did not address all alternatives or adequately assess their impact. The CEQ further indicated that the entire Study Area should be treated as a system. The USACE concurred and directed a project reformulation. In 1980, a plan of study for project reformulation was approved by the Chief of Engineers and initiated shortly thereafter. The study was halted in 1984 due to an issue regarding the cost sharing requirements for periodic renourishment. NYSDEC withdrew its support for the project until a Congressional change was made to the authorization regarding periodic renourishment.

1.4.3 Reformulation Efforts in 1994

The cost sharing issue, including periodic renourishment, was resolved with WRDA of 1986, in which cost sharing provisions provided for 70 percent Federal funding for periodic nourishment of continuing construction at Westhampton Beach for a period of 20 years. With this resolution, the State was willing to participate in a plan for Reach 2 (Westhampton Beach). In light of the State of New York's willingness to participate in a plan for this reach, the most critically eroded of the overall Study Area; the USACE resumed the efforts of the Reformulation Study in 1994.

The USACE, as requested by Congressional and local interests, was charged to evaluate the feasibility of interim projects which could be implemented pending completion of the Reformulation Study. Several interim projects were considered for sections of the Study Area including a Breach Contingency Plan (BCP) designed to achieve breach closure within 3 months.

The Westhampton Interim Project, which was already under study prior to a breach in December 1992, culminated in a Technical Support Document for Westhampton which was finalized in July 1995. That report demonstrated the feasibility of this interim project by evaluating the project costs and benefits, and comparing it to the authorized plan to establish that the interim plan was within the envelope of a larger (potentially National Economic Development - NED) plan, which would provide greater net excess benefits than the proposed interim plan. The report identified a plan to provide interim protection to the Westhampton Beach area west of Groin 15 and affected mainland communities north of Moriches Bay. The project provides for a protective beach berm 90 feet wide and a dune of +15 ft NGVD[1], tapering off of the western two existing groins (groins 14 and 15) and construction of an intermediate groin (groin 14a) between these two. The project also includes periodic nourishment, as necessary to ensure the integrity of the project design, for up to 30 years (2027).

Beachfill for this interim project also includes placement within the existing groin field to fill the groin compartments and encourage sand transport to the areas west of groin 15. The interim plan was determined to be in the Federal interest to provide protection until the findings of the reformulation effort are available. Initial construction of the project was completed in December 1997. The interim project has been subsequently renourished in 2001, 2004 and 2008, and has required less sand at longer intervals than was estimated when designed.

In 1996, the USACE Headquarters (HQUSACE) approved a Breach Contingency Plan (BCP) which provides a rapid response to close breaches along the barrier islands within the authorized project area. The motivation for developing a BCP stems from the early 1990's after a series of powerful storms eroded the barrier islands in Westhampton on Long Island and the 1992 storm caused a breach that took 10 months to close. The BCP is only a response action to restore the barrier island to an elevation of +9 feet NGVD in order to provide a limited level of protection and to provide the basis for future efforts (a 5-year level of protection). Areas along the barrier island where the BCP has been implemented are characterized by low-lying areas likely to be overwashed and subsequently breached again during relatively minor events. The BCP was activated following Hurricane Sandy and used to close a 1,500 foot-wide breach at Cupsogue County Park and a 500-foot-wide breach to the west of Moriches Inlet at Smith Point Count Park. Breach closure operations were not activated at the third breach at Old Inlet, which is on National Park Service land. The USACE and the state of New York are coordinating with National Park Service personnel and monitoring the breach.

In parallel with these interim efforts, the Reformulation Study continued with a goal to identify a long-term (50-year) plan to reduce the risk of storm damages, while maintaining, enhancing or restoring the existing environment. In order to address the data collection and analysis challenges of the Study Area the Interagency Reformulation Group (IRG) was assembled, including representatives from the USACE, New York State, the Cooperating Agencies of National Park

[1] National Geodetic Vertical Datum of 1929 (NGVD29 or NGVD) is approximately 1.06 feet higher than North American Vertical Datum of 1988 (NAVD88 or NAVD) within the FIMP Study Area.

Service and U.S. Fish and Wildlife Service, as well as representatives from National Marine Fisheries, and the Environmental Protection Agency. A number of Technical Management Groups (TMG's) were also established, responsive to this IRG, who were responsible for the scoping, and reviewing of specific technical issues, and included members from the agencies, non-governmental organizations, and academics. As presented in this report, this interagency team developed a Project Visions Statement to provide a planning framework, and has advanced the study to identify a Tentative Federally Supported Plan, which has been modified, and with local support has been identified as the Tentatively Selected Plan.

1.5 Project Area Vulnerability

The downtown area of the hamlet of Montauk is vulnerable to nor'easters and hurricanes which produce storm surges and waves that historically have caused erosion to the beach and dunes in the Project Area. Although long-term erosion and storm events have posed a significant threat to the Project Area for many years, the extensive beach and dune erosion that occurred during Hurricane Sandy has left the foundations of several shorefront commercial buildings exposed and vulnerable to future storm events.

As a consequence of coastal erosion during Hurricane Sandy, the dune and berm system at downtown Montauk is depleted. In response to the increased vulnerability to future events, consistent with the Disaster Relief Appropriations Act of 2013 (Public Law. 113-2; herein P.L. 113-2), and recognizing the urgency to repair and implement immediate storm protection measures, USACE has proposed an approach to expedite implementation of construction of necessary stabilization efforts at Downtown Montauk independent of the FIMP Reformulation Study.

Stabilization efforts were focused on Fire Island to Moriches Inlet (FIMI) which is scheduled for construction start in 2014 and Downtown Montauk as there is a more urgent need to advance the stabilization reaches due to their vulnerability and potential for major damage and risk to life and property.

A detailed storm history is provided in Appendix A.

1.6 Non-Federal Partners and Stakeholders

The non-Federal partner for the overall FIMP project and also for this Stabilization Project is the New York State Department of Environmental Conservation (NYSDEC). There has been extensive coordination with study stakeholders in addition to the non-Federal partner including:

- Department of the Interior; U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- NOAA/National Marine Fisheries Service
- Federal Emergency Management Agency
- New York State Department of State; Emergency Management Office
- Suffolk County
- Town of East Hampton

2.0 EXISTING CONDITIONS

This section provides a summary of the natural and human environment within the Downtown Montauk Project Area and serves as a reference point to understand "future without project conditions" and impacts associated with project alternatives. Additional details are provided in Appendix B, Physical Conditions.

Geological Characteristics

Long Island is part of the Atlantic and Gulf Coastal physiographic province which lies along the eastern border of the United States 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., 2000).

From Montauk Point west to Southampton (approximately 33 miles,) headlands formed by Ronkonkoma moraine and outwash deposits are eroded, forming a narrow beach and a series of small bays (i.e., ponds). Eroded sediments along this reach are transported westward by wave action. The headland section is subdivided into three units. Bluffs that rise to 60 ft or more above sea level and narrow beaches of coarse sand and gravel characterize the shoreline from Montauk Point westward for a distance of approximately 10 miles. The next unit, which includes Napeague Beach, is considered a connecting beach that provides a link between two areas of deposition of the Ronkonkoma moraine. This unit is characterized by a low sandy beach backed by dunes and stretches approximately 4 miles long. The third unit of the headland section is 19 miles long and extends to Southampton. Sandy beaches and long continuous dunes that rise to an elevation of 20 ft above sea level characterize this unit. Lying just north of the shoreline are several small ponds or bays that have been cut off from the ocean by bay mouth bars and narrow barrier beaches, which are periodically breached during and after storms. The larger of these bays include Agawam Lake, Mecox Bay, Sagaponack Lake, Georgica Pond and Hook Pond. To the north of the ponds the Ronkonkoma moraine ridge provides the dominant topographic relief of the area.

Beach Characteristics

Along the Project Area and across the beach profile the grain size distribution of the sediment varies. In general, the median grain size decreases from east to west, with median grain size of 0.44 mm at Montauk (USACE-NAN, DRAFT, 2000).

Astronomical Tides

Astronomical tides on the south shore of Long Island are semi-diurnal, rising and falling twice daily. The tidal range along the ocean shoreline increases from east to west. The average tidal range in the vicinity of Montauk Point is approximately 2 feet.

Storm Surge

Two types of storms are of primary significance along the south shore of Long Island: (1) tropical storms which typically impact the New York area from July to October, and (2) extratropical storms which are primarily winter storms occurring from October to March, often referred to as "nor'easters" due to the predominate direction from which the winds originate.

Storm surge is water that is pushed toward the shore by the force of the winds and the decrease in astronomical air pressure during major storms. Water levels rise at the shoreline when the motion of wind driven waters is arrested by the coastal landmass.

Hurricanes are the most powerful tropical storms to reach the Study Area with wind speeds in excess of 74 mph (by NOAA definition). Records indicate 26 hurricanes have impacted the Study Area in the past century. Nor'easters are less intense than hurricanes, with sustained wind speeds generally less than 57 mph. However, the durations of elevated water levels and waves during nor'easters are generally longer, enhancing the ability of nor'easters to cause coastal damage. Approximately 68 moderate to severe nor'easters have impacted the New York coastal region since 1865.

Sea Level Change

By definition, sea level change (SLC) is an increase (or decrease if land is subsiding) in the mean water surface level of the ocean. Eustatic sea level rise is an increase in global average sea level brought about by an increase to the volume of the world's oceans (thermal expansion). Relative sea level rise takes into consideration the eustatic increases in sea level as well as local land movements of subsidence or lifting. Historic information and local mean sea level (MSL) trends used for the Study Area are provided by the NOAA/NOS Center for Operational Oceanographic Products and Services (CO-OPS) using the tidal gauge at Sandy Hook, New Jersey. The historic sea level rise rate (1935-2013) is approximately 0.0128 feet/year or about 1.3 feet/century.

Recent climate research has documented observed global warming for the 20th century and has predicted either continued or accelerated global warming for the 21st century and possibly beyond (IPCC 2013). One impact of continued or accelerated climate warming is continued or accelerated rise of eustatic sea level due to continued thermal expansion of ocean waters and increased volume due to the melting of the Greenland and Antarctic ice masses (IPCC 2013). A significant increase in relative sea level could result extensive shoreline erosion and dune erosion. Higher relative sea level elevates flood levels which may result in smaller, more frequent storms that could result in dune erosion and flooding equivalent to larger, less frequent storms.

The current guidance, Engineering Regulation 1100-2-8162 (ER 1100-2-8162) from HQUSACE states that proposed alternatives should be formulated and evaluated for a range of possible future local relative sea level rise rates. The relative sea level rates shall consider as a minimum a low rate based on an extrapolation of the historic rate, and intermediate and high rates which include future acceleration of the eustatic sea level rise rate. These rates of rise correspond to 0.7 ft, 1.1 ft, and 2.4 ft over 50 years for the low, medium and high rates of relative sea level change.

Waves

Waves are the dominant forcing mechanism for most coastal processes along the south shore of Long Island. During storm events, wave impact on beaches that cause erosion of the beach are combined with the increased water level from wave setup, which can lead to dune erosion and wave overtopping. In the Study Area, significant wave heights, exceeding 3.3 feet occur approximately 25 to 30 percent of the time (USACE-NAN, DRAFT, 2000). Significant wave heights during extreme storm events may exceed 18 feet.

Storm History

Historical storm records and the recent experience with Hurricane Sandy illustrate the potential for storm risk now and in the future, and illustrate the immediate need for action to address vulnerable areas in Montauk. Severe coastal storms in the last few decades have caused significant damage to the south shore of Long Island. Severe erosion is a consistent result of such storm events, particularly at Montauk.

The 1938 hurricane, with wind gusts up to 135 MPH, caused water to flood through Napeague and cut off the eastern end of the South Fork and turning the entire the Montauk Reach into an 11 mile long island. Water flooded downtown Montauk and ocean surf caused severe beach erosion. During Hurricane Carol in 1954, the ocean broke through the dunes near Fort Pond damaging the Montauk IGA (grocery store). Severe erosion of the beach and cliffs east of Montauk was reported in addition to damage to the seawall at Montauk Point. In addition to these major Hurricanes, several nor'easters have caused extensive beach and dune erosion, including Halloween Storm of 1991 and winter of 1992.

On October 29, 2012, Hurricane Sandy made landfall approximately five miles south of Atlantic City, NJ, where it collided with a blast of arctic air from the north, creating conditions for an extraordinary and historic storm along the East Coast with the worst coastal impacts centered on the northern New Jersey, New York City, and the Long Island coastline. Hurricane Sandy's unusual track and extraordinary size generated record storm surges and offshore wave heights in the New York Bight. The maximum water level at The Battery peaked at 12.4 feet NGVD, exceeding the previous record by over 4 feet. Further east, at Montauk Point, the maximum water level reached 6.6 feet NGVD, 1.4 feet less than the previous storm of record (Hurricane Carol in 1954). Beach and dune erosion occurred in the downtown Montauk area exposing the foundations of several structures along "motel row".

Historic Shoreline Changes

Historic shoreline change rates for the FIMP study are documented in Gravens et al. (1999), which examined three non-overlapping time intervals using available shoreline data sets. The third period, representative of modern times, is approximately 15 years long (1979 to 1995). Observed shoreline changes over this time frame indicate that shoreline from Montauk Point to Downtown Montauk is eroding. Observed erosion rates vary along the shoreline with an average erosion rate at downtown Montauk of approximately -3 feet/year. It is important to note that there is significant temporal and spatial variation in the shoreline change rates within the Study Area.

A separate study by Buonaiuto & Bokuniewicz (2005) evaluated bluff erosion east of downtown Montauk based on profile surveys collected between 1995 and 2001. The study found that the average rate of bluff recession rate was -1 feet/year over this time period.

Recent shoreline changes were evaluated based on LIDAR collected in 2000 and on November 16, 2012 (Post-Hurricane Sandy). A quantitative analysis of the shoreline and dune migration was performed by analyzing the change in the +3 feet NGVD and +11 feet NGVD contours. These contours were selected to characterize the recession of the shoreline and dune. Figure 5 shows the change in position in the +3 feet NGVD and +11 feet NVD contour over the 12 year period. The shoreline experienced an average landward migration of 44 feet or -3.7 feet/year.

Based on these observations a background erosion rate of -3 feet/year was selected to characterize the future without-project conditions and applied in the engineering and economic analysis.

Existing Shore Protection Activities

There is no history of federal beach nourishment activities at downtown Montauk. However, local governments and home owners have periodically trucked in sand to stabilize dunes in response to storm events. Available records indicated that in the years 2010 through 2013 beach and dune repairs of this nature were conducted costing more than $2,200,000.

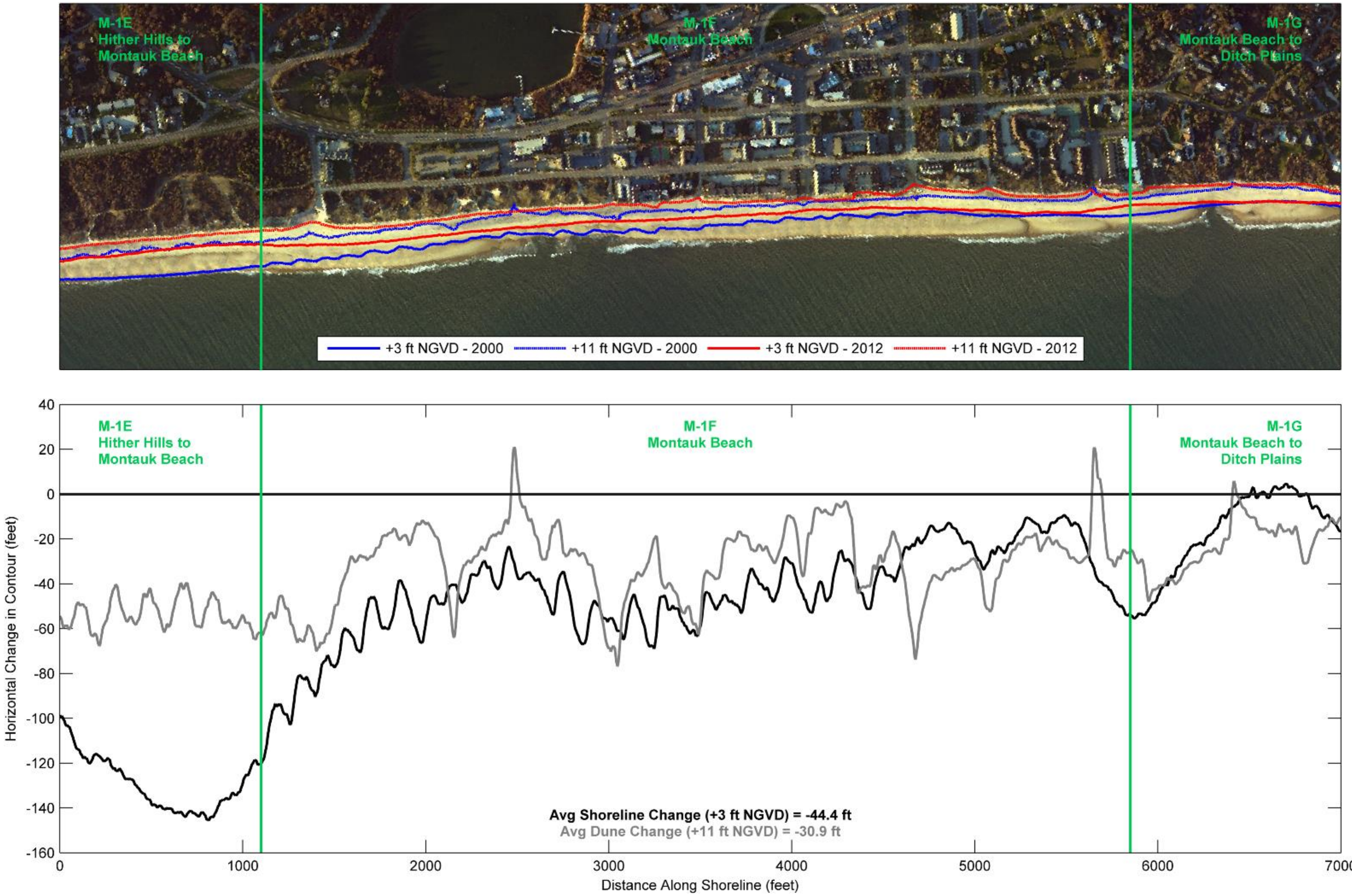


Figure 5: Observed Shoreline Changes at Downtown Montauk

2.2 Socio-Economic Conditions

Table 1 presents the U.S. Census Bureau Median Household, Family and Per Capita Income averages for 2008-2012, for East Hampton Town, its villages and hamlets, and also for Suffolk County. It is noted that while the median household and family income is more than $10,000 lower in East Hampton than in Suffolk County, the per capita income is higher. The higher per capita income is likely the result of the higher wages earned by a smaller segment the East Hampton population that skews the average per capita income as well as the fact that children under 18 make up a smaller percent of the population in East Hampton than in Suffolk County.

Table 1: Per Capita and Family Income

Place	Median Household Income ($)	Median Family Income ($)	Per Capita Income ($)	Percent of Households With Income $200,000 +	Percent of Families Below Poverty Level
East Hampton Town	74,894	90,990	50,377	12.5	6.7
Amagansett CDP	76,346	121,607	60,743	20.2	2.8
East Hampton Village	79,542	88,207	96,189	23.7	6.8
East Hampton North CDP	50,325	70,952	42,005	8.5	11.2
Montauk CDP	71,312	79,495	44,905	7.8	3.9
Napeague CDP	78,958	79,792	40,463	13.0	0.0
Northwest Harbor CDP	94,216	112,371	64,236	16.6	0.0
Sag Harbor Village	91,004	129,432	66,847	15.6	1.9
Springs CDP	72,557	88,667	39,348	15.1	6.3
Wainscott CDP	81,875	81,667	51,428	13.3	6.0
Suffolk County	87,778	100,179	36,819	10.5	4.1

In the hamlet of Montauk, the occupation category with the highest percentage of workers was management, professional and related occupations; 31.1 percent of the employed population, 24.0 percent of the Montauk workforce occupied sales and office positions, 26.5 percent worked in service occupations and 14.6 percent had natural resources, construction, and maintenance occupations. Production, transportation and material moving occupations accounted for 3.7 percent of the employed population. As in Montauk, Countywide the management, professional and related occupations (37.8%); sales and office occupations (26.4%), and service occupations (17.1%) had the highest percentage of workers. Montauk residents are generally well educated; 48.5 percent of the population 25 years old and older have an Associate's degree or higher and another 15.7 percent have some college education. Countywide, 41.7 percent of this segment of the population have an Associate's degree or higher.

Some people in Montauk have a very low income, a fact that is not necessarily obvious from looking only at median income figures. Approximately 3.9 percent of families in Montauk live below the poverty level, as compared to 4.1 percent Countywide. The poverty level is defined according to the number of people per household, the number of children per household and other factors; the weighted average poverty threshold for a 4-person family (including two under the age of 18) in 2013 was an income of $23,624. About 9 percent of the total population of Montauk have an income below poverty level, compared to 6 percent in Suffolk County. The percent of households with incomes over $200,000 is comparatively less in Montauk than Countywide, reflecting less affluence Montauk than in the County in general. Living on a low income in Montauk is particularly difficult as there is limited public transportation and the cost of housing is extremely high.

Downtown Montauk is the major business area in the Study Area. The town is divided by Montauk Highway and extends south to the Atlantic Ocean. There are wide variety of year-round commercial establishments in addition to the seasonal motels and resort units. The business district includes supermarkets, banks, clothing stores, gas stations, restaurants, bars, pharmacies, repair shops and other establishments traditionally found in business centers. Institutional facilities, including churches and a library, are located along Montauk Highway in the eastern portion of the business district. A municipal ball field complex borders the northern portion of the downtown area. The downtown area is laid out in a grid of 40 foot by 100 foot lots separated by wide public roads and alleyways.

2.3 Environmental Resources

The Downtown Montauk project area is surrounded by natural habitats but the project area itself predominantly consists of commercial development that includes hotels, restaurants and shops for transient visitors. Single-family and multi-family residential development is also present in the project area. Natural resources/habitats within the study area are found mainly along the shoreline, within the limits of sand placement for the proposed dune reinforcement, but also extend landward to Fort Pond. Habitats in the project area include the marine nearshore, marine intertidal, maritime beach and maritime dunes, as well as the inland waters of Fort Pond. The marine nearshore and marine intertidal habitats of the Atlantic shores ecosystem support a variety of marine invertebrates, finfish, marine mammals, reptiles and birds. Terrestrial mammals, birds, vegetation and invertebrates are also found in the marine beach habitat of the Atlantic shores ecosystem, as well as in the dunes and swales habitat of the barrier island ecosystem. Upland sand sources are proposed to be used for the dune reinforcement rather than offshore borrow areas. Therefore the project area does not include the marine offshore environment. As these upland sand sources are commercial sand quarries, these sand sources are not described as natural habitats.

Marine Nearshore Habitat of the Atlantic Shores Ecosystem

Physical Description The marine nearshore habitat consists of the area between mean low water (MLW) to 10 meters in depth. The marine nearshore habitat is divided into pelagic and benthic zones and the substrate is predominantly sand. The marine nearshore habitat is a transitional area between the deeper offshore waters of the marine offshore habitat, which is beyond the Downtown Montauk project area, and the shallow, marine intertidal habitat, it includes biota common to both of these areas.

Marine Invertebrates The benthic community of the marine nearshore environment includes a variety of benthic invertebrates, several of which are commercially and recreationally important. Within the marine nearshore habitat of the project area, there is a high degree of spatial and seasonal uniformity in both species composition and abundance (USACE, 2005). 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 starts (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, 2005).

Finfish The marine nearshore 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 saltatrix*), and striped bass (*Morone saxatilis*). 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*). 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 (*Phoca vitulina*) are the most common marine mammal in the marine nearshore habitat. Gray seals (*Halichoerus grypus*) may also be found in this habitat.

Reptiles Several species of sea turtles, including Kemps Ridley (*Lepidochelys kempii*), and loggerhead (*Caretta caretta*), 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 (*Melanitta deglandi*), surf scoter (*Melanitta perspicillata*), oldsquaw (*Clangula hyemalis*), and red-breasted merganser (*Mergus serrator*).

Marine Intertidal Habitat of the Atlantic Shores Ecosystem

Physical Description The marine intertidal habitat extends from the boundary of the marine nearshore at MLW to mean high water (MHW). Within the project area, this habitat is predominantly sandy. The area is typically highly turbid with very high wave energy and exhibits a varying pelagic zone due to the tidal cycle. Biotas 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 Downtown Montauk project area.

Marine Invertebrates Because of the alternate inundation and drying of this zone, the benthic community tends to have 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. 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 nearshore habitat, as well as in marine offshore habitat outside the project area, do not nest in the project 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 project area include, but are not limited to: dunlin (*Calidris alpina*), sanderling (*Calidris alba*), red knot (*Calidris canutus*), semipalmated sandpiper (*Calidris pusilla*), piping plover (*Charadrius melodus*; State and Federally Endangered), semipalmated plover (*Charadrius semipalmatus*), black-bellied plover (*Pluvialis squataroia*), lesser yellowlegs (*Tringa flavipes*), greater yellowlegs (*Tringa melanoleuca*), willet (*Catoptrophorus semipalmatus*),and American oystercatcher (*Haematopus palliates*). Seabird species include least tern, common tern, roseate tern, and Forster's tern (*Sterna forsteri*; State protected).

Marine Beach Habitat of the Atlantic Shores Ecosystem

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. This community is characterized by extremely sparse vegetation that occurs on unstable sand, gravel, or cobble ocean shores above mean high tide, where the shore is modified by storm waves and wind erosion. The marine beach habitat is generally low in biological diversity in relation to other project area habitats.

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*).

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 (*Talorchestia spp*). A variety of beetles, ants and flying insects 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.

<u>Terrestrial Mammals</u> Red foxes (*Vulpes vulpes*) may use the marine beach habitat, particularly within western portion of the project area that is less developed.

<u>Birds</u> A variety of birds use the Long Island beaches for resting, nesting and feeding including several state and/or federally listed threatened and endangered species, such as 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 sparsely vegetated areas may also be used (NYNHP, 2014). 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. Most of the beach in the Downtown Montauk project area is adjacent to hotels which would not be conducive as breeding habitat for these species. Herring gulls (*Larus argentatus*), great black-backed gulls (*Larus marinus*), and ring-billed gulls (*Larus 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.

<u>*Dunes and Swales of the Barrier Island Ecosystem*</u>

<u>Physical Description</u> The dunes and swales habitat is located landward of the marine beach habitat. This habitat typically has a sand substrate and is not regularly inundated by tides. The dune habitat in the eastern portion of the project area consists of a sparsely vegetated, relatively narrow area adjacent to the motels and residential development. The dune habitat in the western third of the project area is approximately 150 feet wide and is vegetated with grasses and low shrubs.

<u>Vegetation</u> This habitat is dominated by grasses and low shrubs that occur on active and stabilized dunes along the Atlantic coast. This habitat consists of a mosaic of vegetation patches. The mosaic of vegetation reflects past disturbances such as sand deposition, erosion, and dune migration. The composition and structure of the vegetation is variable depending on stability of the dunes, amount of sand deposition and erosion, and distance from the ocean (Edinger, et. al, 2002). American beachgrass (*Ammophila breviligulata*) is a pioneer plant that dominates the dune 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 (*Artemisia stelleriana*), beach pea (*Lathyrus japonicus*), and saltwort (*Salsoli kali*). On the primary dunes, American 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.

<u>Terrestrial Mammals</u> Terrestrial mammals that use the dune and swale habitat in the western third of the project area include white-tailed deer (*Odocoileus virginianus*), red fox and raccoon (*Procyon lotor*).

Reptiles and Amphibians   Several species of reptiles and amphibians potentially could utilize the dune habitats on Long Island. However, as noted above the dune habitat in the project area is either adjacent to hotels along the beach or relatively narrow. Therefore, the likelihood of the dune habitat in the project area supporting reptiles and amphibians is minimal.

Birds   Many of the shorebirds and waterbirds that utilize the habitats previously described may also utilize the dunes habitat. However, as noted above the dune and swale habitat in the project area is either located adjacent to hotels along the beach or consists of a relatively narrow area. Therefore, the likelihood of the dune habitat in the project area supporting many species of birds is less optimal compared to the more natural dune and swale habitat to the west of the project area and in other areas of Long Island. Although it is unlikely that listed bird species will occur in the dune and swales habitat in the project area a bird watch plan will be adhered to during construction.

Freshwater Pond

The south end of Fort Pond is within the Downtown Montauk project area; however, no activities are proposed in, or are in the immediate vicinity of, Fort Pond. Fort Pond is one of the largest freshwater ponds on Long Island. The pond is 160 acres and has a maximum depth of 26 feet. The pond supports one of the three major smallmouth bass (*Micropterus dolomieu*) populations on Long Island. The pond is also an important waterfowl wintering area, especially for Canada geese (USFWS, 1997). Fort Pond is also mapped as NYS DEC Freshwater Wetland MP-18. No activities are proposed within the wetlands associated with Fort Pond or within the immediate vicinity (within 100 feet) of the wetlands.

The potential for threatened and endangered species or critical habitat for protected species to occur within the project area was assessed through written consultation with the applicable regulatory agencies and through database review. Based on the habitats present in the Downtown Montauk project area, the proximity of the project area to developed areas and agency responses stating the lack of known records of rare or federal or state-listed animals and plants, and significant natural communities the likelihood of protected species occurring in the Downtown Montauk project area is minimal. Additional information regarding environmental resources in the Downtown Montauk project area is provided in Section 3.3.3 of the accompanying EA.

2.4 Cultural and Archaeological 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) as well as within the area surrounding the Downtown Montauk project area (36 CFR 800.16(d). The APE for this proposed project includes the Downtown Montauk project area which includes approximately one mile of the Atlantic shoreline in the downtown Montauk area, extending seaward from the existing dune line into the marine beach sand placement area and extending landward to include much of downtown Montauk. There are no properties listed on State or National Registers of historic places within the APE. Additional information regarding cultural resources in the Downtown Montauk project area is provided in Section 3.2.6 of the accompanying EA.

The history of development in East Hampton begins with the earliest settlements of Native Americans. The New York State archaeological site location map indicates numerous archaeological sites in East Hampton with many sites located in Montauk (NYSOPRHP, 2014). As is common at many early sites, areas adjacent to ponds, harbors or bays, particularly where fresh water meets salt, were often settled by earliest people. These sites generally contain archaeological material as evidence of the settlement characterized by subsistence hunting, fishing, and gathering. Several sites in East Hampton have undergone archaeological surveys, and these studies, serve as a basis for identification of archaeologically sensitive areas. Recent remains of native culture exist in Montauk, as this was the last area in the Town of East Hampton where the Montauk tribe had a reserve of land. When European settlers arrived in East Hampton in the 17th century a written record of the Native Americans was begun documenting the agreements and conflicts between the two groups (Town of East Hampton, 2008).

Montauk was one of the last outposts of the native tribes who were slowly displaced and disappeared as the European settlement moved eastward. Due to the dynamic nature of the shoreline environment, remnant archaeological resources are not expected within the dune reinforcement footprint. However, the project area is within an area mapped as archeologically sensitive (NYSOPRHP 2014). Although shipwrecks are common off the coast of Long Island, the APE does not extend offshore where wrecks would be located.

Montauk was used as common pasture from 1658 through the late nineteenth century. A few structures remain from the period in Montauk's history from the mid- 1600's through the 1800's when the land was used as common pasture. Second House, located within the Town's Kirk Park on the banks of Fort Pond, north of Montauk Highway, and Third House, located on County parkland, were both used to house the keepers of livestock and later by Theodore Roosevelt and the Rough Riders (Town of East Hampton LWRP, 1999). Second House, which was built in 1797, is the oldest building in downtown Montauk and currently serves as a museum. Second House is located in the northwest corner of the APE while Third House is located outside the APE.

Present development in Montauk is largely a result of influences and events from the late 1800's onward when wealthy New York residents discovered the potential for a vacation area away from the City. The Town of East Hampton began to change from a predominantly rural and agricultural region to a seaside recreational area (Liquori and Nagel, 2005).

The developer Carl Fisher, known for the creation of resorts in Miami Beach, saw potential for recreation facilities on the eastern end of Long Island. His development company designed a resort community, a residential community, the downtown Montauk area, a protected harbor in Lake Montauk and four major sporting facilities, the Surf Club, the Polo Club, the Tennis Club and the Yacht Clubs. None of these sporting clubs are within the APE. After Fisher's death in 1934, his projects went into a decline, leaving only Montauk Manor, the tennis auditorium, Montauk railroad station and several buildings in downtown Montauk. Six of these Tudor Revival style structures constructed by Carl Fisher in the 1920's are located in the downtown area (Town of East Hampton LWRP, 1999). Aside from the Second House and Third House, these are the oldest structures in the community. Four of these buildings retain sufficient integrity to be recognized as historic. Most of the buildings in downtown Montauk were constructed in the 1950's and later.

There are no known resources - terrestrial, underwater, or architectural - that are listed on State and National Registers of Historic Places within the APE; however, there is potential for terrestrial archeological resources.

3.0 PROBLEM IDENTIFICATION AND WITHOUT PROJECT FUTURE CONDITION

3.1 Problem Identification

The downtown area of the hamlet of Montauk is vulnerable to nor'easters and hurricanes which produce storm surges and waves that historically have caused erosion to the beach and dunes in the Project Area. Although long-term erosion and storm events have posed a significant threat to the Project Area for many years, the extensive beach and dune erosion that occurred during Hurricane Sandy has left the foundations of several shorefront commercial buildings exposed and vulnerable to future storm events.

3.2 Comparison of Pre-Sandy and Post-Sandy Conditions

Prior to Hurricane Sandy the beach at downtown Montauk was characterized by a relatively wide beach berm and sand dunes with heights between +16 and +25 feet NGVD.

During Hurricane Sandy the wide beach berm, present before the storm, was effectively removed and the dunes experienced severe erosion / scarping. The relatively high elevation of the dunes prevented significant overwash and overtopping from occurring during Hurricane Sandy except at the gaps in the dunes which provided public beach access. Figure 6 shows profile conditions at four profiles along downtown Montauk in 2000 and 2012 (post-Sandy). The post-Sandy conditions are characterized by a narrow beach berm and narrower dunes. Despite the dune erosion that occurred, the post-sandy dunes are still relatively high, between +16 and +25 feet NGVD, and provide protection against overwash and overtopping during future storm events. The primary near-term threat, and source of storm damages at Montauk, is to several shorefront commercial buildings located along the dunes that had their foundations exposed during Hurricane Sandy (Figure 1 and Figure 2). Emergency actions by local property owners have restored a portion of the dune that eroded during Hurricane Sandy; however, the area still remains vulnerable to future storms.

The beach conditions at downtown Montauk typically undergo a seasonal transformation from a narrower "winter" beach to a wide "summer" beach (Figure 7). During the fall and winter months, storm waves are more frequent and sand from the beach berm is transported offshore and deposited in a protective sand bar. During late spring and summer months, storm events are less frequent and smaller waves dominate, allowing sand to be transported landward restoring the wide summer berm. During particular severe storm events, such as Hurricane Sandy, sand may be transported offshore or downdrift and lost from the system. Beach surveys at Montauk were collected about once every two weeks in the year following Hurricane Sandy, capturing the seasonal variability in the beach conditions at Montauk. Figure 8 illustrates the temporal evolution of the beach conditions at Montauk and transition from a winter beach profile to a summer beach profile and then beginning of the transition back to a winter beach profile.

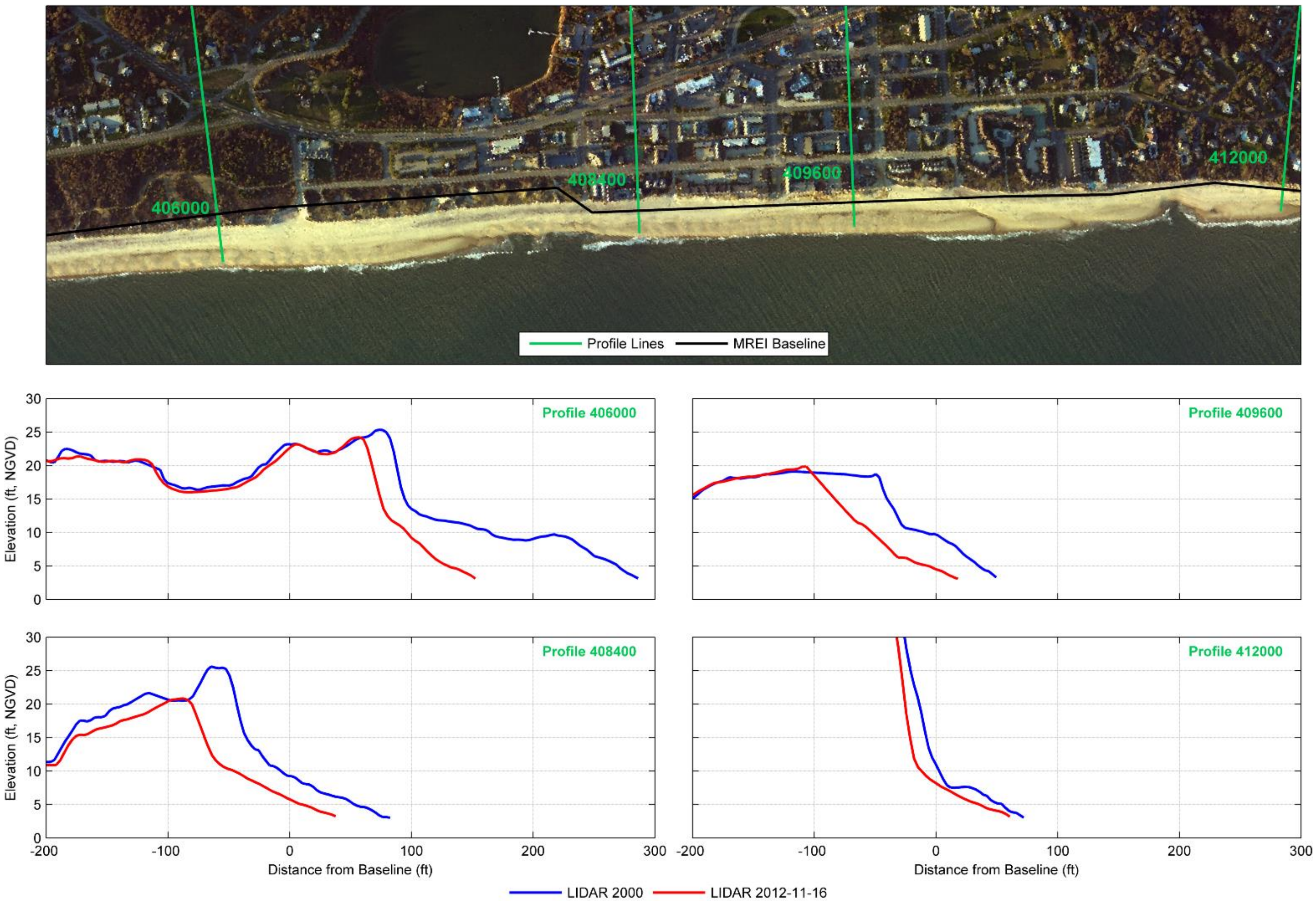


Figure 6: Observed Beach Profile Changes at Downtown Montauk

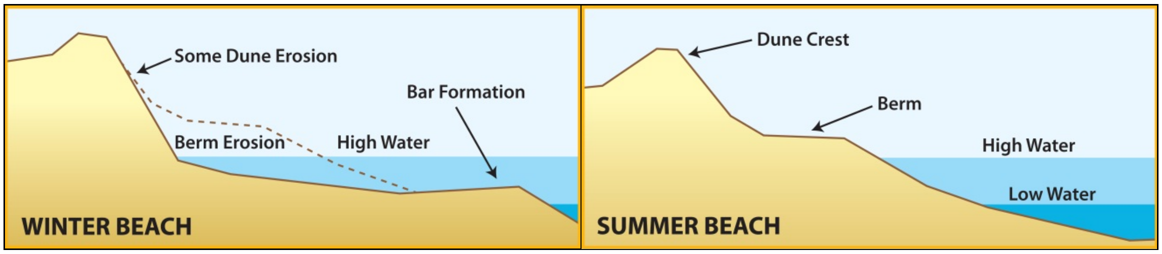


Figure 7: Schematic of Seasonal Changes in Beach Conditions (Maine Sea Grant)

Figure 8: Seasonal Changes in Beach Conditions at Montauk (Photos)

3.3 Storm Damage Analysis

3.3.1 Development of Damages

The Downtown Montauk Shorefront Emergency Stabilization model was developed to quantify the impact of storms on shorefront development and also to quantify the benefits arising from the construction of an emergency stabilization project to reduce the risk of storm damages in this area.

The immediate shorefront area is potentially subject to storm damage from waves, storm erosion/recession undermining of buildings, and inundation.

Prior analyses indicated that the primary damage mechanism affecting shorefront structures in downtown Montauk is undermining by storm erosion/shoreline recession and that wave and inundation damage represent a very small percentage of the potential damages with most wave and inundation damage occurring at very low frequency events. Hence it was decided to limit the model to the calculation of erosion damages only.

Most existing models (including the original FIMP shorefront damage model) were considered to be not appropriate for this task, either due to limitations in the models themselves, or due to the time and budget required to collate and process the required input data. One limitation of the FIMP shorefront damage model is that it was intended to evaluate with-project scenarios featuring regular beach renourishment as a key component, while renourishment will not be considered for any stabilization project implemented at Downtown Montauk under Public Law 113-2 as a one-time, stand-alone project.

The damage model was developed using @Risk for Excel to simulate the damages and losses of shorefront buildings to erosion over the 15-year period of analysis permitted within the bounds of Public Law 113-2, both with- and without project. The model randomly generates one storm event in each year of the analysis period, and returns a corresponding water surface elevation, scoured elevation at the toe of the structure, and storm erosion distance, taking into account the effects of sea level rise and shoreline change due to yearly erosion. These are used to determine whether the reinforced structure has failed due to wave attack or erosion at the toe of the structure, and to lookup damages due to subsequent erosion and undermining of shorefront structures.

In accordance with current HQUSACE guidelines the model incorporates risk and uncertainty in that key parameters are defined by probability distributions. These allow the input value to vary independently for the execution of each lifecycle as the @RISK model repetitively recalculates the model and collects the results to report the mean average annual damage value. The parameters currently subject to uncertainty in this model are the setback distances and depreciated replacement value of the shorefront structures in this area.

3.3.2 Without Project Damages

The calculation of without project damages was based on the assumption that the selected plan is not constructed and that the shorefront structures are vulnerable to damage from erosion in any year of the period of analysis. The set of vulnerable structures contributing to the damage analysis was taken from the structure inventory compiled for the original FIMP shorefront damage analyses, with their depreciated structure replacement values revised to a 2013 price level via an update factor of 1.26, which was derived from the historic building cost index published monthly by the *Engineering News-Record*. This update factor has been used for other components of the current FIMP study. The locations of the 43 structures in the damage dataset are presented in Figure 9. A summary of the characteristics of the structures is presented in Table 2. The structure inventory was verified post Hurricane Sandy to validate the without project damage analysis.

The model records damages due to erosion in any given year by means of a lookup table of aggregated structure damage versus erosion distance. The model currently assumes that as a building is undermined, the damage incurred increases linearly from zero at zero undermining to 100% when the mid-point of the structure has been passed. Content damages were incorporated by adding 50% to the value of each structure.

Table 2: Summary of Downtown Montauk Structure Inventory

Structure Usage	Number	Average Footprint (Sq. Ft)	Depreciated Structure Replacement Value	
			Total	Average
Hotel	**27**	**9,600**	**$79,698,400**	**$2,951,800**
Commercial	**3**	**5,900**	**$2,825,100**	**$941,700**
Single-Family Residential	**8**	**1,300**	**$1,959,900**	**$245,000**
Multi-Family Residential	**5**	**10,200**	**$19,350,500**	**$3,870,100**
Totals	***43***		***$103,833,900***	

Depreciated Structure Value: 2005 price level updated to 2013 via factor of 1.262 (ENR BCI Index)

The aggregate damage/erosion distance function resulting from this approach which has been incorporated in the model is presented in Figure 10. The model currently assumes that structures damaged to 100% of their value are not rebuilt within the same lifecycle.

The model has been executed using an interest rate of 3.5% and 25,000 lifecycle iterations to give without project equivalent annual damages of $1,378,000. It should be noted that if this analysis were to be conducted for the evaluation of a long-term solution for the downtown Montauk area, i.e. one using a period of analysis of 50 years, significantly higher without project equivalent annual damages would be expected, due to the increased vulnerability of structures to erosion in the latter part of the analysis period.

To illustrate this increasing vulnerability (and hence the increase in expected damages), the model outputs were post-processed to derive damage-frequency plots at various points in the analysis period. Figure 11 presents these curves for years 1, 5, 10, and 15. Figure 11 shows, for example, that in the without project base year a storm event of 10% annual chance exceedance ("10-year event") would be expected to cause approximately $1 million in damage, but by year 10 an event of equal probability would be expected to cause approximately $3.8 million in damage to structures and contents.

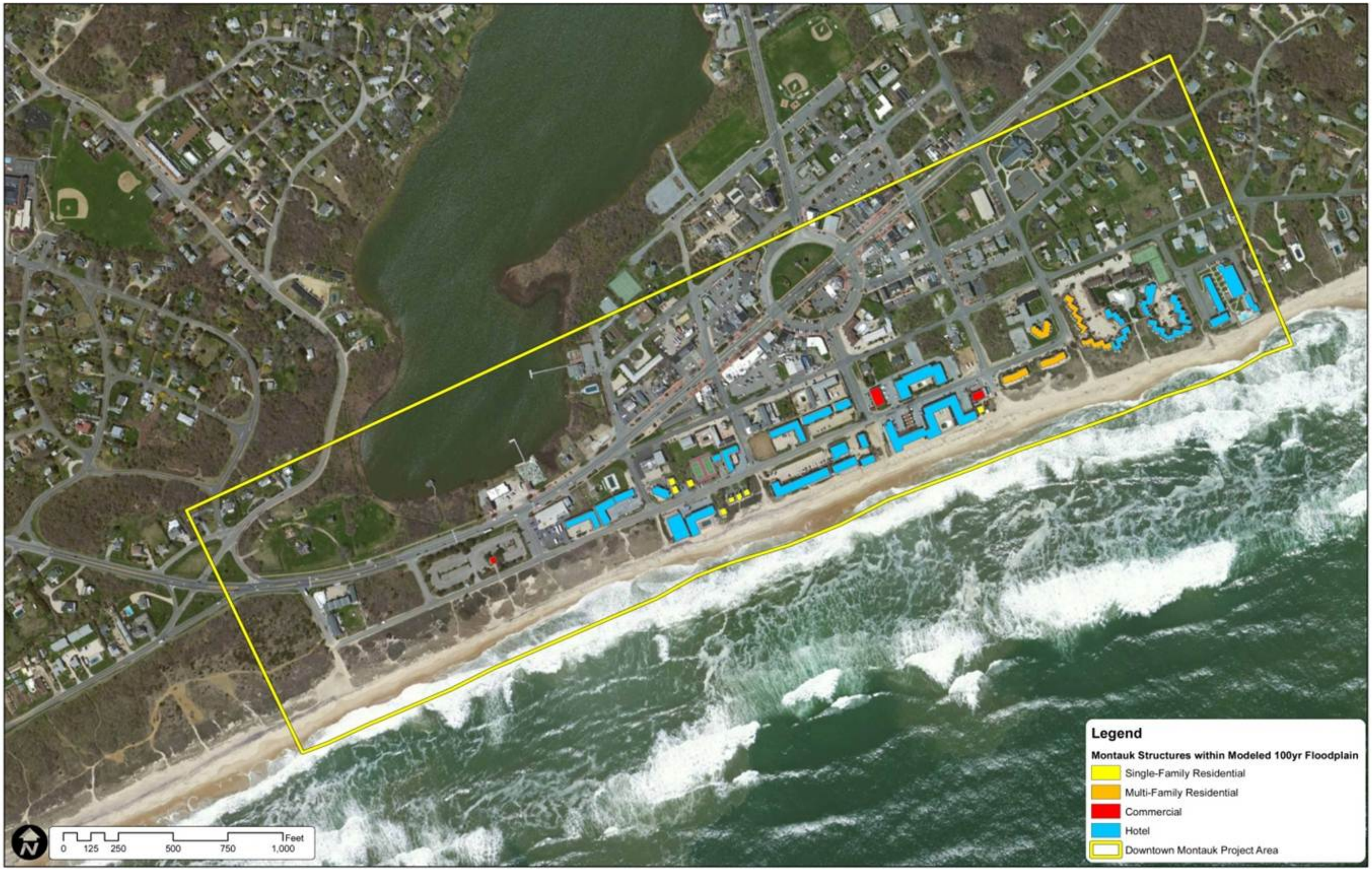


Figure 9: Downtown Montauk Shorefront Structures

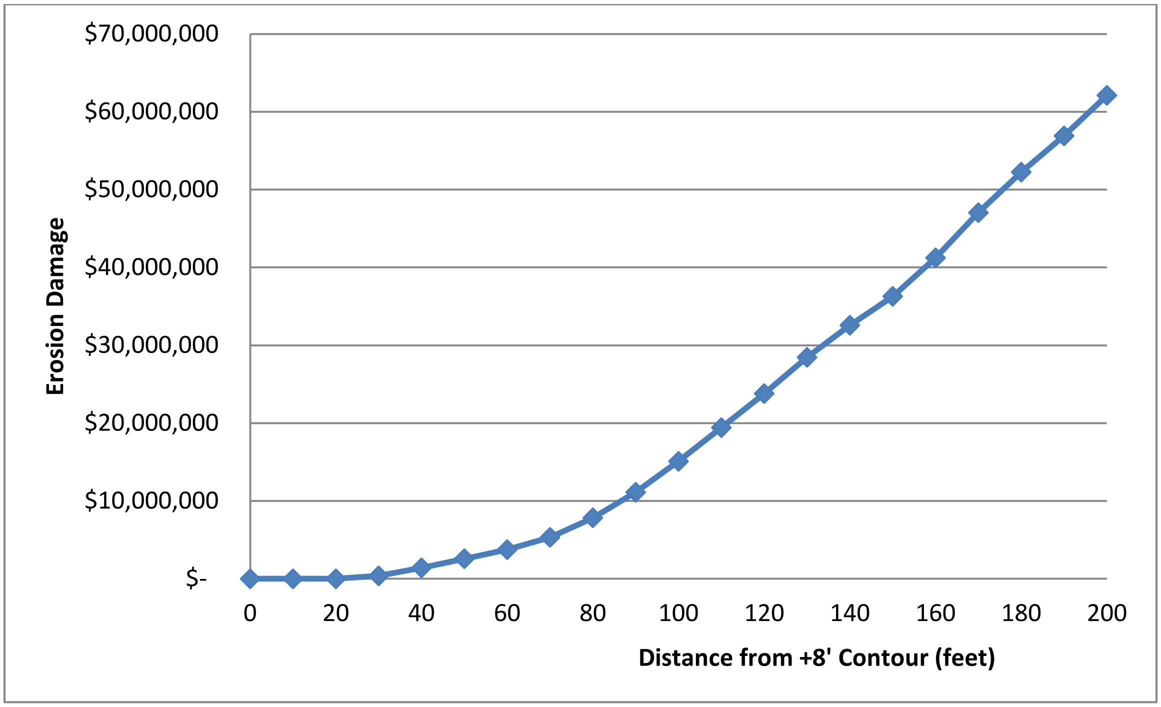


Figure 10: Erosion Distance-Damage Curve

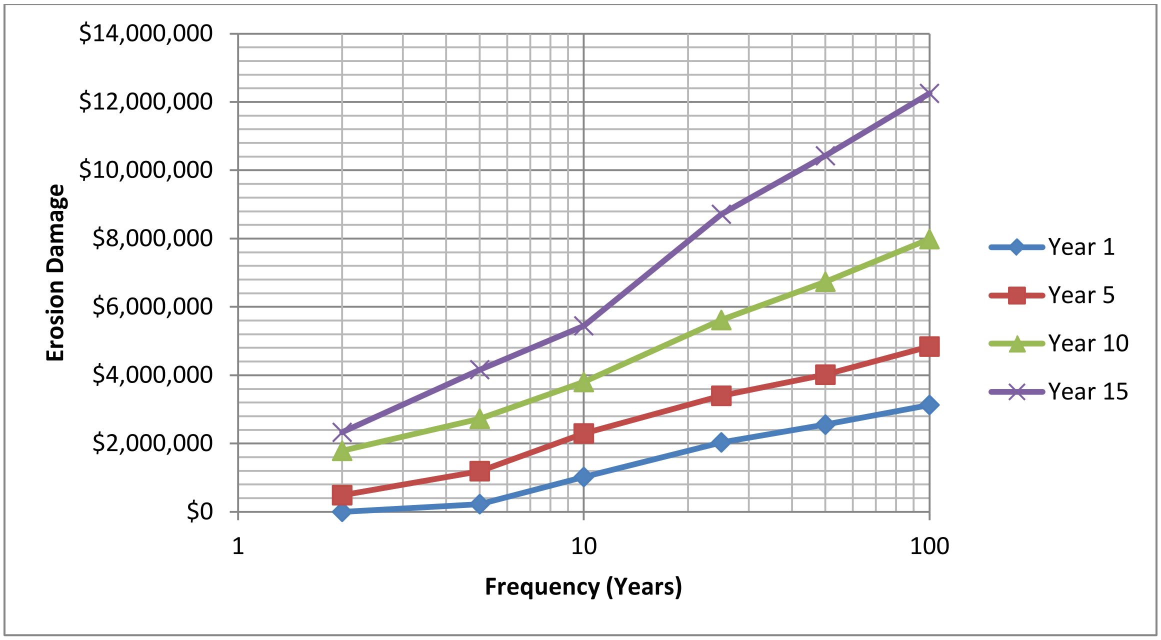


Figure 11: Without Project Damage-Frequency Curve

3.4 Without Project Future Conditions

The Without Project Future Conditions (WOPFC) is by definition the projection of the most-likely future conditions in the Study Area in the absence of a proposed project from the current study. The WOPFC serves as the base conditions for all the alternative analyses, including the engineering design, economic evaluation of alternatives, comparison of alternatives, as well as environmental, social and cultural impact assessment.

The WOPFC is a forecast based upon what has actually occurred, is currently occurring or is expected to occur in the Study Area if no actions are taken as a result of this study. As it is impossible to predict specifically what may occur, future activities that impact the without-project condition must be representative of what is most likely to occur, and as such must be based upon historic practice and trends, unless there is definitive evidence of new actions or policies scheduled for implementation that would influence past practices. The goal is to choose the most likely future scenario (not the only future scenario), based upon reasoned, documentable forecasting.

In defining the WOPFC, it is assumed that emergency dune construction projects will continue to be implemented by property owners to maintain a minimal dune condition. This condition is based on a review of recent activities including the extent of private activities. Recent records indicated that in the years 2010 through 2013 dune repairs of this nature costing more than $2,200,000 were locally implemented. An example of recent and ongoing dune repairs at downtown Montauk are captured in photos taken in July of 2014. It is likely that within their available resources, property owners will continue to maintain a minimum dune condition.

The minimum beach and dune condition that is currently maintained merely helps to provide continued access to the beach; it provides only limited protection against severe storms. A more robust dune and beach is required to provide adequate protection from severe storms and address the vulnerability of the project area.

Figure 12: Recent and Ongoing Dune Repairs (June 2014)

4.0 STUDY GOALS AND OBJECTIVES

4.1 Study/Project Goals

The goal of the overall FIMP Reformulation Study is to manage the risk of storm damages on the mainland and barrier island by reducing the potential for barrier island breaching and overwash, shorefront erosion, and by directly addressing residual flooding along the bayside shoreline. The short-term goal of this Downtown Montauk stabilization effort is to provide risk management through a one-time stabilization effort to the vulnerable shorefront within the hamlet of Montauk that suffered severe erosion during Hurricane Sandy. The stabilizing effort does not pre-suppose the outcome of the Reformulation or limit the range of options that could be implemented as part of the overall FIMP project.

4.2 Planning Objectives

ER 1105-2-100 states that the Federal objective of water and related land resources project planning is to contribute to National Economic Development (NED) consistent with protecting the nation's environment, pursuant to national environmental statues, applicable executive orders, and other federal planning requirements. A secondary objective of this project is to integrate opportunities for advancing National Ecosystem Restoration (NER) objectives consistent with the NED objectives that restore the coastal processes in a manner to advance the USACE Strategic Vision, Environmental Operating Principles, and Regional Sediment Management Principles. These objectives were established by the U.S Water Resources Council's Economic and Environmental Principles and Guidelines for Water and related Land Resources Implementation Studies (P&G's) on 10 March 1983.

The objective of this stabilization effort is to provide a separate, independent Coastal Storm Risk Management Plan that can address the extensive and immediate problems associated with the extremely vulnerable downtown Montauk conditions and that can proceed independently of the ongoing FIMP Study. **Long-term risk management measures for Downtown Montauk are currently being evaluated as part of a system approach for the entire FIMP study area.**

4.3 Project Constraints

Formulation and evaluation of alternative improvement plans are constrained by technical, environmental, economic, regional, social, and institutional considerations. These constraints must be considered in current and future project planning efforts, as summarized below.

<u>Technical Constraints</u>

- Plans must represent sound, safe, acceptable engineering solutions.
- Plans must be in compliance with sound engineering practice and satisfy HQUSACE regulations.
- Plans must be realistic and state-of-the-art. Reliance on future research and development of key components is unacceptable.
- Plans must provide storm risk management.

Economic Constraints

- Plans must be efficient. They must represent optimal use of resources overall. Accomplishment of one economic purpose cannot unreasonably impact another economic system.
- The economic justification of the proposed project must be determined by comparing the anticipated annual tangible economic benefits which should be realized over the project life with the average annual costs

Environmental Constraints

- Plans cannot unreasonably impact environmental resources.
- If a potential adverse impact is established, plans must consider replacement measures and should adopt such measures, if justified.
- Where opportunities exist to enhance significant environmental resources, the plan should incorporate all justified measures.

Regional and Social Constraints

- Reasonable opportunities for development within the study scope must be weighed relative to others, and views of State and local public interests must be solicited.
- The needs of other regions must be considered and one area cannot be favored to the unacceptable detriment of another.

Institutional Constraints

- The State must be willing to participate in a plan to provide storm risk management and be responsible for the operations and maintenance of the completed project.
- Federal and State participation must be contracted for the recommended period of time for implementation, although no assurances can be made that future Federal budgets will accommodate the capability funding against competing needs.
- Plans must be consistent with existing Federal, State, and local laws.
- Plans must be locally supported to the extent that local interests must, in the form of a signed Project Partnership Agreement (PPA), guarantee all items of local cooperation.
- Local interests must agree to provide public access to the beach in accordance with Federal guidelines and with requirements of State laws and regulations.
- The plan must be fair and find overall support in the region and State.
- Plans must be consistent with State Coastal Zone Management Policies to the maximum extent practicable and consider such policies in plan formulation.
- Each considered measure must identify environmental impacts and appropriate mitigation (mitigation measures for the Project Are not required).

Stabilization Constraints

- The Stabilization Plan must have independent utility.
- The Stabilization Plan cannot foreclose on alternatives under evaluation in the overall FIMP Reformulation Study.
- The stabilization Plan must not be reliant on future federal funds to achieve its intended benefits. This is assumed to effectively preclude any alternative requiring regular beachfill renourishment.
- The Stabilization Plan must be within the current FIMP authorities as authorized in the River and Harbor Act of 14 July 1960 in accordance with House Document (HD) 425, 86th Congress, 2d Session, dated 21 June 1960, which established the authorized project. The FIMP authorization precedes authorization of P.L. 113-2 in 2013; thus providing the authority for the Stabilization Plan to be evaluated in a Hurricane Sandy Limited Reevaluation Report (HSLRR).

5.0 FORMULATION OF ALTERNATIVE PLANS

Prior to Hurricane Sandy, preliminary coastal storm risk management measures for the downtown Montauk area were considered as part of the ongoing FIMP Reformulation Study. This section details the development of plan alternatives under the Reformulation Study, and the inputs used from that analysis as input into the stabilization project.

Any stabilization project formulated for downtown Montauk in the aftermath of Hurricane Sandy is required to be:

a. The selected plan will not limit the overarching reformulation process;
b. Economically justified as a separate, independent project;

Alternatives identified during the FIMP reformulation study for the downtown Montauk areas included:

- Non-structural measures,
- Beachfill with structures,
- Beachfill.

Each of the these measures were analyzed with regard to the criteria identified above as well as general design requirements, costs, and local acceptability.

Non-structural measures (relocation and acquisition) were eliminated from further consideration based on high costs to relocate or acquire the large ocean front structures, the lack of local support for an alternative that would largely eliminate a significant component of the local economy, and the fact that these alternatives would be irreversible.

Similarly, beachfill with structures such as groins and breakwaters was eliminated from further consideration based on cost considerations and also that structural alternatives would be of long duration and largely irreversible. Beachfill met each of the criteria and was the only measure considered for further evaluation.

5.1 Pre-Sandy Alternative Plan Comparison

The FIMP Reformulation Study undertook alternative analysis that included the downtown Montauk area. The initial screening considered non-structural measures, beachfill with structures, and beachfill. Each of these measures were analyzed considering general design requirements, costs, and local acceptability.

Non-structural measures (relocation and acquisition) were eliminated from further consideration based on high costs to relocate or acquire the large ocean front structures, and the lack of local support for an alternative that would largely eliminate a significant component of the local economy. Similarly, beachfill with structures was eliminated from further consideration based on cost considerations. Beachfill was the only measure considered for further evaluation.

The performance of the following three beachfill design templates was evaluated during the Reformulation Study: 1) +13 ft dune, 90 ft berm; 2) +15 ft dune, 90 ft berm; 3) +17 ft dune, 120 ft berm. The +15 ft (NGVD) dune and 90 ft berm was identified as the optimal design template for reducing storm damages and minimizing costs. However, an economic analysis of the beachfill alternative showed that it had a low Benefit-Cost Ratio (BCR). Consequently, the beachfill alternative was removed from further consideration in the Reformulation Study.

Downtown Montauk has one of the highest cost damages per foot of shoreline in the Study Area; however, unlike other reaches in the Study Area the Project Area is not susceptible to barrier island breaching, a major driver of economic benefits in the FIMP Study Area. The cost of beachfill at downtown Montauk is also significantly higher than at other locations because of the relatively high volume of sand required for initial construction and renourishment, and relatively high unit costs for sand.

The Reformulation study identified downtown Montauk as an area of high damage where sediment management measures should be evaluated as a possible alternative. Sediment management features are small-scale beach nourishment projects that are designed to offset long-term erosion trends in a location, which also act as a feeder beach for downdrift areas.

The sediment management measure for downtown Montauk recommended the placement of 120,000 cy of sediment every 4 years. The feeder beach would contribute an additional 30,000 cy/yr to the sediment budget. This supplemental sediment source would provide a constant supply of sediment to the beaches at downtown Montauk and farther west and, therefore, provide erosion control benefits to this region. The feeder beach would be constructed once every four years in concert with future renourishment operations at other locations in the Study Area.

An important distinction between the feeder beach and the beachfill alternatives is that a specific design section (i.e. 90 ft berm), and thus, a specific level of protection, is not being provided and maintained in the feeder beach. The primary objective of the feeder beach is to offset long-term erosion and ensure long-term continuity of longshore sediment transport. An economic analysis of the feeder beach indicated that the alternative had an acceptable BCR (greater than 1.0) and was incorporated in the TFSP plan.

5.2 Post-Sandy Alternative Plan Comparison

In the aftermath of Hurricane Sandy, it was recognized that there was a need to revisit the TFSP and determine if the eroded beach conditions and updated costs and benefits warranted selection of a larger alternative plan at downtown Montauk. This analysis is presently underway as part of the Reformulation Study to consider a wider array of alternatives, and to aid in identifying a stabilization plan. An evaluation of five alternatives is underway, taking into consideration the severely eroded beach conditions following Sandy. This includes reevaluation of the cost assumptions and other sources of potential economic benefits.

5.2.1 Alternative Development

Based on the prior screening of alternatives, and coordination with State and local officials five conceptual alternatives were considered for evaluation:

- Alternative 1: Beach Restoration,
- Alternative 2: Beach Restoration and Buried Seawall,
- Alternative 3: Feeder Beach,
- Alternative 4: Dune Reinforcement,
- Alternative 5: Dune Reinforcement and Feeder Beach.

These five alternatives represent a range of measures providing different levels of protection and design project lives. Alternatives 1, 2, and 3 are similar to the pre-Sandy alternatives, and are designed to provide a 44 year level of protection and have a design project life of 50 years. The 44-year level of protection is equivalent to a survivability rate of 50% over 30 years, which is a stipulation of New York State resiliency requirements. The post-Sandy analysis also considered two alternatives that provided a lower level of protection, and a shorter design life to stabilize the project area immediately and effectively. Alternative 4 is a geotextile reinforced dune alternative that could be constructed as a one-time action to offset the loss of dune function from Hurricane Sandy. Alternative 5 is an update to the plan previously recommended in the TFSP, which would repair the dune function at downtown Montauk and provide beach nourishment to maintain a consistent level of functioning.

Due to the large quantities of sand fill required for construction of Alternatives 1, 2, 3, and 5 dredging of an offshore borrow area would be required. Dune Reinforcement (Alternative 4) requires significantly less sand, approximately 51,000 cy, than other four alternatives. Therefore, it is feasible and expected to be less costly to obtain the necessary sand fill material from upland sediment sources.

The final analysis and comparison of alternatives for the long-term Reformulation Study are still underway, but the above information has been used as the basis for developing the stabilization plan for downtown Montauk.

Detailed cost estimates and economic analyses were performed for each of the five alternatives. An overview of the alternatives is provided below.

- <u>Alternative 1 – Beach Restoration</u>

The Beach Restoration alternative consists of the placement of sand to build (or restore) the beach berm and dune. The dune provides a barrier between downtown Montauk and storm tides and waves. The beach berm protects the dune during storm events and alleviates dune erosion by providing a sacrificial storm barrier. Renourishment operations are required over the life of the project to maintain the design berm and dune and provide continued storm damage protection.

The design section for the Beach Restoration alternative consists of 90 foot wide berm at an elevation of +9.5 ft NGVD and a 25 foot wide dune with a crest elevation of +15 ft NGVD. The design (not construction) foreshore slope (from +9.5 to +2 ft NGVD) is roughly 12.1 on 1. Below MHW (+2 ft NGVD) the submerged morphological profile is translated and used as the design profile. A typical beachfill template is shown in Figure 13:   Typical Beachfill Section.

The beachfill alignment or baseline defines the cross-shore location of design section. The design sections are oriented to the baseline by setting the centerline of the design dune coincident with the baseline. In the absence of oceanfront real estate, the most cost effective alignment is one that ties into the existing dune line and extends seaward from the existing shoreline only the distance necessary to achieve the required level of protection. The beachfill alignment also affects renourishment costs, as beachfill losses caused by "spreading out" or diffusion of beachfill will be greater the farther seaward an alignment is located.

The baseline for the Beach Restoration alternative, Minimum Real Estate Impact, was unchanged from prior plan formulations and is located seaward of all the ocean front structures. Consequently, the design shoreline "sticks out" relative to the adjacent shorelines, leading to relatively high renourishment costs.

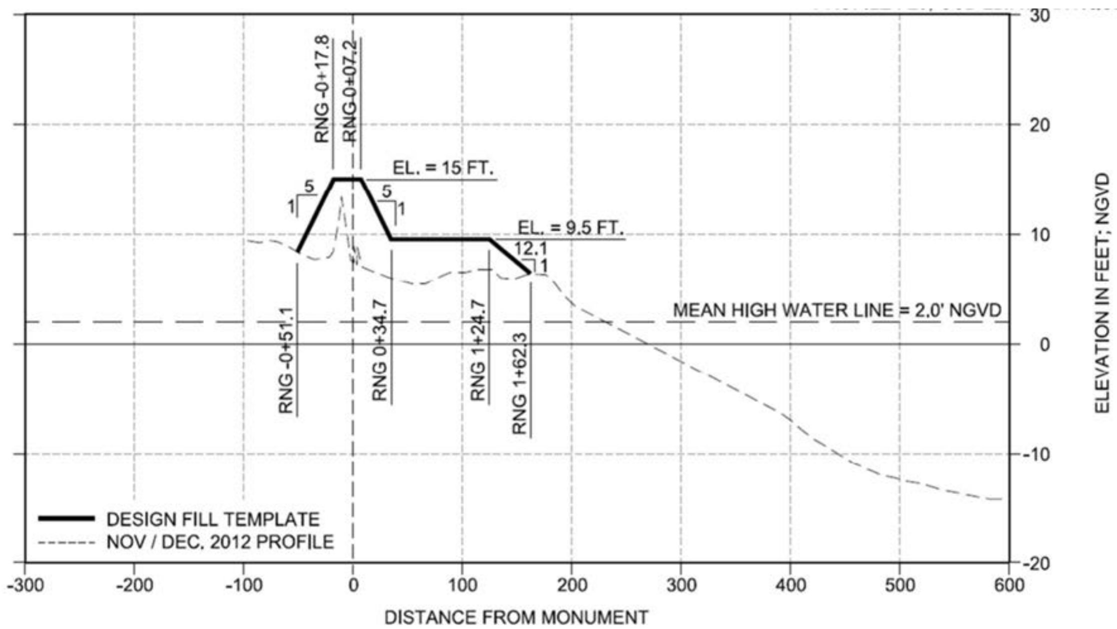


Figure 13: Typical Beachfill Section

- Alternative 2 - Beach Restoration and Buried Seawall

Alternative 2, Beach Restoration and Buried Seawall, is similar to the Beach Restoration alternative except that a rubble-mound seawall is buried beneath the dune and the design berm width is reduced to 35 ft. The rubble-mound seawall reinforces the dune and reduces the reliance on the beach berm for storm damage protection. Buried seawalls are more robust than a dune because in the event of a storm exceeding the design level, it is likely that the buried seawall will offer residual protection and continue to provide some protection against wave attack. A typical section of the rubble mound seawall is provided in Figure 14. The proposed rubble-mound seawall has a crest elevation of +11 ft NGVD, toe elevation of +4.3 ft NGVD, a crest width of 7.7 ft, slope of 1V:1.5H, scour apron width of 13.1 ft, and armor stone size of 1.4 ton.

Renourishment over the project life is required to maintain the design berm and ensure the integrity of the seawall. However, it is anticipated that renourishment quantities will be significantly lower than for the Beach Restoration alternative since the design berm is narrower and located farther landward, curtailing losses due to beachfill diffusion. The relatively high initial construction costs of the buried seawall may be offset by a reduction in the quantity and/or frequency of future renourishments over the design project life.

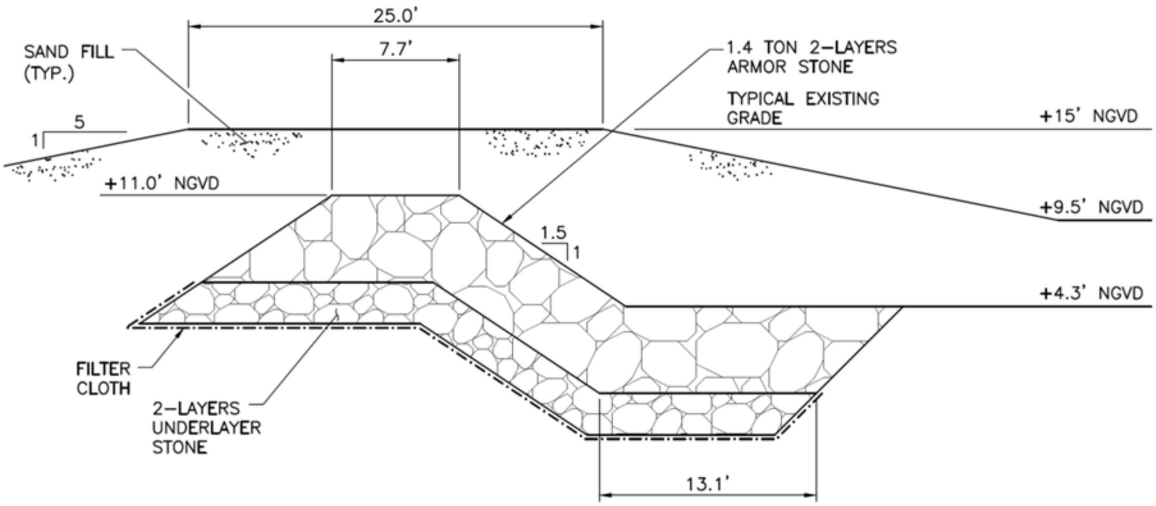


Figure 14: Typical Buried Seawall Section

- Alternative 3 - Feeder Beach

Alternative 3, Feeder Beach, consists of periodic placement (once every four years) of 120,000 cubic yards of sand at downtown Montauk. The Feeder Beach design is unchanged from the TFSP and would contribute an additional 30,000 cy/yr or 25 percent of the longshore sediment transport to the sediment budget. This supplemental sediment source would provide a constant supply of sediment to the beaches along Montauk and farther west providing erosion control benefits to this region. As previously noted, the feeder beach alternative does not build nor maintain a specific design section, and thus a specific level of protection. The feeder beach would be constructed once every four years in concert with future renourishment operations at other locations in FIMP.

- Alternative 4 - Dune Reinforcement

Alternative 4, Dune Reinforcement, consists of stabilizing and reinforcing the existing dune along 3,100 ft of the shoreline in downtown Montauk. The core of the dune consists of hydraulically-filled Geotextile Sand Containers (GSCs). Geotextile Sand Containers (GSCs) have increasingly been used to provide low cost, soft, environmentally acceptable solution for shore protection structures (Pilarzyk, 2002, Dassanayake and Oumeraci, 2012). Coastal structures built with GSCs are obtained by substituting rocks with containers made of geotextile and filled with locally available sand. An example of two coastal protection projects utilizing GSCs is provided in Figure 15: Example Applications of Geotextile Sand Containers

Figure 15: Example Applications of Geotextile Sand Containers

A typical section of the proposed Reinforced Dune is shown in **Error! Reference source not found.**. The core of dune consists of approximately 14,171 GSCs with filled dimensions of approximately 5.5 ft long, 3.5 ft wide, and 1.5 ft tall, each weighing approximately 1.7 tons. For greater stability the GSCs are aligned with the long side perpendicular to the shoreline with an overlap of 50% of the filled width. The proposed design is to provide reinforcement by stacking the bags along the existing dune at a 1V:2H slope. The Dune Reinforcement extends from a toe elevation of +3 ft to a crest elevation of +13.5 ft NGVD. In order to increase the resiliency of the design and reduce the potential for undermining, the proposed design includes a 50 foot wide berm cap at +9.5 ft NGVD. The additional sediment, estimated at approximately 25,700 cubic yards, will provide additional protection to the toe of the structure from undermining and decrease the likelihood of exposure of the GSCs during small storm events.

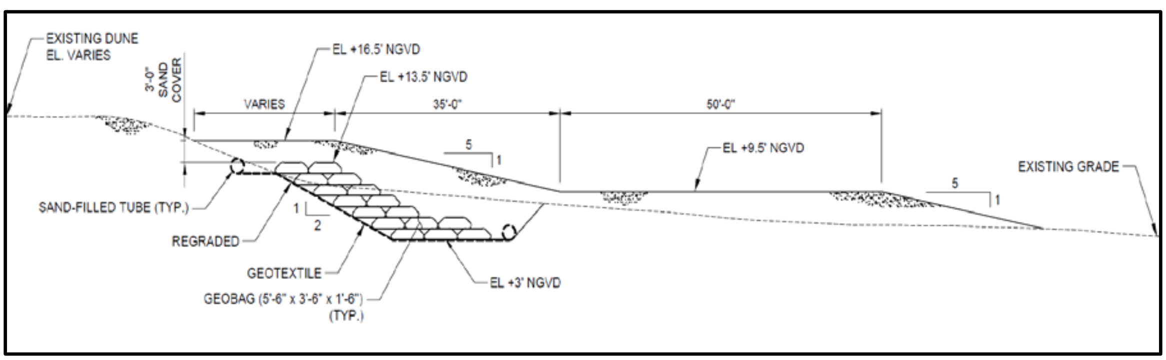


Figure 16: Reinforced Dune Typical Section

Dune reinforcement with GSCs may provide a relatively soft, flexible, easily installed, and easily removed solution. However, there are some disadvantages to using GSCs in the place of traditional armor stone units. The level of protection and longevity offered by the GSCs is considerably less than armor stone. GSCs have a lower specific gravity and are more susceptible to sliding and being pulled out when exposed to large waves. The longevity offered by GSCs is also limited by deterioration from UV exposure, sand abrasion, vandalism, and debris. To maximize the longevity of the GSCs the proposed design calls for the GSCs to be covered by a layer of sand to decrease the likelihood of the geotextile bags from being exposed for long periods of time.

It is estimated that the reinforced dune provides a level of protection of approximately 25 years (4% annual chance of design exceedance) and that the effective life of this type of structure would be approximately 15 years. A 15 year effective project life was determined based on two factors: 1) 15 years is the approximate point in the future in which the cumulative failure probability of the reinforced dune exceeded 50%; 2) the durability and longevity of the geotextile sand containers is limited and will eventually breakdown due to UV radiation, abrasion, and debris.

- Alternative 5 – Feeder Beach and Dune Reinforcement

Alternative 5, Feeder Beach and Dune Reinforcement, is a combination of Alternatives 3 and 4 and provides immediate stabilization / reinforcement of the existing dune at downtown Montauk and constant supply of sediment to alleviate long-term erosion. Inclusion of the feeder beach in Alternative 4 increases the beach width in front of reinforced dune, which would improve the performance and extend the effective life of the reinforced dune. The design of the feeder beach, placement of 120,000 cy once every 4 years, and design of the reinforced dune are unchanged from Alternatives 3 and 4.

5.2.2 Quantities and Costs

Quantities

Initial construction beachfill quantities for Alternatives 1, 2, and 3 were estimated from profile surveys conducted during September, 2013. Average end area calculations were performed based on the design section and profile surveys. Advance fill is included in the initial beachfill quantities. Advance fill is a sacrificial quantity of sand that acts as an erosional buffer against long-term and storm-induced erosion as well as beachfill losses caused by “spreading out” or diffusion. The required advance berm width was computed based on representative erosion rates and expected renourishment interval (4 years). Table 3 provides a summary of the initial construction beachfill quantities, which include a 10% overfill factor and a 15% contingency/tolerance factor.

The beachfill quantities for the Dune Reinforcement (Alternative 4) were estimated from a profile survey conducted by First Coastal on November 24, 2013 at Ocean Beach as the November 2013 profile is more indicative of the winter profile that leaves the project area more vulnerable. The flat (unfilled) GSCs are assumed to be placed in location by hand and hydraulically filled in place. Vegetation of the berm and the installation of sand fencing is also assumed to be included.

Renourishment quantities and costs are based on the estimated “effective” erosion rates under each alternative. The effective erosion rates were estimated based on sediment budgets of the Study Area, historical shoreline change rates, and a numerical beachfill diffusion analysis. Effective erosion rates for the alternatives range from 6 ft/yr to 18 ft/yr. The renourishment volumes reflect the required amount of beachfill volume to replace the sediment losses in between renourishments. Renourishment fill volumes for a single renourishment event (once every four years) and over the entire 50-yr project life are presented in Table 4. No renourishments are included in the Dune Reinforcement alternative (15-year project life).

Table 3: First Construction Beachfill Volumes

Item	Beach Restoration	Beach Restoration & Seawall	Feeder Beach	Dune Reinforcement	Feeder Beach & Dune Reinforcement
Length (ft)	6,600	6,000	3,100	3,100	3,100
Design fill (c.y.)	689,338	298,772	120,000	51,000	147,000
Advance Fill (c.y.)	591,514	140,873			
10% Overfill (c.y.)	128,085	43,865			
Subtotal (c.y.)	***1,408,937***	***482,510***	***120,000***	***51,000***	***147,000***
15% Tolerance (c.y.)	211,341	72,376			
Total Fill (c.y.)	**1,620,000**	**555,000**	**120,000**	**51,000**	**147,000**

Table 4: Renourishment Beachfill Volumes

Item	Beach Restoration	Beach Restoration & Seawall	Feeder Beach	Dune Reinforcement	Feeder Beach & Dune Reinforcement
Length (ft)	6,600	6,000	3,100	3,100	3,100
Erosion Rate (ft/yr)	18	6			
Advance Fill (c.y.)	641,520	194,400	120,000	n/a	120,000
10% Overfill (c.y.)	64,152	19,440			
Subtotal (c.y.)	***705,672***	***213,840***			
15% Tolerance (c.y.)	105,851	32,076			
Total Fill (c.y.)	**812,000**	**246,000**	**120,000**	**n/a**	**120,000**

Note: Fill quantities are provided for each 4-year renourishment cycle.

Offshore Dredging Alternatives

Due to the large quantities of sand fill required for construction of Alternatives 1, 2, 3, and 5 dredging of an offshore borrow areas is proposed. Dredging costs per cubic yard are estimated using CEDEP (USACE of Engineers Dredge Estimating Program). Mob/Demob estimates of $4 million are based on recent contracts. All future renourishment cost estimates are based on an intra-site Mob/Demob with the expectation that the alternative at downtown Montauk may be able to “piggy back” on other beachfill projects once the GRR is approved.

Buried seawall costs were developed based on the estimated quantities of armor stone, under layer stone, core fill, geotextile, and excavation with USACE cost estimating software MII.

Upland Trucking Alternatives

Dune Reinforcement (Alternative 4) requires significantly less sand, approximately 51,000 cy, than other four alternatives. Therefore, it is feasible and expected to be less costly to obtain the necessary sand fill material from upland sediment sources. There are two upland sand distributors in close proximity to Montauk that could provide the necessary sand fill quantities.

The fill material would be transported from the distributor to downtown Montauk in either dump trucks or tractor-trailers. The estimated travel distance from the upland distributors to downtown Montauk is less than 25 miles.

The total cost of placing sand from upland distributors on the beach includes three main components: raw material, transportation, and placement/shaping on the beach.

Plan Comparison

A summary of the annualized costs and residual damages for the five conceptual alternatives are provided in

Table **5:** **Annualized Costs and Residual Damages of Alternatives**

Annual Costs/Damages	**Beach Restoration1**	**Beach Restoration & Seawall1**	**Feeder Beach1**	**Dune Reinforcement2**	**Feeder Beach & Dune Reinforcement1**
First Construction	$1,248,000	$1,390,000	$466,000	$761,0003	$680,000
Renourishment	$3,837,000	$2,417,000	$2,337,000	n/a	$2,422,000
O&M	$292,000	$326,000	$109,000	$157,000	$160,000
Total3	$5,377,000	$4,133,000	$2,912,000	$918,000	$3,262,000
Residual Damages	$122,000	$122,000	$312,000	$326,000	$145,000

Notes: FY 2014 price level, 3.5% Discount rate;
[1] *Based on 50 yr. Period of Performance (POA) with periodic nourishment every 4 years;*
[2] *Based on 15 yr. POA with no renourishment.*
[3] *Includes Interest During Construction (IDC) based on a four-month construction schedule.*

As previously discussed, the five alternatives represent a range of measures offering different levels of protection and different design project life. The annualized costs of alternatives 1, 2, 3, and 5 are based on a 50 year period of performance and assumed a periodic nourishment requirement every 4 years, while alternative 4 is based on a 15 year period of performance with no periodic nourishment. The 15 year period of performance is based on the expected life of the GSCs that are used to construct the reinforced dune. Due to the high annualized costs of alternatives 1, 2, 3, and 5 and also given that the stabilization project for Downtown Montauk is intended as a 1 time project in advance of the implementation of the overall FIMP reformulation, these 4 alternatives will not be considered further.

Table 5: Annualized Costs and Residual Damages of Alternatives

Annual Costs/Damages	Beach Restoration[1]	Beach Restoration & Seawall[1]	Feeder Beach[1]	Dune Reinforcement[2]	Feeder Beach & Dune Reinforcement[1]
First Construction	$1,248,000	$1,390,000	$466,000	$761,000[3]	$680,000
Renourishment	$3,837,000	$2,417,000	$2,337,000	n/a	$2,422,000
O&M	$292,000	$326,000	$109,000	$157,000	$160,000
Total[3]	$5,377,000	$4,133,000	$2,912,000	$918,000	$3,262,000
Residual Damages	$122,000	$122,000	$312,000	$326,000	$145,000

Notes: FY 2014 price level, 3.5% Discount rate;
[1] Based on 50 yr. Period of Performance (POA) with periodic nourishment every 4 years;
[2] Based on 15 yr. POA with no renourishment.
[3] Includes Interest During Construction (IDC) based on a four-month construction schedule.

5.3 Economic Evaluation

5.3.1 With-Project Storm Damages and Benefits

In compliance with Public Law 113-2 and the project constraints described in previous sections, current efforts are limited to the implementation of a stabilization project with a 15 year life and no provision for periodic renourishment. Therefore at this stage in the study only Alternative 4, the reinforced dune structure has been subject to analyses for damages and benefits.

To model the damages with the Stabilization Project in place showing the benefits of the project, the model described in Section 3.3 was configured to allow erosion beyond the +5 foot NGVD contour only after the reinforced dune structure has failed due to either wave action or scour. In the first year of the project life, the dune provides approximately a 1 in 25 year level of protection (4% annual chance of failure immediately following construction) with the annual failure probability rising to approximately 8% (1 in 13 year) by the end of the project life. The increase in annual failure probability of the project over time is presented in Figure 17. The cumulative failure probability of the project is presented in Figure 18, which indicates that the probability that the project will have failed by the end of the period of analysis is almost 60%.

The model has been executed using a project life of 15 years, an interest rate of 3.5% and 12,500 iterations to compute with-project equivalent annual damages of $326,000. Hence the annual storm damage reduction benefits of the project are estimated to be $1,052,000.

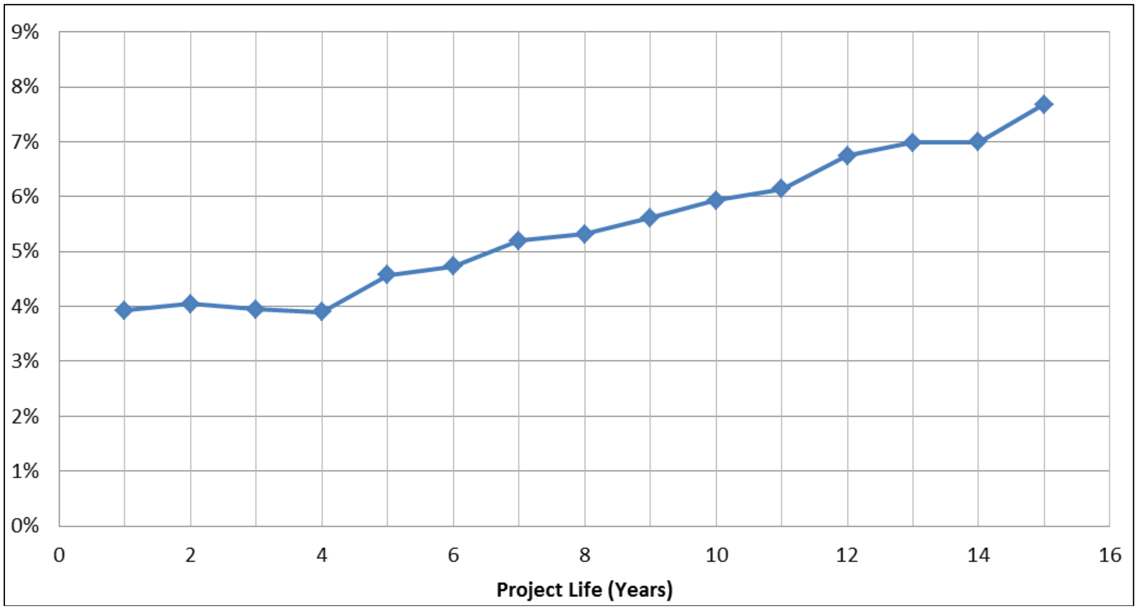


Figure 17: Annual Failure Probability of Reinforced Dune

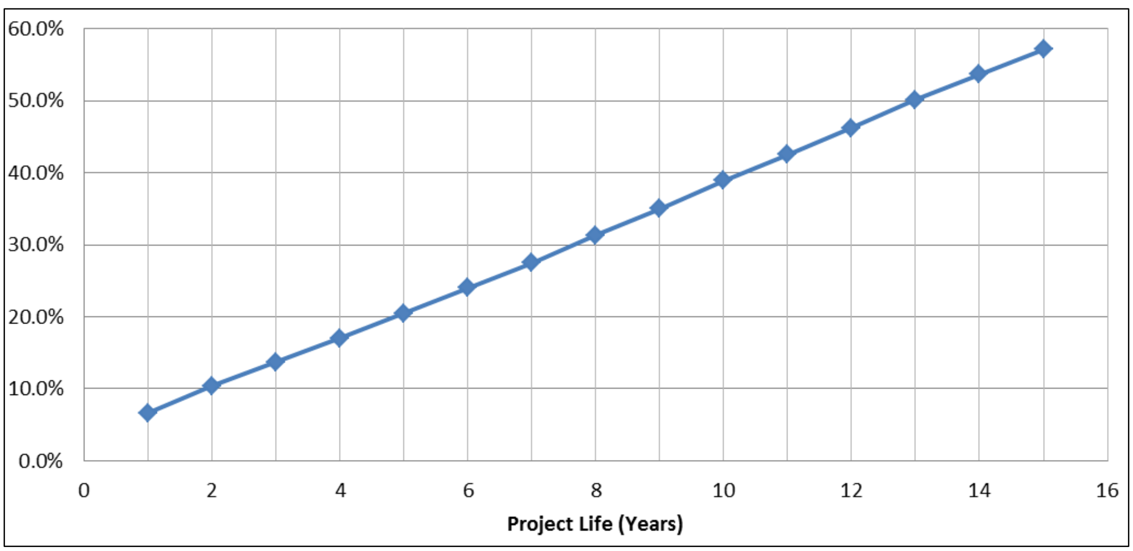


Figure 18: Cumulative Failure Probability of Reinforced Dune

The with-project model outputs were post-processed to derive damage frequency plots for years 1, 5, 10, and 15 in the analysis period, and these plots are presented in Figure 19 for comparison with Figure 11. It is evident that while the vulnerability to erosion still increases over time with the project in place, the expected damages are greatly reduced. For example; for the 10% annual chance exceedance event, expected damages in years 1 and 10 are expected to be reduced from $1 million and $3.8 million to zero and $1.3 million respectively.

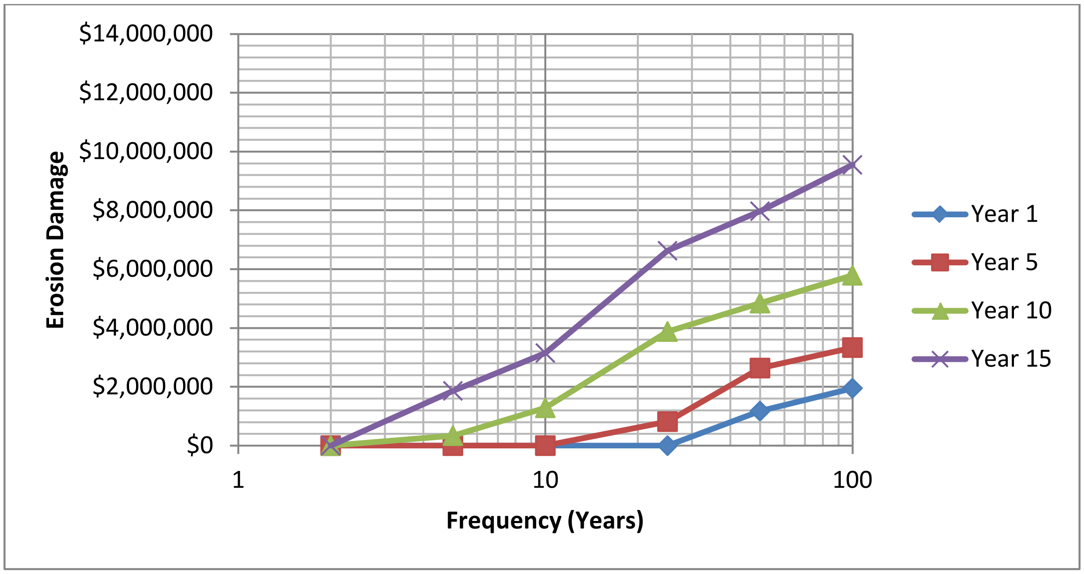


Figure 19: With-Project Damage-Frequency Curve

5.3.2 Additional Benefits

The cost of locally implemented beach and dune repairs mentioned in Section 3.2 would assumed to be avoided following the construction of the selected plan, and therefore can be considered a project benefit. The annual cost avoided has been derived by assigning frequencies of occurrence to the recorded local repair costs for the years 2011 – 2013, based on the return periods of the most significant storms in those years. A cost/frequency curve was subsequently constructed which was used to compute a probability-weighted annual average cost avoided of $185,000.

5.3.3 Summary of Economic Evaluation

The annual damages and benefits resulting from the model analyses for the reinforced dune are summarized in Appendix D, Back-up Calculations, and also in below, along with annualized project costs estimated separately (See Appendix G), and the resulting benefit-cost ratio of 1.4.

Table 6: Summary of Stabilization Project Damages, Costs, and Benefits

Without Project Annual Damages	**$1,378,000**
With Project Annual Damages	**$326,000**
Storm Damage Reduction Benefits	**$1,052,000**
Local Costs Avoided	**$185,000**
Total Annual Project Benefits	**$1,237,000**
Annual Cost	**$918,000**
Net Benefits	**$319,000**
Benefit-Cost Ratio	**1.4**

Interest rate 3.5%, Project Life 15 years

To illustrate the potential variance of the model results, 25th and 75th percentile storm damage reduction benefits have been extracted from the @Risk model results. The 25th percentile benefits are $1,118,000 and the 75th percentile damage reduction benefits are $1,108,000, giving a range of benefit-cost ratios of 1.21 to 1.12.

6.0 IDENTIFICATION OF MONTAUK STABILIZATION PLAN

As a consequence of coastal erosion during Hurricane Sandy, the dune and berm system at downtown Montauk is depleted. The foundations of several shorefront commercial buildings were exposed during Hurricane Sandy and are vulnerable to future storm events. In response to the increased vulnerability to future events, consistent with the Disaster Relief Appropriations Act of 2013 (Public Law. 113-2; herein P.L. 113-2), and recognizing the urgency to repair and implement immediate storm protection measures, the USACE has proposed an approach to expedite implementation of construction of necessary stabilization efforts at Downtown Montauk independent of the FIMP Reformulation Study. This approach has gained widespread approval from New York State, Suffolk County, N.Y. and the Town of East Hampton, who recognize the extreme vulnerability of the coast and the need to move quickly to address this need.

The post-Sandy Downtown Montauk Stabilization Project was developed based upon the Engineering, Economic, Environmental and Planning efforts that have been undertaken through the ongoing FIMP Reformulation Study. The study compared several alternatives to identify the recommended scale and scope of a stabilization project. Stabilization efforts were focused on downtown Montauk as 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.

This stabilization effort has been developed as a one-time, stand-alone construction project to repair damages caused by Hurricane Sandy that entails stabilizing / reinforcing the dune. This Chapter demonstrates that the Downtown Montauk 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.

Stabilization Plan Selection

As presented previously, a stabilization project for downtown Montauk must meet the following requirements:

a. The selected plan will not limit the overarching reformulation process;
b. Economically justified as a separate, independent project;

In reviewing the alternatives under consideration, Alternative 4 was identified as the only alternative that meets the criteria for a stabilization project. Alternatives 1, 2, 3, and 5 all have very high costs, and can only perform as designed if done in conjunction with a long-term plan for renourishment.

The stabilization Project is estimated to have a 15 year project life, which represents the approximate timeframe when the cumulative failure probability of the reinforced dune exceeds 50%. This takes into account the longevity of the geotextile sand containers, which will eventually breakdown due to UV radiation, abrasion, debris, and vandalism. This also considers that in the absence of a sediment management solution as part of the overall FIMP Reformulation Study, long-term erosion will lead to a reduced level of protection increasing the likelihood of undermining and displacement of the reinforced dune core. Continued maintenance over the effective project life is required to maintain the sand dune cover and increase the longevity of the GSCs.

6.2 Stabilization Plan Details

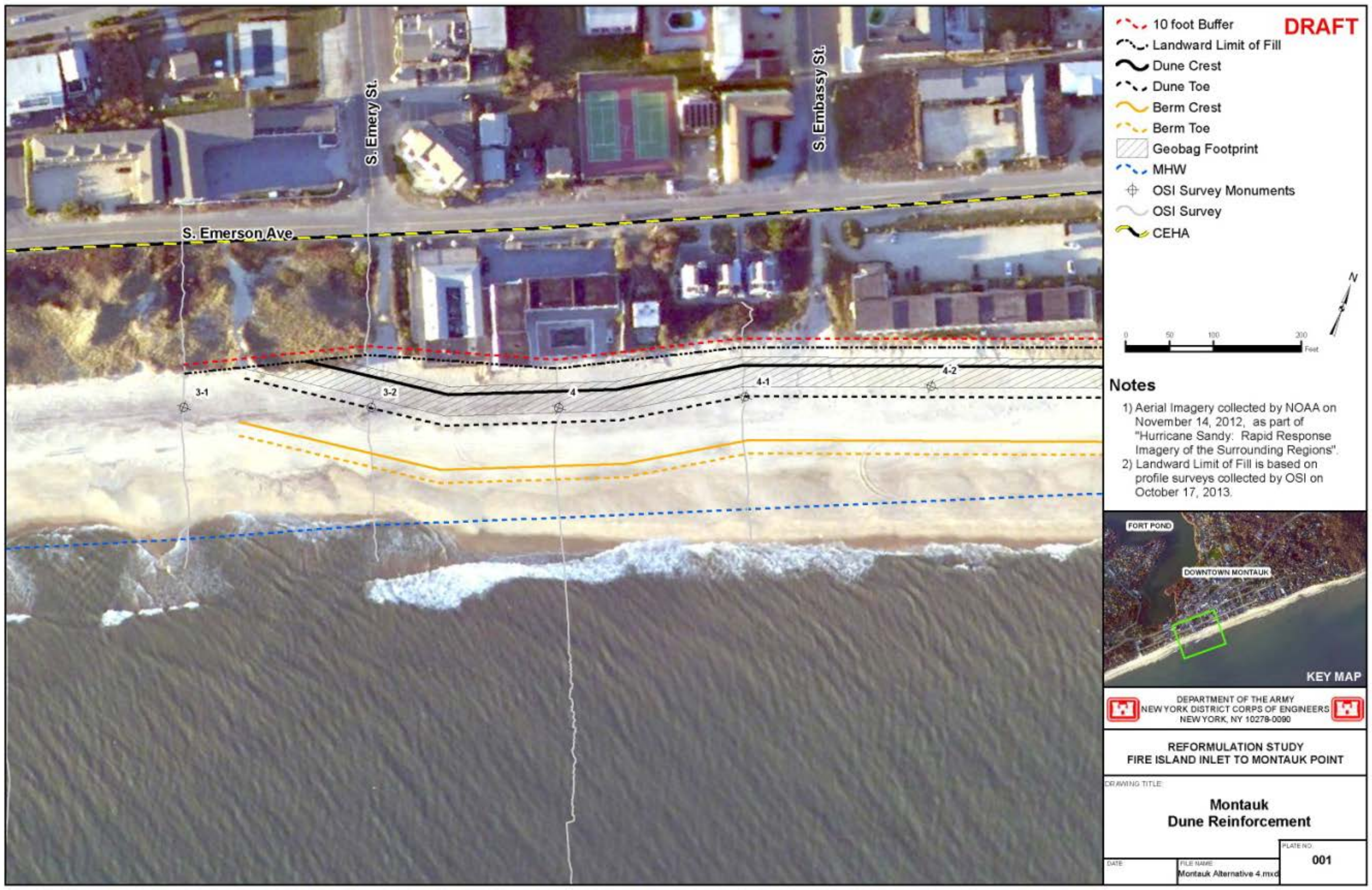
6.2.1 Extent

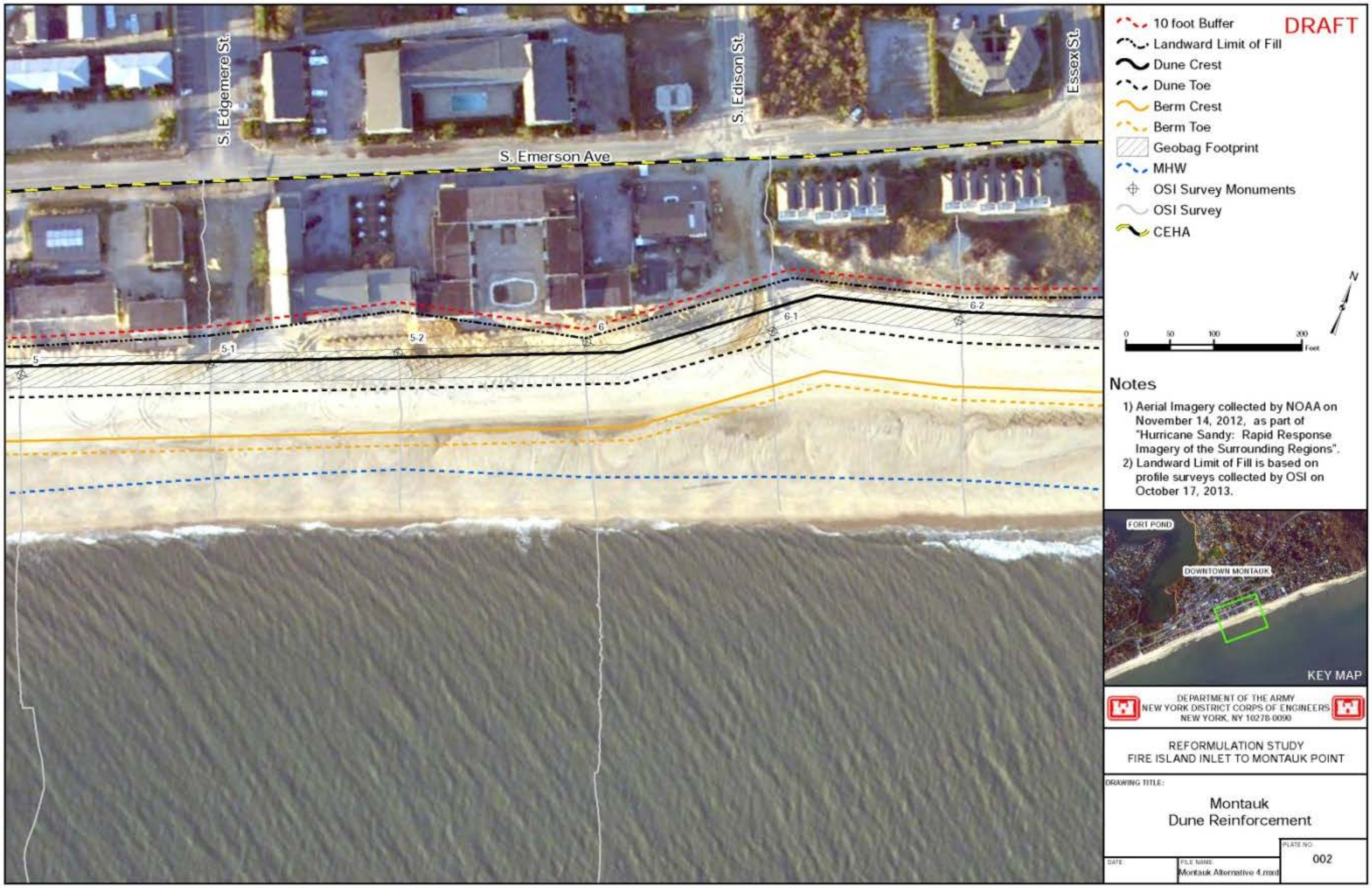
The proposed design includes 3,100 feet of reinforced dune extending from west to east from South Emery Street to Atlantic Terrace Motel and tapering into high dunes at both ends of the Project Area. The extent of the proposed plan was selected to provide protection to all of the shorefront commercial buildings in downtown Montauk.

6.2.2 Alignment

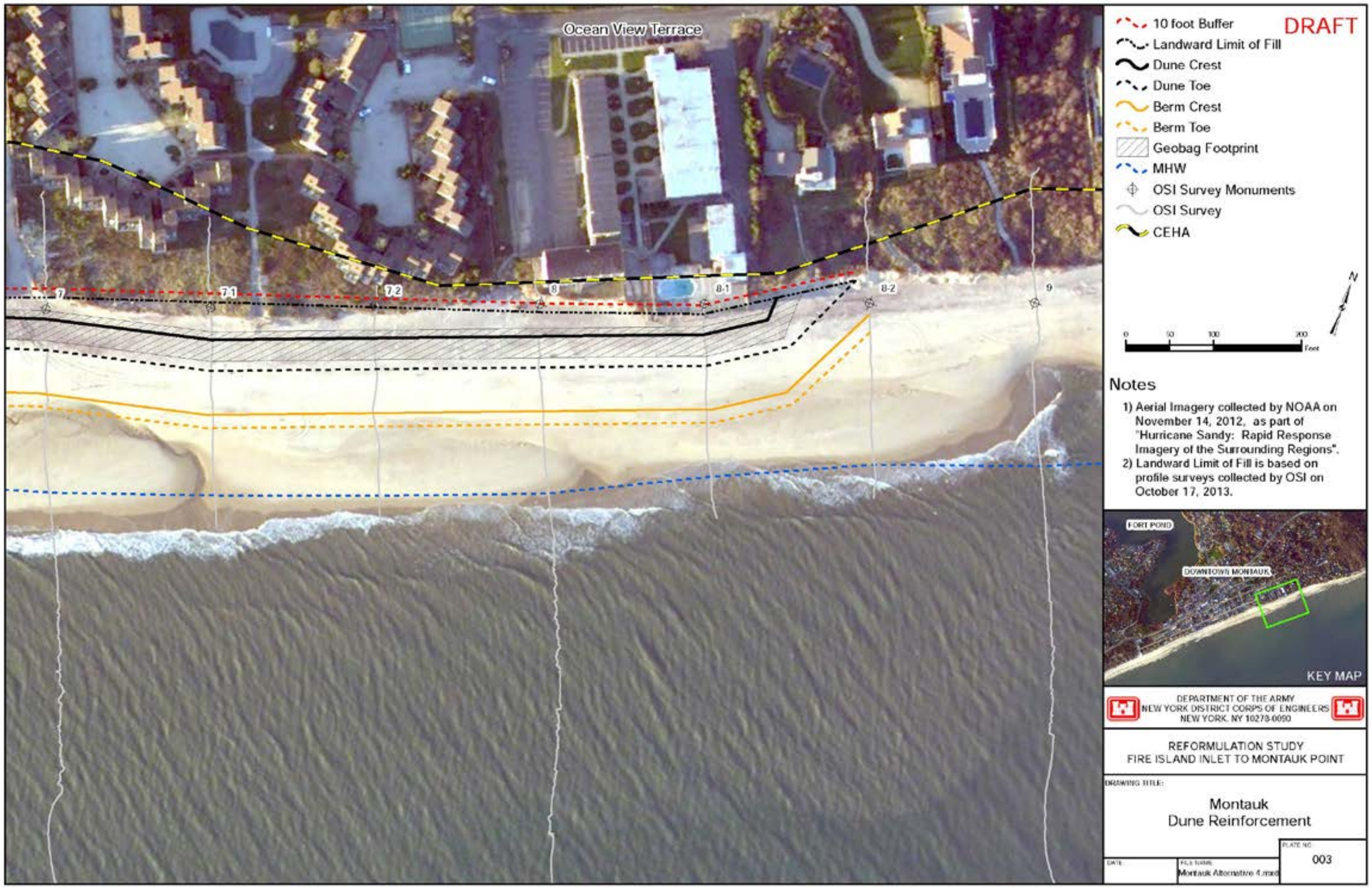
The design alignment defines the cross-shore location of the design section. For the Stabilization Project the alignment closely follows the existing dune (+ 12 ft NGVD contour). In some locations the alignment was adjusted to ensure that the footprint of the GSCs is seaward of shorefront structures.

Figure 20: Downtown Montauk Alignment





S. Edgemere St.
S. Edison St.
Essex St.
S. Emerson Ave
5
5-1
5-2
6
6-1
6-2
10 foot Buffer
Landward Limit of Fill
Dune Crest
Dune Toe
Berm Crest
Berm Toe
Geobag Footprint
MHW
OSI Survey Monuments
OSI Survey
CEHA
DRAFT
N
0
50
100
200
Feet
Notes
1) Aerial Imagery collected by NOAA on November 14, 2012, as part of "Hurricane Sandy: Rapid Response Imagery of the Surrounding Regions".
2) Landward Limit of Fill is based on profile surveys collected by OSI on October 17, 2013.
FORT POND
DOWNTOWN MONTAUK
KEY MAP
DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
NEW YORK, NY 10278-0090
REFORMULATION STUDY
FIRE ISLAND INLET TO MONTAUK POINT
DRAWING TITLE:
Montauk
Dune Reinforcement
DATE:
FILE NAME:
Montauk Alternative 4.mxd
PLATE NO.
002


Ocean View Terrace
10 foot Buffer
Landward Limit of Fill
Dune Crest
Dune Toe
Berm Crest
Berm Toe
Geobag Footprint
MHW
OSI Survey Monuments
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FIRE ISLAND INLET TO MONTAUK POINT
DRAWING TITLE:
Montauk
Dune Reinforcement
003

6.2.3 Design Section

A typical section of the proposed Reinforced Dune is shown in Figure 21. The core of dune consists of approximately 14,171 GSCs with filled dimensions of approximately 5.5 ft long, 3.5 ft wide, and 1.5 ft tall, each weighing approximately 1.7 tons. For greater stability the GSCs are aligned with the long side perpendicular to the shoreline with an overlap of 50% of the filled width. The GSCs are stacked along the existing dune at a 1V:2H slope. The GSCs extend from a toe elevation of +3 ft to a crest elevation of +13.5 ft NGVD. In order to increase the resiliency of the design and reduce the potential for undermining, the proposed design includes a 50 foot wide berm cap at +9.5 ft NGVD. The additional sand will provide protection to the toe of the structure and decrease the likelihood of exposure of the GSCs during small storm events.

The design of the GSC structure is based on beach conditions on November 24, 2013, which are more representative of a winter profile. It is possible that during winter months or during a severe storm event the beach conditions could become even narrower than depicted by the November survey. The toe elevation of the reinforced dune was selected to minimize the risk of scour and undermining under storm events with annual exceedance probability of 4% (25 year return period).

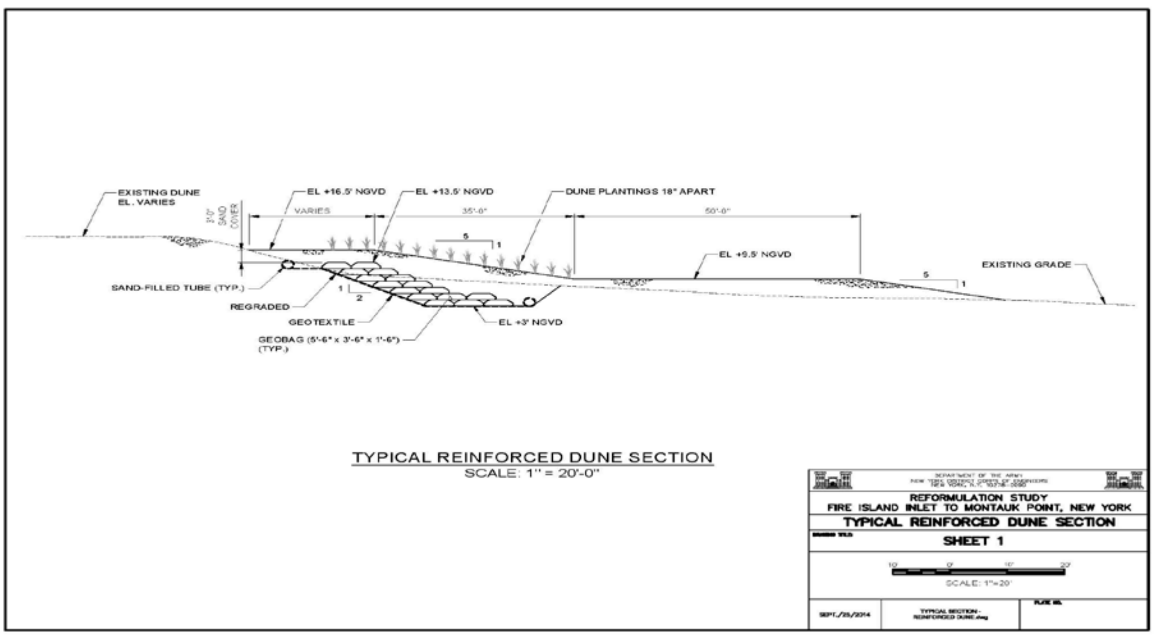

Figure 21: Reinforced Dune Typical Section

6.2.4 Geotextile Sand Containers

Geotextile Sand Containers (GSC) are an emerging technology and design guidance for the use of GSC in coastal protection structures is still evolving. Large scale model tests and field tests have shown that the dislodgment and pullout of the slope containers by wave action, including the sliding and the overturning of crest containers, are strongly affected by the deformation of the sand containers (Dassanayake and Oumeraci, 2012). Recent advances in understanding the hydraulic stability of the GSC under wave attack (Wouters, 1998; Pilarczyk, 2000; Oumeraci et al, 2003; and Dassanayake and Oumeraci, 2012) have led to several design formulae for GSC structures. Most of the design formulae relate the stability of the GSC to the surf similarity parameter and wave height. An increase in the wave height and wave period results in decreased stability of the GSCs and increases the required size and weight of the GSC.

The aforementioned design guidance led to selection of 1.7 ton GSCs with filled dimensions of approximately 5.5 ft long, 3.5 ft wide, and 1.5 ft tall. In order to increase the stability of the GSCs the long side of GSCs is laid out perpendicular to the shoreline with an overlap of 50% of the filled width. A total of 14,171 GSC are required to construct the reinforced dune core.

A total of 71,000 cy of sand are required to construct the reinforced dune. Approximately 51,000 cubic yards of the sand fill will be used to fill the GSCs or placed in the dune. The remaining 20,000 will be used to construct the berm cap and will be obtained from excavation and re-grading of the existing dune. The remaining 51,000 cy will be obtained from upland sediment sources. In order to more closely match the appearance of the sand after the project is constructed, the construction will ensure that the upland sand is used for filling the GSC's and base fill. The sand excavated from on site will be used as a top cover for the project. The dune will be planted with dune grass on 18 inch centers on the dune crest and face. Sand fencing will be installed at the seaward toe of the dune to retain wind-blown sand.

Filling of the GSCs will be hydraulic and conducted using Best Management Practices (BMPs) to minimize any discharge that could be in violation of the Water Quality Certificate (WQC). The contractor will submit a Sediment Control Plan for District approval prior to any construction activities.

6.2.5 Upland Sediment Sources

Due to the relatively small quantity of sand fill needed to construct the project it is recommended that the sand fill be obtained from upland sediment sources. The cost of mobilizing a dredge, approximately $4 million, would not be cost-effective considering the relatively small quantities of sand fill required.

Two upland sediment sources that could meet the sediment demands of the project were identified within 25 miles of the Project Area. The compatibility of the upland sediment and native sediment was evaluated based on the grain size distribution and color. The analysis indicated that the median grain size of the upland sediment sources (0.51 and 0.44 mm) is the same or slightly larger than the native sediment (0.42 mm). In addition, the grain size distribution of the upland sediment sources and native sediment are similar. The compatibility of the color of the sediment is illustrated by Figure 22 which compares sediment samples from the two upland sediment sources.

Figure 22: Upland Sediment Samples

6.2.6 Real Estate

The Real Estate requirements, for this project, include certain lands, easements, relocations and rights of way (LERR). The total LER required in support of the Project is approximately 13.36 acres; approximately 2.13 acres required in perpetual easements, and approximately 11.23 acres required in access agreements over public land. The Project impacts 19 parcels, impacting 13 private owners and 6 public owners. This project will not require relocation of property or utilities. Details of the real estate requirements and cost estimate are provided in Appendix F.

No property acquisitions or structural relocations are required for the project. The lands, easements, rights of ways, and relocations necessary for implementing the project are described herein. The two types of easements required for the Stabilization Project include a perpetual easement, and a temporary work easement. A perpetual easement would be obtained along all areas where beachfill material is placed to allow continual access to construct, operate, maintain, patrol, repair, and replace the beach berm and dune. This easement precludes development, other than approved dune crossings and ensures that the design section would be held inviolate from future development. Temporary work area easement would be obtained to allow right of way in, over, and across the land for a period of three years for construction operations.

Within a few of the oceanfront properties, perpetual easements are required over a portion of the footprint of decks. In these locations construction work is limited to placing beachfill underneath the deck. This work is consistent with recent and ongoing engineering practices in downtown Montauk carried out by local property owners.

The responsibility for the acquisition of the necessary lands and easements is the responsibility of the Non-Federal Sponsor (NFS), the New York State Department of Environmental

Conservation. The NFS may enter into sub-agreements with local municipalities to assist in carrying out its acquisition responsibilities. New York State Law (Title 4, Chapter 7, Sections 1531-1539 of the Unconsolidated Laws) require that lands upon which beachfill is placed must be municipally owned, while lands upon which dunes are erected may be privately owned with permanent easement granted to a municipality. In either case, the NFS must maintain the control it needs in order to certify the property interests required for the project.

6.2.7 Public Access

Since there is adequate parking facilities for the general public, the requirements for parking as specified in ER 1165-2-130, paragraph 6h.(2) meet the federal guidelines and the Planning Guidance Notebook, ER 1105-2-100. Suitable public access is required for any areas where Federal expenditure of funds will be utilized for beach restoration.

Three (3) pedestrian wood constructed dune crossings at Emery, Embassy and Edgemere roads and two (2) vehicular crossings at Edison and Essex (constructed utilizing a sand aggregate mix) have been identified and included in the project. The following figure shows the pedestrian and vehicular access points. The analysis of public access indicates that the areas where sand is being placed is fully accessible and in compliance with ER 1165-2-130. Analysis and acceptability of public access is documented in Appendix E. Figure 23 shows the pedestrian and vehicular access points.

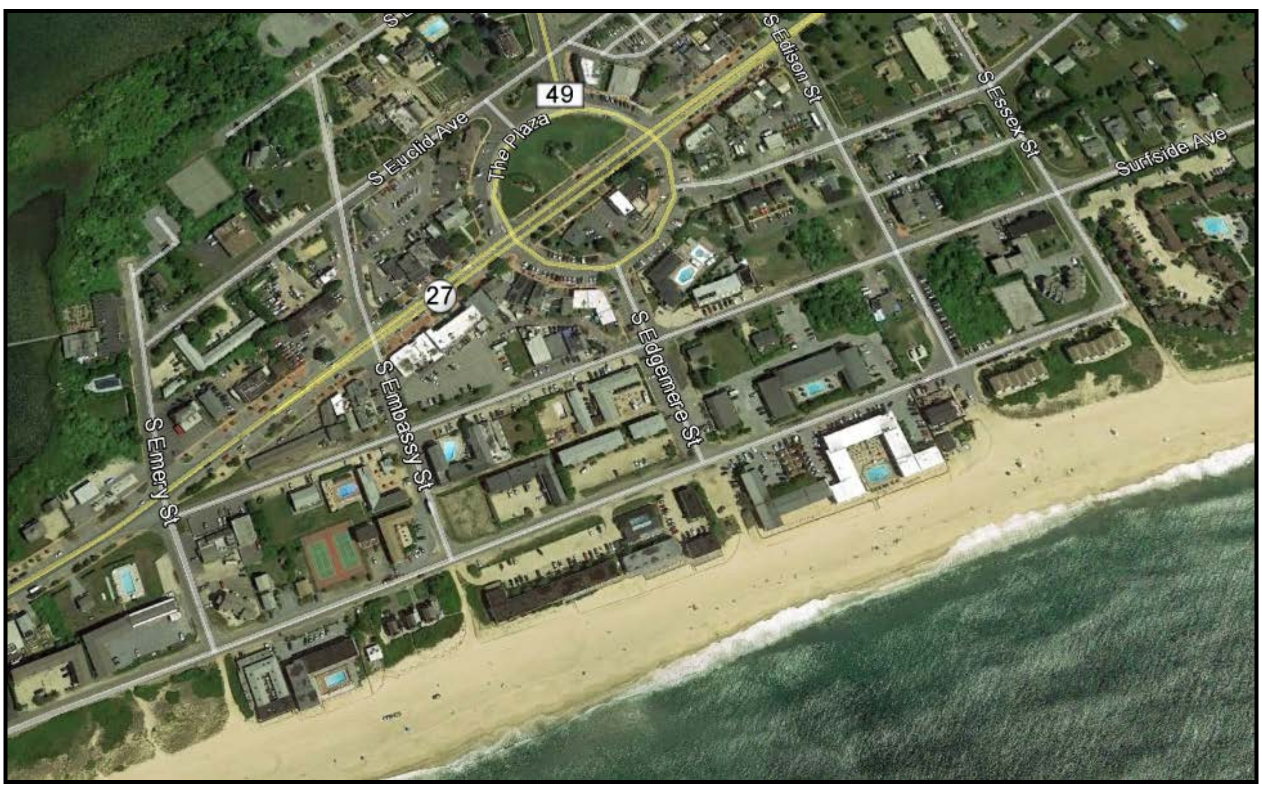

Figure 23: Public Access

7.0 PROJECT IMPACTS

Given its limited scope, implementation of the Downtown Montauk project is not expected to have any significant adverse impact on the environment. The following is a summary of potential impacts. Details of specific impacts are outlined in the accompanying EA.

7.1 Human Environment

The construction activities for the Dune Reinforcement Alternative are limited to the shoreline, waterward of existing shoreline structures in downtown Montauk. Therefore, the Dune Reinforcement Alternative would not have a negative impact on the land use in downtown Montauk project area. The proposed project would help prevent damage to and/or the loss of hotels and restaurants in the downtown Montauk project area. Therefore the proposed project would have a positive impact on the land use in the project area. Also, overall, the Downtown Montauk TSP is expected to yield annual storm damage reduction benefits estimated at $728,000. With the Dune Reinforcement Alternative, adverse effects to traffic, transportation, access, and circulation that are expected following a severe storm event under the No Action Alternative would be reduced. The existing road network would continue to function. During construction the Dune Reinforcement Alternative would prevent the use of the beaches in the project area including a small portion of Kirk Park Beach. There would be a temporary impact on recreational use of the area during the construction period. However, the construction activities would not occur during the summer tourist season. The proposed project would prevent the loss of beaches in the project area, and would have a positive impact on the recreational use in the project area.

7.2 Cultural Resources

There are no known resources - terrestrial, underwater, and architectural - that are listed on State or National Registers of Historic Places within the APE that could potentially be impacted by the project. The historic properties in the downtown Montauk area include Second House which was built in 1797 and several Tudor Revival style structures constructed by Carl Fisher in the 1920's. These properties are located outside the APE. The construction activities for the Dune Reinforcement Alternative are limited to the shoreline, waterward of existing shoreline structures and therefore would not adversely impact any of these structures. The added shoreline protection from the Dune Reinforcement Alternative would protect these structures from potential future storm damage. The increased truck traffic necessary to transport sand to the project area could cause vibrations that could damage older structures in the area. To minimize the potential for this impact, truck routes will avoid roads with sensitive structures to the extent practicable.

Because of the dynamic nature of the shoreline environment, no remnant archaeological resources are expected within the dune reinforcement footprint. However, the area is mapped as archeologically sensitive (NYSOPRHP 2014.) During construction, the excavation area will be monitored by a qualified archaeologist. If any archaeological resources are encountered, work will be stopped in the vicinity of the find to determine if the resources are eligible for the National Register of Historic Places and coordinate this determination with the NYSHPO and other interested parties. A Memorandum of Agreement in accordance with the National Historic Preservation Act is provided in Attachment F, Environmental Assessment).

7.3 Physical Environment

The Dune Reinforcement Alternative includes the placement of sand filled geobags below the sand fill along approximately 3,100 feet of shoreline. The dune reinforcement activities will take place waterward of existing shoreline structures to create a design beach and dune profile. There are three major ways that the proposed geobags and sand cover could physically impact the coastal beach environment: 1) the direct deposition of new material cover the existing beach sediments, 2) l modification of the beach (sand/water) interface following material placement; and 3) erosion/transport of the deposited material into tidal waters resulting in increased turbidity in the intertidal and near shore areas. Any impacts to water quality associated with the construction activities would be minor, localized and short term, limited to the construction phase of the project. The project would also alter the beach/dune profile substantially, reducing the potential for breaching and overwash during storm events and creating greater stability of this reach along the shoreline in the project area. The project would facilitate coastal processes, such as longshore sediment transport and dune development and evolution, yielding a benefit to the physical environment.

7.4 Natural Environment

The project would not directly affect the marine nearshore habitat, as all sand placement would be landward of MLW. Likewise, there would be no direct impact to the marine intertidal habitat, as the project footprint is primarily landward of MHW, and incidental sediment transport to the intertidal habitat would be expected to be within the natural variability typical of this dynamic environment. The selected alternative would result in direct sand placement on the marine beach and dunes and swales habitat. In the Project Area, this habitat is subject to heavy human use, particularly during the summer tourist season; impacts to the marine beach and dunes habitat would be short term, with return of affected species within a year. There are no listed species or critical habitats within the Project Area; no impacts to species or habitats are anticipated. Additional details on potential impacts are provided in the accompanying EA.

7.5 Cumulative Impacts

The Council on Environmental Quality (CEQ) definition of cumulative impacts as found in 40 Code of Federal Regulation (CFR) Section 1508.7 is as follows: "Cumulative Impact is the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or nonfederal) or persons undertakes such other acts." Repeated beach renourishment projects, as well as implementation of other emergency projects, may result in cumulative impacts to resources impacted by the overall the Downtown Montauk Stabilization Project area.

With the exception of the authorized but unconstructed Montauk Point Shoreline Stabilization Project, Federal shoreline stabilization projects on the south shore of Long Island are west and down-drift (long-shore current and ocean shoreline sand generally runs east to west of the project site and would not contribute to the cumulative impacts of this project. The Montauk Point project involves the installation of stone revetment which, while it could cause down-drift erosion adjacently west of that project area, is approximately 4.5 mi. east of the Downtown

Montauk project area is therefore not expected to significantly contribute to the cumulative impacts of the proposed action.

Other than beach nourishment projects, local/state actions that are reasonably certain to occur in the project area that could potentially affect fish and wildlife resources include beach maintenance (raking and cleaning), the installation of sand fencing, continued recreational activity, and the maintenance of the proposed action to maintain the sand dune cover to increase the longevity of the proposed alternative.

The cumulative impact assessment of federal nourishment projects on the south shore of Long Island indicate that federal project actions would occur in a dynamic environment whose biotic inhabitants have adapted to these conditions. Studies indicate that borrow area and sand placement areas re-colonize shortly after construction activities are completed. Unlike several of the other projects proposed along the south shore of Long Island the Downtown Montauk project does not propose the use of an offshore borrow area and therefore would not add to the cumulative impacts to the offshore benthic environment. Relative to the categorization provided within Council on Environmental Quality guidance, the cumulative impacts of the Federal projects in the Study Area can be characterized as additive. 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.

Maintenance of the proposed action by the Town of Easthampton and/or the state of New York is expected after the one-time Corps project is complete. Maintenance activities could include: beach scraping (moving of sand existing on the beach to eroded areas); beach nourishment (upland or off-shore borrow areas); installation of sand fencing and/or beach grass plantings; or replacement of damaged GSCs. Each of these activities could have impacts to fish and wildlife resources addressed in the project area.

The area immediately adjacent to the beach and dunes in the Downtown Montauk project area is fully developed and consists of hotels, commercial and residential structures. Therefore, there is no opportunity for early successional communities to evolve in overwash areas in the project area. The extent of these cumulative impacts will be fully vetted in the EIS prepared for the Reformulation Project.

Cumulative impacts of the Downtown Montauk Stabilization Project alternatives evaluated in this EA are discussed in the following paragraphs.

Cumulative Impacts of the No Action Alternative. With the No Action Alternative there would likely be periodic sand placement as a result of local initiatives; however, there would be no federal contribution to the sand placement area in advance of the FIMP Project implementation. The biotic communities in the sand placement would be expected to recover between stabilization projects and abiotic conditions, such as water quality, would be expected to return to pre-disturbance conditions. Cumulative impacts of the No Action Alternative would be most noticeable in the event of a severe storm and resultant damages to structures and the community.

Cumulative Impact of the Preferred Alternative. The cumulative impacts of the Federal projects in the Study Area are uncertain. The coastal barriers were originally 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 coastal regulation and research on coastal barrier island behavior and sea level rise. Under the cumulative effect of natural processes acting on an environment altered by human intervention the proposed Downtown Montauk TSP mediates between managing risk to the community and natural processes. The additive damages to homes, businesses, the area's recreational resources, and its economy would be reduced by the Downtown Montauk proposed 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 Downtown Montauk 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.

Under extreme storm conditions coupled with deterioration of the geotextile fabric of the sand bags, sections or strands of the polypropylene fabric could be released into the environment, contributing to the cumulative inputs of foreign, non-biodegradable debris released to the environment from anthropogenic sources. Strands of material, such as polypropylene, plastic fishing line, etc., poses direct risk to marine life, including marine mammals, sea turtles, and birds as well as fishes, as they can become entangled and unable to swim or feed normally, resulting in injury or mortality. Ultraviolet radiation is expected to degrade the geotextile material into small pieces; reducing the potential for entanglement. Small pieces of foreign matter, particularly plastics, such as the geotextile, pose a physical threat to marine life and can contribute to both direct and indirect impacts on the environment and aquatic species. Ingestion of such materials can physically harm the intestinal tract, or can contribute to malnutrition. Plastic debris accumulated on shorelines or on estuarine and ocean bottoms can damage plants and habitat and prevent re-establishment of native communities, as well as harbor contagions (USEPA 2014).

Measures to Minimize Cumulative Impacts

The Corps will implement the following measures that will avoid and/or minimize some of the project's impacts to fish and wildlife resources:

- The GSCs will be buried with sand to provide suitable dune habitat.
- The grain size of the sand used to bury the GSCs is the same or slightly larger than the native sediment.
- The project is designed to maximize the stability of the GSCs and reduce the potential for undermining and exposure of the GSC which would diminish habitat suitability for affected species.
- 45,000 cy of sand will be obtained from upland sediment sources and will avoid off-shore borrow area ocean bottom disturbances.

The majority of unavoidable impacts associated with the identified federal projects are likely to occur within the borrow areas. The Downtown Montauk TSP will not contribute to these impacts as upland sand sources will be utilized instead of offshore borrow areas. Thus the cumulative effects of this Federal Stabilization project are minimized. Implementation of the maintenance plan for the preferred alternative will minimize the environmental impacts associated with potential deterioration of the geotextile bags and subsequent release to the environment. Also the geotextile bags are not made of plastic and therefore would not be ingested by marine life which similarly happens with clear plastic material.

8.0 PUBLIC LAW 113-2 CONSIDERATIONS

This Hurricane Sandy Reevaluation Report has been prepared in response to and accounting for the Disaster Relief Appropriations Act of 2013 (P.L. 113-2). Specifically, this report addresses:

1. The costs and cost-sharing to support a Project Partnership Agreement (PPA).
2. The specific requirements necessary to demonstrate that the project is economically justified, technically feasible, and environmentally acceptable.
3. The specific requirements necessary to demonstrate resiliency, sustainability, and consistency with the Comprehensive Study.

8.1 Fully Funded and Costs Apportionment

The summary of Total Project Cost for the Downtown Montauk Stabilization is provided in Table 7: Project Costs

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
							Program Year (Budget EC):			2015					
							Effective Price Level Date:			1 OCT 14					
WBS NUMBER *A*	Civil Works Feature & Sub-Feature Description *B*	COST ($K) *C*	CNTG ($K) *D*	CNTG (%) *E*	TOTAL ($K) *F*	ESC (%) *G*	COST ($K) *H*	CNTG ($K) *I*	**TOTAL ($K)** *J*	Spent Thru: 6/3/2014 ($K)	**FIRST COST ($K)**	ESC (%)	COST ($K) *M*	CNTG ($K) *N*	FULL ($K) *O*
17	BEACH REPLENISHMENT	$5,416	$1,491	28%	$6,907	1.6%	$5,501	$1,514	$7,014	$0	$7,014	0.5%	$5,528	$1,521	$7,049
	CONSTRUCTION ESTIMATE TOTALS:	$5,416	$1,491		$6,907	1.6%	$5,501	$1,514	$7,014	$0	$7,014	0.5%	$5,528	$1,521	$7,049
01	LANDS AND DAMAGES	$499	$0	0%	$499	1.6%	$507	$0	$507	$0	$507	0.0%	$507	$0	$507
30	PLANNING, ENGINEERING & DESIGN	$650	$83	13%	$733	2.2%	$664	$85	$749	$0	$749	0.0%	$664	$85	$749
31	CONSTRUCTION MANAGEMENT	$509	$65	13%	$574	2.2%	$520	$67	$587	$0	$587	0.5%	$523	$67	$589
	PROJECT COST TOTALS:	$7,074	$1,639	23%	$8,713		$7,191	$1,666	**$8,857**	$0	**$8,857**	0.4%	$7,221	$1,673	$8,894

Mandatory by Regulation	CHIEF, COST ENGINEERING, Mukesh Kumar		
		ESTIMATED FEDERAL COST:	100% **$8,857**
Mandatory by Regulation	PROJECT MANAGER, Frank Verga	ESTIMATED NON-FEDERAL COST:	0% **$0**
Mandatory by Regulation	CHIEF, REAL ESTATE, Noreen Dresser	**ESTIMATED TOTAL PROJECT COST:**	**$8,857**

The initial construction element includes beach replenishment (i.e. dune reinforcement). In addition, the real estate costs associated with obtaining the required easements for construction as well as the planning, engineering, and design costs and construction management costs are shown in the Total Project Costs table. The estimated costs for each contract are escalated to the midpoint of construction. The Project First Cost is $8,860,000 and the Fully Funded Cost is $8,900,000 as presented in Table 7. A detailed Total Project Cost Summary table is provided in the Appendix G.

P.L. 113-2 states that 'the completion of ongoing construction projects receiving funds provided by this division shall be at full Federal expense with respect to such funds. The Downtown Montauk Stabilization Project has 100% Federal funding (P.L. 113-2). Table 8 indicates the full Federal expense is $8,860,000. Midpoint of construction is 2015Q3.

Table 7: Project Costs

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2015									
						Effective Price Level Date: 1 OCT 14									
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Spent Thru: 6/3/2014 ($K)	FIRST COST ($K)	ESC (%)	COST ($K) M	CNTG ($K) N	FULL ($K) O
17	BEACH REPLENISHMENT	$5,416	$1,491	28%	$6,907	1.6%	$5,501	$1,514	$7,014	$0	$7,014	0.5%	$5,528	$1,521	$7,049
	CONSTRUCTION ESTIMATE TOTALS:	$5,416	$1,491		$6,907	1.6%	$5,501	$1,514	$7,014	$0	$7,014	0.5%	$5,528	$1,521	$7,049
01	LANDS AND DAMAGES	$499	$0	0%	$499	1.6%	$507	$0	$507	$0	$507	0.0%	$507	$0	$507
30	PLANNING, ENGINEERING & DESIGN	$650	$83	13%	$733	2.2%	$664	$85	$749	$0	$749	0.0%	$664	$85	$749
31	CONSTRUCTION MANAGEMENT	$509	$65	13%	$574	2.2%	$520	$67	$587	$0	$587	0.5%	$523	$67	$589
	PROJECT COST TOTALS:	$7,074	$1,639	23%	$8,713		$7,191	$1,666	**$8,857**	$0	**$8,857**	0.4%	$7,221	$1,673	$8,894

Mandatory by Regulation — CHIEF, COST ENGINEERING, Mukesh Kumar

Mandatory by Regulation — PROJECT MANAGER, Frank Verga

Mandatory by Regulation — CHIEF, REAL ESTATE, Noreen Dresser

ESTIMATED FEDERAL COST:	100%	$8,857
ESTIMATED NON-FEDERAL COST:	0%	$0
ESTIMATED TOTAL PROJECT COST:		**$8,857**

Table 8: Cost Allocations

Federal (100%)	$8,860,000
Non-Federal (0%)	**$0**
Total	**$8,860,000**

8.2 Section 902 of WRDA 1986, as amended

P.L. 113-2 included language that changes the applicability of Section 902 of WRDA 1986, as amended, to projects funded by its appropriation. Specifically, it states in Title X, Chapter 4, "…Provided further, that for these projects, the provisions of section 902 of the Water Resources Development Act of 1986 shall not apply to these funds…" There are no Section 902 limits associated with the construction of the project since the project was authorized for construction prior to WRDA 1986.

8.3 Risks, Economics and Environmental Compliance

The prior sections of this report, notably Section 5.3, demonstrate how the recommended alternative reduces flood and coastal storm risks, and contributes to improved capacity to manage such risks. It also identifies that the recommended alternative is economically justified for the authorized period of federal participation.

It is estimated that the reinforced dune provides a level of protection of approximately 25 years (4% annual chance of design exceedance) and that the effective life of this type of structure would be approximately 15 years.

To model the damages with the Stabilization Project in place showing the benefits of the project, the model described in Section 3.3 was configured to allow erosion beyond the +5 foot NGVD contour only after the reinforced dune structure has failed due to either wave action or scour. In the first year of the project life, the dune provides approximately a 1 in 25 year level of protection (4% annual chance of failure immediately following construction) with the annual failure probability rising to approximately 8% (1 in 13 year) by the end of the project life. The increase in annual failure probability of the project over time is presented in Figure 17. The cumulative failure probability of the project is presented in Figure 18, which indicates that the probability that the project will have failed by the end of the period of analysis is almost 60%.

The with-project model outputs were post-processed to derive damage frequency plots for years 1, 5, 10, and 15 in the analysis period. It is evident that while the vulnerability to erosion still increases over time with the project in place, the expected damages are greatly reduced. For example; for the 10% annual chance exceedance event, expected damages in years 1 and 10 are expected to be reduced from $1 million and $3.8 million to zero and $1.3 million respectively.

With project annual damages are estimated to be $326,000 over 20 years at a discount rate of 3.5%.The attached EA has been prepared to meet the requirements of NEPA and demonstrate that the recommended alternative is compliant with environmental laws, regulations, and policies and has effectively addressed any environmental concerns of resource and regulatory agencies.

8.4 Resiliency, Sustainability and Consistency with the Comprehensive Study

This section has been prepared to address how the recommended alternative contributes to the resiliency of downtown Montauk; how the recommended alternative affects the sustainability of environmental conditions in the affected area; and how the recommended alternative will be consistent with the findings and recommendations of the North Atlantic Coast Comprehensive Study (NACCS).

Resiliency is defined in the February 2013 USACE-NOAA Infrastructures Systems Rebuilding Principles white paper as the ability to adapt to changing conditions and withstand, and rapidly recover from disruption due to emergencies.

http://coastalmanagement.noaa.gov/resources/docs/infsysrebuildingprinciples.pdf

Sustainability is defined as the ability to continue (in existence or a certain state, or in force or intensity), without interruption or diminution. The short-term sustainability of the dune reinforcement (5 to 15 years) is tied to beaches ability to recover naturally and the dune to recover through periodic maintenance operations. The recommended plan at Downtown Montauk has a project life of approximately 15 years. The long-term sustainability of the dune reinforcement beyond the project life (e.g. 20 to 50 years) is limited by the durability of the geotextile sand containers (UV degradation and abrasion) and likelihood of continued shoreline erosion (- 3 ft/yr). If the dune reinforcement alternative is combined with other elements of the GRR, such as the possibility of a sediment management feature described as a feeder beach, then the alternative may be viewed as a sustainable solution, albeit requiring periodic replacement of the geotextile sand containers.

The proposed features described in this report represent a resilient, sustainable solution, which reflects a model resilient, sustainable solution that integrates sand based features, improved systems management, integration of nature-based infrastructure, and integrated non-structural plans with improved land management. The beaches and dunes are resilient, in that they can adapt to changes, and can recover after a major disturbance, both through natural recovery of the beach, and through maintenance operations or major rehabilitation of the project.

In assessing consistency with the forthcoming North Atlantic Coast Comprehensive Study (NACCS), it is acknowledged that the results of the Comprehensive Study are not yet available, but that there are overriding principles which have been established for the NACCS that can be addressed for consistency. These principles recognize that preferred plans are those that provide protection with the use of sand features, which are readily adaptable, and could be modified or terminated based upon findings of the NACCS. The NACCS also emphasizes the need for integrated land-use planning, recognizing the need for local adoption of Flood Plain Management Regulations, based upon current understanding of risks.

The proposed features of the Downtown Montauk Stabilization Report are consistent with these principles of the NACCS. The overall risk management is to be provided with a geotextile reinforced dune system that could be readily adapted, based upon future findings. With respect to integrated land management, there are FEMA floodplain regulations and also regulations pursuant to New York State's Coastal Erosion Hazard Act (CEHA), to address development within the primary dune. Recognizing the Federal government's commitment to ensure no inducement of development in the floodplain, pursuant to Executive Order 11988, this project will identify in the Project Partnership Agreement, the need for the local partner to develop a Floodplain Management Plan, and a requirement for the local partner to certify that measures are in place to ensure the project does not induce development within the floodplain.

9.0 PROJECT IMPLEMENTATION

The completion of this Hurricane Sandy Limited Reevaluation Report and recommendation by the District Engineer is the first step toward implementing construction of the Stabilization Project. Upon approval by USACE's North Atlantic Division, the project will be considered for construction with funding made available through P.L. 113-2.

9.1 Construction Schedule

The pre-construction and construction sequence, and time schedule of the Stabilization Project is dependent on the timeliness of this report's approval, the foregoing construction procedures, and the ability of local interests to implement items of local cooperation. These items of local cooperation are principally the furnishing of the required shoreline real estate easements by the State of New York.

The construction schedule is based on a Notice to Proceed (NTP) for construction on January 2, 2015. The total duration of construction is 122 days (4 months), with construction forecast to be completed on May 4, 2015.

9.2 Local Cooperation

The initial project cost of the Stabilization Project will be funded 100% by the Federal Government. A fully coordinated Project Partnership Agreement (PPA) package has been prepared which will be coordinated and executed subsequent to the approval of this document and will serve as the agreement for the next phase of the project. The PPA reflects the recommendations of this Hurricane Sandy Limited Reevaluation Report. The non-Federal partner, NYSDEC, has indicated support for evaluating a stabilization project for downtown Montauk, and will provide a letter of support with the final report, stating their willingness to execute a PPA for the Montauk Stabilization Project.

As the non-Federal project partner, NYSDEC must comply with all applicable Federal laws and policies and other requirements, including but not limited to:

1. In coordination with the Federal Government, who shall provide 100% of the initial project cost,

    a. Provide all lands, easements, rights of way and relocations (LERR) determined by the Federal Government to be necessary for the initial construction and operation, and maintenance of this project.

    b. Provide all improvements required on lands, easements, and rights-of-way to enable the proper disposal of excavated material associated with the construction, operation, and maintenance of the project.

    c. Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law (PL) 96-510, as amended, 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the construction, operation, and maintenance of the Project. However, for lands that the Federal Government determines to be subject to the navigational servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal project partner with prior specific written direction, in which case the non-Federal project partner shall perform such investigations in accordance with such written direction.

d. Coordinate all necessary cleanup and response costs of any CERCLA-regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, or maintenance of the Project.

e. Coordinate mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project.

2. For so long as the project remains functioning, operate, maintain, repair, replace, and rehabilitate the completed project, or functional portion of the project, including mitigation features, at no cost to the Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and any specific directions prescribed by the Government in the Operations, Maintenance, Replacement, Repair and Rehabilitation (OMRR&R) manual and any subsequent amendments thereto.

3. Provide the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal project partner, now or hereafter, owns or controls for access to the Project for the purpose of inspection, and, if necessary after failure to perform by the non-Federal project partner, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the Project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Federal Government shall operate to relieve the non-Federal project partner of responsibility to meet the non-Federal project partner's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance.

4. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the Project and any Project-related betterments, except for damages due to the fault or negligence of the United States or its contractors.

5. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the Project in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Codes of Federal regulations (CFR) Section 33.20.

6. As between the Federal Government and the non-Federal project partner, the non-Federal project partner shall be considered the operator of the project for the purpose of CERCLA

liability. To the maximum extent practicable, operate, maintain, repair, replace and rehabilitate the Project in a manner that will not cause liability to arise under CERCLA.

7. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1790, Public Law 91-646, as amended by Title IV of the Surface Transportation and Unifom1 Relocation Assistance Act of 1987 (Public Law 100-17),and the Unifom1 Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for the construction, operation, and maintenance of the Project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

8. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense directive 5500.11 issued pursuant thereto, as well as Army regulation 600- 7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

9. Participate in and comply with applicable Federal flood plain management and flood insurance programs and comply with the requirements in Section 402 of the Water Resources Development Act of 1986, as amended.

10. Not less than once each year inform affected interests of the extent of protection afforded by the Project.

11. Publicize flood plain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with the protection provided by the project.

12. Prevent obstructions of or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) which might hinder its operation and maintenance, or interfere with its proper function, such as any new development on project lands or the addition of facilities which would degrade the benefits of the project.

13. Provide and maintain necessary access roads, parking areas, and other public use facilities, open and available to all on equal terms.

14. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal project partner has entered into a written agreement to furnish its required cooperation for the project or separable element.

15. At least twice annually and after storm events, perform surveillance of the beach to determine losses or nourishment material from the project design section and provide the results of such surveillance to the Federal Government.

9.3 Operations, Maintenance, Repair, Replacement and Rehabilitation Plan

New York State Department of Environmental Conservation (NYSDEC) as the local partner will be responsible for the Operations and Maintenance (O&M) of the Downtown Montauk Stabilization Project. The O&M Responsibilities will be provided in greater specificity in the OMRR&R Plan (Operations, Maintenance, Repair, Replacement and Rehabilitation Plan), which is provided to the partner after completion of initial construction and describes the specific requirements of the non-Federal partner. The OMRR&R costs are estimated to be $157,000 annually (Table 9).

Table 9: Estimated Annual Maintenance Costs

Item	Quantity	Unit Cost	Cost
Dune Fill	2,754 c.y.	$35	$96,396
Patch & Fill GSCs	78 each	$40	$3,118
Replace GSCs	39 each	$370	$14,419
Geotextile Roll	0.5 each	$1,350	$675
Subtotal			***$114,608***
Contingency	7%		$22,922
E&D	7%		$9,627
S&A	7%		$9,627
Total (Annual)			**$157,000**

Relatively high maintenance costs are associated with the Dune Reinforcement alternative at downtown Montauk for two reasons:

1. The GSCs should remain covered by a layer of sand to protect against UV degradation, vandalism, and debris.

2. Unlike typical beachfill projects, the dune is not protected by a wide design berm. As a result the dune is vulnerable to erosion during storm events.

Maintenance of the Dune Reinforcement alternative entails: a) trucking in sand in response to storm events which result in dune volume losses; and b) effort required to patch & fill or replace GSC damaged during a storm events. The required maintenance quantities were estimated based on Multivariate Empirical Simulation Technique (EST) results, recession of the 10 foot NGVD contour, for an eroded beach profile at downtown Montauk

Figure **24.** The purpose of the reinforced dune core (GSC) is to prevent erosion landward the reinforced core during storm events. Therefore, the dune recession EST results were adjusted to capture the reduction dune recession and dune volume loss caused by the presence of the reinforced core (GSC).

An estimate of the number of bags that would be damaged during storm events is estimated based on the likelihood that the GSC would be uncovered (roughly 5 year event) as well as the likelihood that the GSC would be subjected to large waves that have the potential to dislodge the GSC or carry debris up the GSC slope and puncture the containers.

One of the important variables applied in the estimate is the permanent loss factor. The permanent loss factor defines the percentage of sediment that is eroded from the beach and lost from the system. Typically a permanent loss factor between 10% and 30% is used in beachfill projects when estimating emergency rehabilitation volumes. However, a value of 50% was applied in this alternative because the eroded material is coming from the dune and not primarily from the berm. A value less than 100% was selected because the eroded dune material will not be completely lost from the system. A large percentage of the eroded dune material will likely be transported seaward and stored in a sand bar. During non-storm conditions the sediment in the sand bar will be gradually transported back to the berm. This process often takes days, weeks, or even a few months (i.e. summer/winter beach profiles). Longer time scales (e.g. months/years) are typically required for the dune to be naturally restored by aeolian transport. For this project it is assumed that a portion of the dune maintenance fill (50%) will be recovered from the system through naturally processes or beach scraping.

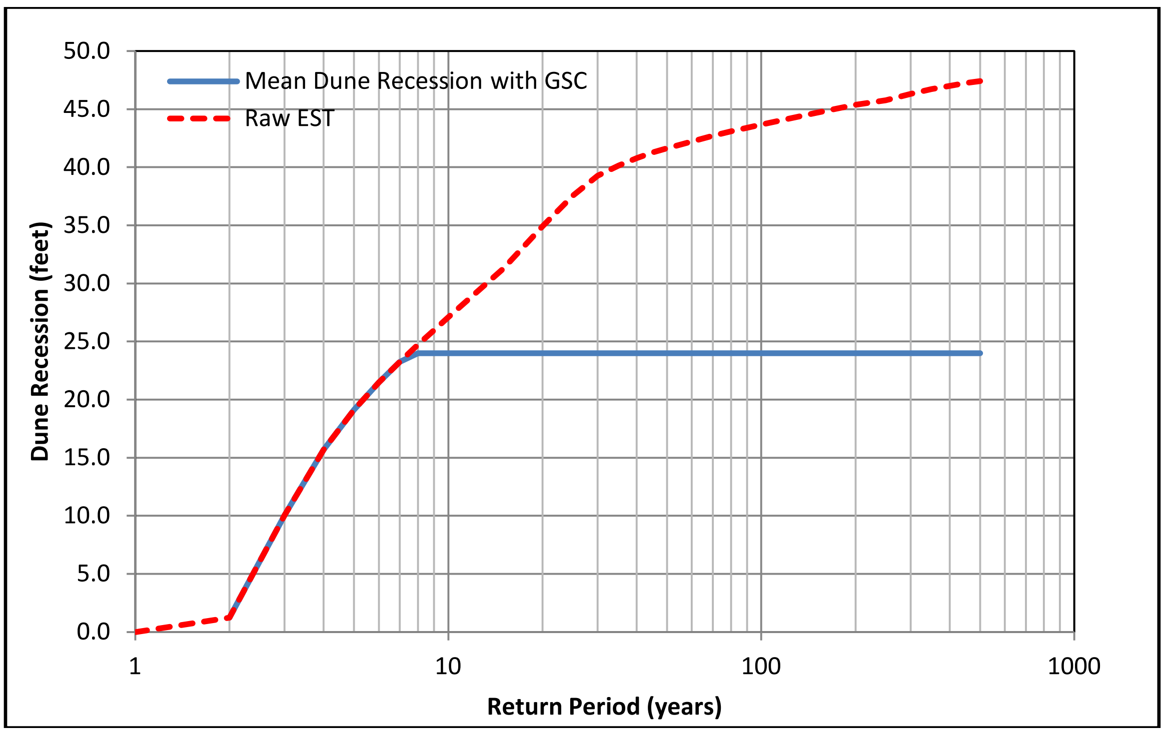

Figure 24: Storm Induced Dune Recession

9.3.1 *NFS Administrative and Operational Responsibilities:*

- Maintain public ownership and public use of the Project Area which are the basis of the Federal participation in the project. This includes preventing trespass or encroachment by private interests by the placement, onto these shores or within the seaward portion of the project, of any temporary or permanent structures, except as specifically permitted by the District Engineer or authorized representative.
- Prohibit any excavation of or construction on, over, under, or through the dune or beach berm, without prior written approval of the District Engineer or authorized representative
- Prohibit alterations in any feature of the beach fill that may affect its functional performance unless prior written approval has been obtained from the District Engineer
- Prohibit unauthorized vehicular traffic on the beach and restrict authorized vehicle access to authorized access ways.
- Assure that no drains discharge onto the beach.
- Remove all trash and debris from beach (day to day operations of the facilities).
- Permit the District Engineer or authorized representative access to the project at all times.
- Maintain organized records of activities and costs covering maintenance, operation, inspection, repair and replacement of protective works
- Participate in a yearly joint inspection of the project with personnel from the New York District.
- Ensure that safe operation of recreational activities continues during construction and maintenance operations.

9.3.2 *Maintenance Responsibilities:*

- Repair (patch and fill) or replace any damaged Geotextile Sand Containers.
- Take measures to prevent sand from blowing off the dune and berm onto nearby streets and into adjacent properties, including deploying and keeping sand fences in an upright position and in serviceable condition.
- Undertake semi-annual Inspections of the dunes as well as before and after each tropical and extratropical storm.

9.3.3 *Reporting Responsibilities:*

- Provide semi-annual Inspection Reports
- Provide organized records of activities and costs covering maintenance, operation, inspection, repair and replacement of protective works.
- Contact the District Engineer if at any time storm or other erosion reduces the berm to below the minimum beach fill cross-section width and maintenance measures to move sand from accreted areas to eroded areas prove inadequate to restore the design section.

10.0 FINDINGS AND CONCLUSIONS

The effects of Hurricane Sandy on downtown Montauk have made project implementation imperative to restore and reinforce the dune system to provide storm damage protection to vulnerable oceanfront commercial structures. In light of the changes provided in P.L. 113-2 with regard to the urgency, and cost-sharing of project implementation, the District recommends that the above project be implemented in accordance with this Hurricane Sandy Limited Reevaluation Report and the provisions of PL113-2 as a stabilization project.

The District has given consideration to all significant aspects in the overall public interest, including environmental, social and economic effects, engineering feasibility and compatibility of the project with the policies, desires and capabilities of the State of New York and other Federal and non-Federal interests. The project's annual benefits and annual costs were updated to FY 2014 price levels and are $1,237,000 and $918,000 respectively. The updated Benefit to Cost Ratio is 1.4 (at 3.50% FY14 Discount Rate). The project is economically justified and the District recommends that the Stabilization Project be constructed at first cost of $8,860,000 that has a fully funded project cost (FY 2014 PL) is $8,900,000 (based on an estimated March 2015 midpoint of construction).

11.0 RECOMMENDATIONS

Prefatory Statement

In making the following recommendations, I have given consideration to all significant aspects of this study as well as the overall public interest in eliminating or reducing storm damage within the Fire Island to Montauk Point Study Area and the Downtown Montauk Project Area in particular. The aspects considered include engineering feasibility, economic effects, environmental impacts, social concerns, and compatibility of the project with the policies, desires, and capabilities of the local government, State, Federal government, and other interested parties.

Recommendations

A number of alternatives have been examined as part of the ongoing FIMP study and a Tentative Federally Selected Plan has been identified. That plan may be further refined during completion of the overall FIMP Reformulation Study, the Hurricane Sandy General Reevaluation Report (HSGRR). However, in accordance with the current analysis and the guidance outlined in P.L. 113-2, the Downtown Montauk Stabilization Tentatively Selected Plan described in this report is acceptable to the non-Federal partner, agencies, and stakeholders as a one-time action, stand-alone stabilization project for immediate implementation.

Due to the currently degraded condition of the dunes at downtown Montauk as a result of Hurricane Sandy, it is recommended that this stabilization project be constructed as authorized by P.L. 113-2. I make this recommendation based on findings that the Stabilization Plan constitutes engineering feasibility, economic justification, and environmental acceptability. These recommendations are made with such further modifications thereof, as in the discretion of the MSC may be advisable, at a project first cost of $8,860,000 and at fully funded cost of $8,900,000 (based on an estimated March 2015 midpoint of construction), provided that non-Federal interests comply with all the requirements substantially in accordance with the Project Partnership Agreement which will be executed upon approval of this report.

Disclaimer

The recommendations contained herein reflect the information available at this time and current Department policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of the national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to higher authority as proposals for authorization and/or implementation funding.

Paul E. Owen
Colonel, U.S. Army Corps of Engineers
District Engineer

12.0 REFERENCES

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APPENDIX A

PROJECT AREA STORM HISTORY

APPENDIX B

EXISTING PHYSICAL CONDITIONS

APPENDIX C

PLAN SHEETS

APPENDIX D

BACK-UP CALCULATIONS

APPENDIX E

PUBLIC ACCESS PLAN

APPENDIX F

REAL ESTATE PLAN

APPENDIX G

COST APPENDIX

APPENDIX H

PERTINENT CORRESPONDENCE

APPENDIX I

NYSDEC LETTER OF APPROVAL