Lake Montauk Harbor, East Hampton, NY
Navigation Improvements
Feasibility Study
Draft Feasibility Report
July 2019

New York State
Department of
Environmental Conservation

U.S. Army Corps of Engineers
North Atlantic Division
New York District

EXECUTIVE SUMMARY

This Study has determined that insufficient channel and harbor depth of the existing navigation project at Lake Montauk Harbor, NY, is causing problems and economic inefficiencies to the commercial fishing fleet that use the harbor. In addition, periodic coastal storms, such as tropical storms, hurricanes, and nor'easters, pose a severe threat to life and property along the Block Island Sound shoreline, within the first mile west of the harbor inlet. There is an opportunity to provide more reliable navigation in Lake Montauk Harbor and an incidental opportunity to respond to the erosion damages on the shoreline west of the inlet jetties by the placement of dredged sand from the navigation channel on the beach as the least cost disposal method. This placement of dredged sand could provide coastal storm risk management benefits ancillary to navigation improvements. In response to these problems and opportunities, plan formulation activities considered a range of measures as documented in this draft Feasibility Report. Through an iterative plan formulation process, potential navigation improvement measures were identified, evaluated, and compared.

Alternative navigation improvement plans under consideration included authorizing the existing channel to a deeper depth and creating a deposition basin next to the east side of the authorized channel. The Project identified as the Tentatively Selected Plan (TSP) includes deepening of the existing navigation channel from --12 feet MLLW to a depth of -17 feet MLLW, creating a deposition basin immediately east of the channel at a width of 100 feet, and placing the dredged material on the shoreline west of the inlet for a distance of 3,000 feet and a width of 44 feet. The exact dimensions of the project will be determined during the optimization phase of the Study, which follows public and agency reviews of this report.

The estimated total first cost for project implementation is $3,632,000 (Fiscal Year 19 Price Level), to be cost shared 90% Federal and 10% non-Federal. The non-Federal sponsor will also be required to make an additional contribution of ten percent of the cost of design and construction once initial construction is completed. The estimated present worth of future maintenance is $3,836,000 which will be 100% at Federal expense. It is important to note that this expense is less than what maintenance would cost the Federal government if the project were not constructed (this cost savings for this alternative is counted as a benefit). Annual net benefits are in the amount of $2,353,000 (including incidental coastal storm risk management benefits accrued from the initial placement of the dredged material on the shoreline west of the inlet in the amount of $175,000/yr)and the benefit cost ratio is 18.1 to 1.

The non-Federal study sponsor, New York State Department of Environmental Conservation (NYSDEC), has indicated its support for the TSP subject to its public review. NYSDEC cost-shared its portion of the study cost with a local sponsor, the Town of East Hampton. East Hampton would serve as the non-Federal sponsor for design and construction because navigation improvement is outside of NYDDEC's departmental mission. Subject to report finalization, East Hampton has indicated its willingness to enter into Project Partnership Agreements (PPAs) with the Federal Government for the design and the construction of the Recommended Plan if the Project is implemented as a congressionally authorized project. Alternatively, the Project could be implemented under the Continuing Authorities Program, Section 107 of the River and Harbor Act of 1960 as amended (33 U.S.C. Section 577).

PERTINENT DATA

DESCRIPTION
The Tentatively Selected Plan (TSP) for the Lake Montauk Harbor, New York navigation improvement feasibility Study provides for deepening the existing Federal channel to a depth of -17 feet MLLW and the creation of a deposition basin 100 feet wide immediately east of the channel. Disposal of dredged material will take place on the shoreline west of the inlet over the first 3,000 feet.

LOCATION
The study area is located in East Hampton, Suffolk County, NY, to include Lake Montauk Harbor as well as the inlet connecting it to Block Island Sound and along the Block Island Sound shoreline west (and also east, to consider sediment transport).

FEATURES
The project is deepening the existing Federal navigation channel to depth of -17 feet MLLW, creating a deposition basin immediately east of the channel at a width of 100 feet, and placing the dredged material on the shoreline west of the inlet for a distance of 3,000 feet.

REAL ESTATE REQUIREMENTS
The project will require easements for construction in the form of a non-standard estate. The estimated cost for real estate to obtain the easements is $248,000.

Easements	2.45 acres

PROJECT COSTS (FY 2019 price levels)

Initial Project First Cost	$3,632,000
Present Value of Maintenance Costs	$3,836,000

ECONOMICS (FY 2019 price levels)

Annual Project Cost (Discounted at 2.875% over a 50-year period)	$ 138,000
Average Annual Benefits (Discounted at 2.875% over a 50-year period)	$2,491,000
Average Annual Net Benefits	$2,353,000
Benefit Cost Ratio	18.1:1

COST APPORTIONMENT (FY 2019 price levels)

Fully Funded Project First Cost	$3,872,000
Federal (90%)	$3,485,000
Non-Federal (10%*)	$387,000

**The non-Federal share requires that 10% ($387,000) be provided upfront; an additional 10% ($387,000) must be paid after construction is completed, allowing for payment to occur for a period of up to 30 years at a rate equivalent to current Department of the Treasury bond rates.*

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Chapter 1: Introduction

1.1 Study Purpose and Scope

The U.S. Army Corps of Engineers (USACE) North Atlantic Division (NAD), New York District (NAN) prepared this draft Feasibility Report for Lake Montauk Harbor, New York, Navigation Improvements Study. It includes input from the non-Federal Study partner, local governments, natural resource agencies, and the public. This report presents potential solutions to improve navigation in and around the Lake Montauk Harbor inlet in the Town of East Hampton, Suffolk County, New York (Figure 1).

Figure 1. Study Area in East Hampton, Suffolk County, New York

The Federal objective of water and related land resources project planning is to contribute to national economic development (NED) consistent with managing and reducing risk to the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements (Principles and Guidelines (P&G), 1983). Water and related land resources projects are formulated to alleviate problems and take advantage of opportunities in ways that contribute to this objective. This feasibility report will: (1) summarize the current and potential water resource problems, needs, and opportunities for navigation improvement in and around the Lake Montauk Harbor study area; (2) present and discuss the results of the plan formulation for water resource management solutions; (3) identify specific details of the Tentatively Selected Plan (TSP), including inherent risks and (4) determine the extent of Federal interest and local support for the plan.

1.2 Purpose and Need for Action

The purpose of the Study is to determine if Federal participation is warranted in providing engineeringly feasible, economically justified, and environmentally acceptable improvements to

the Federal Navigation Project at Lake Montauk Harbor, New York. The need for the Study stems from insufficient depth in the Federally-authorized inlet channel, currently only -12 feet Mean Lower Low Water (MLLW), and in the harbor for many vessels due to increased vessel size. Further, maintaining the channel depth and width has become more difficult with the accretion of sand on the eastern side of the east jetty through and around which sand migrates generally to the west into the channel.

1.3 Study Authority

The study is being conducted under the authority of two Congressional resolutions. First, a resolution was adopted by the United States Senate Committee on Environment and Public Works on October 17, 1991:

> *"Resolved by the Committee on Environment and Public Works of the United States Senate, that the Secretary of the Army is hereby requested to review the report of the Chief of Engineers on Lake Montauk Harbor, East Hampton, New York, published as House Document 369, Seventy-sixth Congress, First Session, and other pertinent reports, with a view to determining if further improvements for navigation are advisable at this time. Beneficial use of any dredged material for improvements to the environment should also be considered."*

In accordance with this resolution, the reconnaissance report was completed in May 1995. It also recognized that there were erosion problems on the shoreline west of the inlet partially related to the navigation project and opportunities for multipurpose solutions. With this finding, the scope of the study was further expanded by authority of a resolution adopted by the United States Senate Committee on Transportation and Infrastructure on May 22, 2002:

> "*Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That, the Secretary of the Army is requested to review the report of the Chief of Engineers, published as House Document 369, 76th Congress, 1st Session, and other pertinent reports, to determine whether modifications to the recommendations contained therein in the interest of navigation improvements, to include beneficial uses of dredged material and sand-bypassing, in accordance with Section 110 of the River and Harbor Act of 1962, to determine the need for measures to address storm damage reduction, shoreline protection, environmental restoration and protection and allied purposes in the vicinity of Lake Montauk Harbor, East Hampton, New York*."

A Feasibility Cost Sharing Agreement (FCSA) under this 2002 authority was signed with the non-Federal sponsor on 24 February 2003. Following Hurricane Sandy in 2012, the Lake Montauk Harbor study was identified in the May 2013 Second Interim Report to Congress in response to the Disaster Relief Appropriation Act of 2013 (PL 113-2) as a feasibility study to be completed at 100% Federal expense. The study was re-scoped to focus on coastal storm risk management (CSRM) as an interim response to the original congressional authorities, and a FCSA amendment was signed on 31 March 2014, with a separate response to the navigation improvement purpose to be completed in the future. A TSP for CSRM was identified and coordinated with the Non-Federal sponsor and its local partner, the Town of East Hampton, in 2016. Feedback from public meetings indicated a lack of non-Federal support for the CSRM TSP. The non-Federal sponsor, by letter dated 6 April 2017, requested that this study focus on navigation improvements only. By memo dated 15 May 2017, the U.S. Army Corps of Engineers New York District responded to this request and is now completing the study to recommend navigation improvement only. The recommendation of this study will be a partial response to the 2002 congressional authorization because the non-Federal sponsor would not agree to a TSP for CSRM and now requests this

scope for the study. As PL 113-2 funding is solely for CSRM studies and projects, the Lake Montauk Harbor study is being completed with cost-shared funds on hand under the original 2003 FCSA that included navigation as a project purpose.

1.4 The Planning Process

In compliance with the USACE planning process, this draft Feasibility Report is being released for concurrent public and agency technical review of the TSP. For the TSP, the Study team has evaluated an array of alternatives to arrive at a selected alternative of authorizing the existing channel to a deeper depth of -17 feet MLLW and a lateral deposition basin immediately east of the channel 100 feet in width. The exact details will be determined in a process called optimization. Optimization of the TSP happens after comments from public review and agency review are received and incorporated into the draft report package. Through optimization, the TSP becomes the Recommended Plan. Following final rounds of agency reviews, the Study team will prepare a Final Feasibility Report to present the Recommended Plan.

1.5 Prior Studies, Reports, and Existing Water Projects

The navigation channel was initially improved by private interests beginning in 1914 and was studied by the Corps of Engineers beginning in 1935 with a report in 1939 recommending maintaining a channel -12 feet deep MLLW, 150 feet wide, extending from the 12-feet contour in Block Island Sound to the same depth in the existing yacht basin east of Star Island; a boat basin -10 feet deep MLLW and 400 by 900 feet northwest of Star Island; and the repair and extension shoreward of the east and west jetties. A 1967 General Design Memorandum recommended the following improvements: raising the west jetty crest elevation by 2 feet to match all other sections of the east and west jetties and the addition of sport fishing facilities on top of both jetties.

Recently, navigation problems in Lake Montauk Harbor (as well as storm damages west of the harbor inlet) were identified in the 1995 Reconnaissance Report of the area. This, as well as other relevant studies, reports, authorizations, as well as projects pertaining to Lake Montauk Harbor, are summarized in Table 1.

Table 1: Historical Summary of Lake Montauk Harbor

Date	Historical Item/Event
1914	Private interest constructs a timber bulkhead across the inlet at Lake Montauk Harbor.
1926	Two parallel stone jetties were constructed by private interests to protect the harbor entrance. An approximately 700' long west jetty and a 750' long east jetty are separated by a distance of 500 feet.
1927	Dredging of the entrance channel and yacht basin by private interests.
1935	Section 3 of the River and Harbor Act directed a survey investigation of Lake Montauk Harbor.
1936	The Chief of Engineers authorized the survey investigation for the assessment of Federal participation in further improvements and maintenance of the privately owned Lake Montauk Harbor development.
1939	In response to a U.S. House Resolution, adopted by the Committee on Rivers and Harbors, a second report was prepared, including the results of the previous unpublished report of 1938. This report contained a favorable recommendation for the following improvements: a channel 12 feet deep at MLW, 150 feet wide, extending from the 12-foot contour in Block Island Sound to the same depth in the existing yacht basin east of Star Island; a boat basin

Date	Historical Item/Event
	10 feet deep at MLW and 400 by 900 feet northwest of Star Island; and the repair and extension shoreward of the east and west jetties.
1942	Federal extension of west jetty shoreward. The work was accomplished at the request of the U.S. Navy with Navy funds. The U.S. Army Corps of Engineers supervised the work. The west jetty was extended 280 feet with crest elevation at +8 feet MLW. The total length is 981 feet.
1942-1943	Entrance Channel was dredged to -12 feet MLW, and to a width of 150 feet. The work was accomplished at the request of the U.S. Navy with Navy funds. The U.S. Army Corps of Engineers supervised the work.
1945	The River and Harbor Act of 2 March 1945 authorized the recommended Federal project.
1949	The first dredging project authorized by Congress began.
1967	General Design Memorandum for Lake Montauk Harbor, New York was prepared. The initial project was well justified with a BCR of 1.8. The benefits were primarily recreational. Work remaining from the authorized project: dredging of the boat basin, extension of the east jetty, and repairs to the east and west jetties. Modification to the plan as contained in the authorizing document includes: raising the west jetty crest elevation to +8 feet MLW during repair from present +6 feet, to match all other section of the east and west jetties, and the addition of sport fishing facilities on top of both jetties.
1968	East jetty extended shoreward 350 feet with crest elevation to +8 feet MLW. Length becomes 750+350=1,100 feet Initial dredging of boat basin to -10 feet MLW. Repair of the east and west jetties. Added jetty sport fishing facilities.
1991	U.S. Senate Resolution adopted by the Committee on the Environment and Public Works for authorization of a shallow draft navigation reconnaissance study at Lake Montauk Harbor, New York.
1995	Lake Montauk Harbor, New York Reconnaissance Report completed.
1995	Rehabilitation of East Jetty
1998	Partial Removal of Inner Harbor Shoal
1999	Advance maintenance dredging conducted by USACE for NYSDEC under Support for Others Program
2002	Lake Montauk Harbor Navigation and Storm Damage Improvement Feasibility Study Authorized with NYSDEC as Local Sponsor.
2003	Feasibility Cost Sharing Agreement (FCSA) with NYSDEC for this multipurpose coastal storm risk management and navigation study and report signed.

1.6 Study Area

The study area is the area within which significant project impacts may occur. The study area and its existing conditions are described in this study as Lake Montauk and the harbor itself, including the Federally-authorized navigation channel, and the Block Island Sound shorelines bounded by Fort Pond Bay on the west and Shagwong point on the east.

Lake Montauk Harbor is on the northern shore of the south fork of Long Island, three miles west of Montauk Point and approximately 125 miles east of New York City. It is within the Town of East Hampton, Suffolk County, New York (Figure 1). The harbor is landlocked on the east, south,

and west sides and connected on the north side with Block Island Sound through a stabilized inlet. The study area also encompasses the Block Island Sound shorelines bounded by Fort Pond Bay on the west and Shagwong point on the east. These extended shoreline areas were included in the study area to fully consider the littoral transport system, erosion and accretion problems of the shorelines adjacent to the inlet, and the sources and quantities of material contributing to channel shoaling. The shoreline east of the inlet jetties is accreting and is generally undeveloped parkland. The shoreline to the west of the inlet jetties is eroding and is developed with residential and commercial properties (including rental properties with supporting roads and infrastructure). The inlet jetties are a contributing cause of these erosion problems because they block some sediment flow from the east.

Lake Montauk itself is two miles long in a north-south orientation. It has an average width of 0.7 miles and encompasses 1,037 acres with a mean depth of 7 feet. It is a home port and a port of call for commercial fishing and recreational vessels. There are several marinas for commercial vessels, a yacht club, and small-craft facilities on both sides near the entrance to Montauk Harbor. Two rock jetties stabilize the inlet. The east and west jetties are approximately 1,100 and 980 feet in length, respectively, with top elevations of +8' MLLW. There is a 500-foot separation between them.

Within the stabilized inlet is the Federally authorized channel -12 feet deep at MLLW, 150 feet wide, extending from the 12-foot contour in Block Island Sound to the same depth in the existing yacht basin east of Star Island. The jetties are part of the Federal Navigation Project.

Star Island, located south of the inlet within the lake, is 0.5 miles long in a north-south direction and 0.2 miles wide. It is connected to the mainland by a causeway. A U.S. Coast Guard Station is situated at the northern end of Star Island with direct access to the inlet. Coonsfoot Cove is between Star Island and the western shore of the lake. The Federal Navigation Project also includes a boat basin -10 feet deep at MLLW and 400 feet wide by 900 feet long northwest of Star Island. The channel and turning basin servicing Coonsfoot Cove have been maintained by Suffolk County. There has been extensive development of the Coonsfoot Cove area to provide marine services for commercial fishing vessels, charter boats, and pleasure craft.

1.6.1 Project Area

The project area is the geographical extent designated for the consideration of navigation improvement measures, or the project footprint. The project area is a subset of the study area (Figure 2). It includes the inlet, including the Federally authorized navigation channel, and extends west toward Culloden Point.

1.7 Non-Federal Sponsor

The non-Federal Sponsor for the Study is the New York State Department of Environmental Conservation (NYSDEC). East Hampton is an active participant in the Study and is a local sponsor partnering with NYSDEC per a signed agreement between East Hampton and NYSDEC. On 24 February 2003, the District and NYSDEC executed the FCSA to initiate the feasibility phase with a cost-share of 50% / 50%. The passage of the Disaster Relief Appropriation Act of 2013, Pub. L. No. 113-2, resulted in a FCSA amendment signed on 31 March 2014 for the CSRM purpose of this study to be completed at 100% Federal cost; however, as described in 1.3 above, no TSP for CSRM was supported by the non-Federal sponsor. This study of navigation improvement only now is being completed under the original 2003 FCSA with cost-shared funds on hand. NYSDEC has indicated that since their agency does not have a navigation mission that they expect the Town of East Hampton will be the non-Federal partner for construction of this project.

Figure 2: Lake Montauk Harbor Study Area and Project Area

Chapter 2: Existing Conditions

Existing conditions, which serve as the basis for the characterization of problem identification and projection of future without project conditions, are described in this section. Existing conditions are described through the environmental setting, the built environment, and the human environment.

2.1 Existing Conditions Affected Environment

2.1.1 Land Use, Geology, Topography and Soils

2.1.1.1 Land Use

The land use in the extended study area includes parkland, commercial and private marinas, vacation rental properties, and private residences. Immediately west of the inlet on Block Island Sound is a beach owned by the Town of East Hampton open to the public. The Town beach is widened to varying widths, with no engineering design, upon the placement of maintenance dredging material, but over the last few decades it rapidly eroded to just a sliver of beach at high tide. Due to recent storms there is little, if any, dry beach seaward of the bulkheads and dunes/bluffs.

The area east of the inlet is a park owned by the Town for the first 500 feet east of the inlet and beyond that first 500 feet are park lands owned by Suffolk County. The Suffolk County shores further to the east are used in the warmer seasons for camping and recreational vehicle (RV) use. The land east of the east jetty can be subject to erosion during storms, but more typically this shore is growing in width and elevation especially closer to the east jetty which impounds littoral material transported from the east.

As for the shoreline inside of Lake Montauk inlet, currently approximately 75% is tidal wetland, which is a decrease over the past three decades as a result of development. Moving southeast inside the Lake the shore is heavily developed with marinas for commercial and recreational fishing including headboats which take customers out for fishing trips. The marinas have a total of approximately 1,235 dockside slips. Currently, the largest slip is 70 feet long. A few of the marinas have slips designated for transient boats and fishing and charter boats. Lake Montauk Harbor has two town docks, one named Star Island and the other Montauk Dock with 23 and 17 slips, respectively. Nearly all of these slips are occupied. About 400 additional moorings are used by transients during the summer. The demand for moorings is greater than the availability by 200 moorings. The docks are backed by marinas, fish storage or handling facilities, and restaurants and seafood snack bars.

2.1.1.2 Subsurface and Surface Geology and Topography

The study area is located in the Atlantic Coastal Plain physiographic province, which extends along the eastern United States and consists of loose, unconsolidated Cretaceous to recent sediments resting on a deeply buried crystalline rock floor. The main body of Long Island divides into two branches at the head of Great Peconic Bay. The backbone of the Island in the main body consists principally of two moraine ridges of Pleistocene age, the Harbor Hill Moraine and the Ronkonkoma Moraine. The moraine and outwash accumulations associated with the glacial or recent epochs constitute the greater portion of both the surface and underlying materials throughout the entire island. Logs of exploratory borings made by the Suffolk County Highway Department in connection with proposed bridge and highway construction and by the New York City Board of Water Supply in connection with investigation of water supply sources on Long Island are indicative of the material underlying the general area. An examination of these data

shows that sand, or sand and gravel, predominate to depths of over 100 feet. At Montauk Point, to the east of the study site, the shoreline is characterized by a series of bluffed headlands formed by erosion of the face of the Ronkonkoma Moraine, with some nearly vertical bluffs rising to a height of almost 70 feet above sea level. The shoreline from Montauk Point westward to Fort Pond Bay, the western limit of the study area, is a succession of wave-formed beaches. The beaches are backed by sand dunes or coastal bluffs with widths ranging from 20 to 50 feet and heights ranging from 10 to 25 feet above mean sea level. At most parts of the shoreline west of the inlet, narrow beach at low tide and a mild foreshore slope backed by a steep dune or bluff face characterizes the beach profile; in recent years there has been little, if any, dry beach seaward of the bulkheads and dunes/bluffs.

2.1.1.3 Soils

Littoral material on the study shoreline is predominantly sand and gravel. On the westward 5,100 feet of shoreline next to the inlet, beach sand due to erosion has been reduced to a gravel beach. Two sediment samples were collected at the east and west sides of the inlet in October 1994, representing typical beach sand sizes in the study area. The sand samples were tested for grain size distribution. The littoral material is predominantly light to brown fine to medium sand. The median sand size at the east shoreline is approximately 0.4 mm. The median size at the west shoreline is approximately 0.24 mm. The finer sediment size at the west shoreline is believed to be material from channel dredging, consistent with the dredged material in the channel and boat basin indeed being predominantly comprised of fine to medium sand with traces of silt.

2.1.2 Water Resources

2.1.2.1 Surface Water

Impacts from post WWII development along the Lake shoreline include loss of submerged aquatic vegetation via direct removal and loss due to increased turbidity and changes in benthic substrate. Upland runoff carrying pesticides and fertilizers has degraded near shore benthic areas as well as caused further increases in turbidity in Lake Montauk. It is likely that commercial and recreational boat usage within the Lake is also a significant contributor of pollutants to the Lake. However, water quality within the Lake Montauk watershed and its nearby beach shorelines are assigned a “Class SA” water quality classification by NYSDEC. Class SA surface waters are defined within the New York State Codes, Rules as saline surface waters best used for shell fishing for market purposes and primary and secondary contact recreation and fishing; Class SA surface waters are considered suitable for fish propagation and survival. Lake Montauk is a well-mixed estuary in the northern two-thirds of the Lake and a partially mixed estuary in the southern third. Water circulation is impeded by Star Island and causeway; two one-way valves underlying the causeway to Star Island, which were installed to increase tidal flushing north of the causeway, have silted in and are not functioning properly. Water circulation in the lake is also impeded by the presence of bottom vegetation, such as eelgrass (*Zostera marina*) and green fleece (*Codium fragile*).

Together with Lake Montauk several fresh waterbodies are present within the Montauk watershed, including Peter’s Run, Stepping Stones Pond, and Little Red Pond.

2.1.2.2 Groundwater

Groundwater recharge for Montauks’ principle aquifer is precipitation which amounts to about 50 inches per year. Suffolk County Water Authority supplies water to most dwellings on the west of Lake Montauk. Dwellings on the east side of the Lake obtain potable water from individual wells or from the Capuso Water Company.

2.1.2.3 Wetlands

The NYSDEC has identified 20 freshwater wetlands within or partially within the Lake Montauk Watershed. These areas comprise approximately 700.3 acres of wetland systems, 431.3 acres of which are located within the watershed. It is noted that the largest freshwater wetland, MP-2, is associated with Big Reed Pond located in the northeastern portion of the watershed and is approximately 197.3 acres in size of which approximately 106.22 acres are located within the watershed, and is generally of high quality. The only two freshwater wetlands of moderate quality (MP-41 and MP-42) are located in proximity to the southeastern shoreline of the lake while the only two freshwater wetlands of low quality (MP-19 and MP-36) are located in the southern and west-central portions of the watershed, respectively.

The tidal wetlands within the watershed are located where the shoreline intersects and interfaces with tidal waters. These wetlands contain saline waters, which originate from the ocean-fed surface waters associated with the lake. These features are formed by coastal processes and, with the exception of formerly connected tidal wetlands, are subject to tidal influence. These areas are not only vital to the ecological systems to which they serve, but also function to control storm surges during flood and major storm events which may impact sensitive watershed areas.

Tidal wetlands in the study area are generally located around the perimeter of the Lake, or directly adjacent and hydrologically connected to the Lake. Tidal wetlands were predominantly vegetated with salt marsh cord grass (*Spartina alterniflora*), whereas high marsh areas included vegetation such as salt hay (*Spartina patens*), spike grass (*Distichlis spicata*), black grass (*Juncus gerardi*), marsh elder (*Iva frutescens*), and glasswort (*Salicornia spp.*). Tidal wetlands comprise about 75% of Lake Montauk's shoreline (Town of East Hampton 1989). This description is consistent with the current tidal wetland community in the study area, with the exception of a decrease in the amount of tidal wetlands along the Lake Montauk shoreline, due to development in the area since the 1981 survey was conducted.

2.1.3 Coastal Processes

Three primary factors shape coastal zone morphology: 1) ocean factors; 2) beach characteristics; and 3) other natural physical variables. Ocean factors include waves, tidal variations, storm surges, and sea level change. Beach characteristics include beach sediment volume, composition, and grain size. Other natural variables include rainfall runoff, groundwater flow, pore pressures, and existing vegetative cover (Komar 1998). All three factors interact in a dynamic process, which defines the coastal zone area.

Anthropogenic influences often supplement the natural forces and play significant roles in shaping the coastal zone. As shorelines retreat due to long shore currents, wave and tidal action, and storm events, artificial structures are often constructed to slow down or minimize further erosion. These structures typically modify the coastal zone to increase sediment retention within heavily utilized or populated areas (USACE 2000b). Most of Long Island was formed during the Pleistocene Age. The major topographic features of Long Island are the plateaus of the north shore, which are glacial moraines, and the sloping plains of the southern portion of the island (Gross et al 1972).

2.1.4 Sediment Budget

Shoreline and bathymetry change data, as well as channel dredging quantities, formed the primary sources of information for developing a sediment budget for the periods 1892 to 1933 (41 years), and 1933 to 2004 (71 years) using the USACE Sediment Budget Analysis System (SBAS). These time periods were chosen to represent pre- and post-construction intervals relative to initial stabilization of the entrance in 1926. The post-jetty construction period was further subdivided to

develop a recent sediment budget for the 1965-2004 time periods, which captures the effects of major rehabilitation of the entrance structures done in 1968. The results of sediment budget analyses are shown in Table 2, 3, and 4 and are illustrated graphically in Figures 3, 4, and 5. As shown in the figures and tables, net longshore sediment transport is to the west. West-directed transport quantities were determined by balancing volume change estimates derived from shoreline change results, offshore losses due to storms, estimates of sediment deposition inside the harbor, and dredging quantities placed on the beach west of the entrance harbor jetties. Channel maintenance dredging of shoaling material has been deposited as beachfill west of the jetties (bypassed) into Reach 4 since 1945. Maintenance dredging data were used to derive average annual beach fill/bypassing rates of 6,100 cubic yards per year for 1933 to 1965, 7,400 cubic yards per year for 1965-2004, and 6,800 cubic yards per year for 1933 to 2004. These channel maintenance bypassing rates are reflected in the sediment budget as inputs into Reach 4 from the east.

Pre-Jetty Construction 1892-1933

The pre-jetty construction sediment budget provides an overview of the un-interrupted shoreline evolution and sediment transport pattern from 1892-1933. As shown in Table 2 and Figure 3, the net sediment transport direction is westward. Erosion of the eastern headland at Shagwong Point provided approximately 15,000 cubic yards per year source of littoral material. The general shoreline between the two headlands (Shagwong Point to the east and Culloden Point to the west) was erosive. There were approximately 20,000 cubic yards per year net sediment transport across the inlet and approximately 30,000 cubic yards per year net transport passing Culloden Point. The majority of the littoral material passing Culloden Point continued moving offshore; creating a sub aerial spit southwest of Culloden Point as shown on the 1933 and 1999 bathymetric maps. The result was a net 10,000 cubic yards per year sediment deficit on the downstream (west of the inlet) shoreline even with a constant supply of 20,000 cubic yards per year of littoral material from upstream shoreline across the inlet before the jetties were constructed.

Post-Jetty Construction 1933-2004

The post-jetty construction sediment budget (Table 3 and Figure 4) represents the general sediment transport pattern and can be used as a basis to predict the future without project sediment transport and shoreline condition at the project site. Based on the 1933-2004 sediment budget, the available upstream littoral source entering Reach 6 was reduced to 13,000 cubic yards per year. Approximately 5,000 cubic yards per year of that littoral material was retained in the east sediment fillet (east of east jetty) while the rest was bypassed onto the downdrift shoreline via maintenance dredging or lost permanently offshore. Even with 7,000 cubic yards per year sand being bypassing at the inlet, approximately 23,000 cubic yards per year leave the project area at Culloden Point, which results in the downdrift shoreline west of the inlet experiencing erosion at a rate of 16,000 cubic yards per year.

Recent Time Period 1965-2004

In the second half of the post-jetty period (1965-2004), due to slow-down bluff erosion (providing littoral material source) and man-made shore protection structures, the littoral transport rates along the project shoreline have slowed down gradually (Table 4 and Figure 5). As shown in the 1965-2004 sediment budget, the downdrift erosion along shoreline west of the inlet reduced to 12,200 cubic yards per year with approximately same updrift sediment supply as in the overall 1933-2004 time period. The downdrift erosion along shoreline west of the inlet is naturally (that is, even if the jetties hadn't been built), 2 feet/year.

Predicted Future Sediment Budget

Based on the results of the pre-construction, post-construction, and recent sediment budgets, and the observation that the updrift fillet is fully saturated and can no longer impound additional material, the future without project sediment budget was estimated as follows:

Updrift sediment source (Reach 6) to be bypassed: 10,000 - 12,000 cubic yards/year;
Downdrift shoreline net (westward) transport at Culloden Pt: 20,000 cubic yards/year;
Net downdrift shoreline sediment deficit (after bypassing): 8,000 - 10,000 cubic yards/year;
Majority of littoral material passing Culloden Point ends up in sub aerial spit.

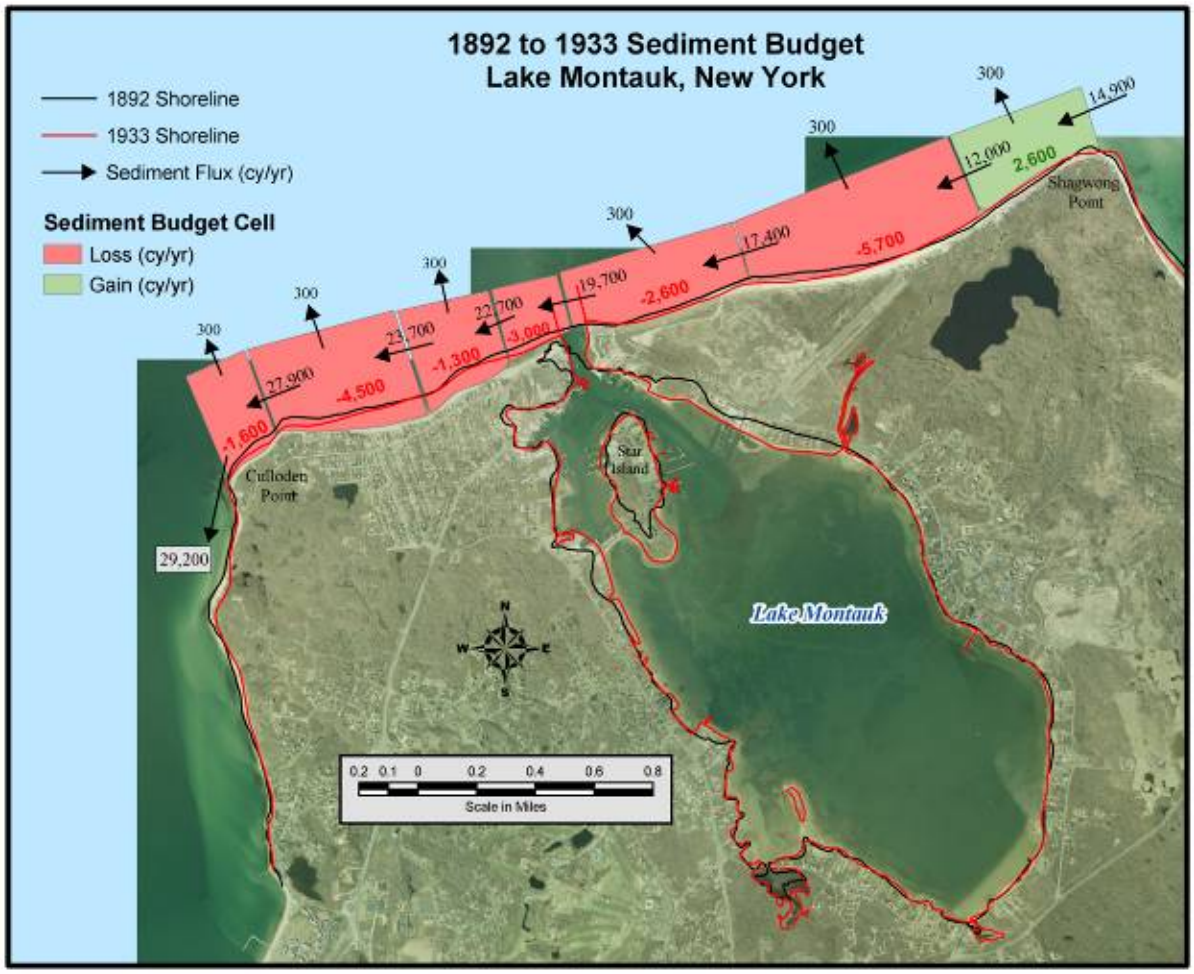

Figure 3: Pre-jetty construction sediment budget

Table 2: Lake Montauk Beach Sediment Budget, 1892 to 1933 (Reaches are west to east)

Reach Number	1	2	3	4	5	6	7	8
Input (+)	27,900	23,700	22,700	19,700		17,400	12,000	14,900
Output (-)	29,200	27,900	23,700	22,700		19,700	17,400	12,000
Offshore	300	300	300	0		300	300	300
Residual	**-1,600**	**-4,500**	**-1,300**	**-3,000**		**-2,600**	**-5,700**	**2,600**

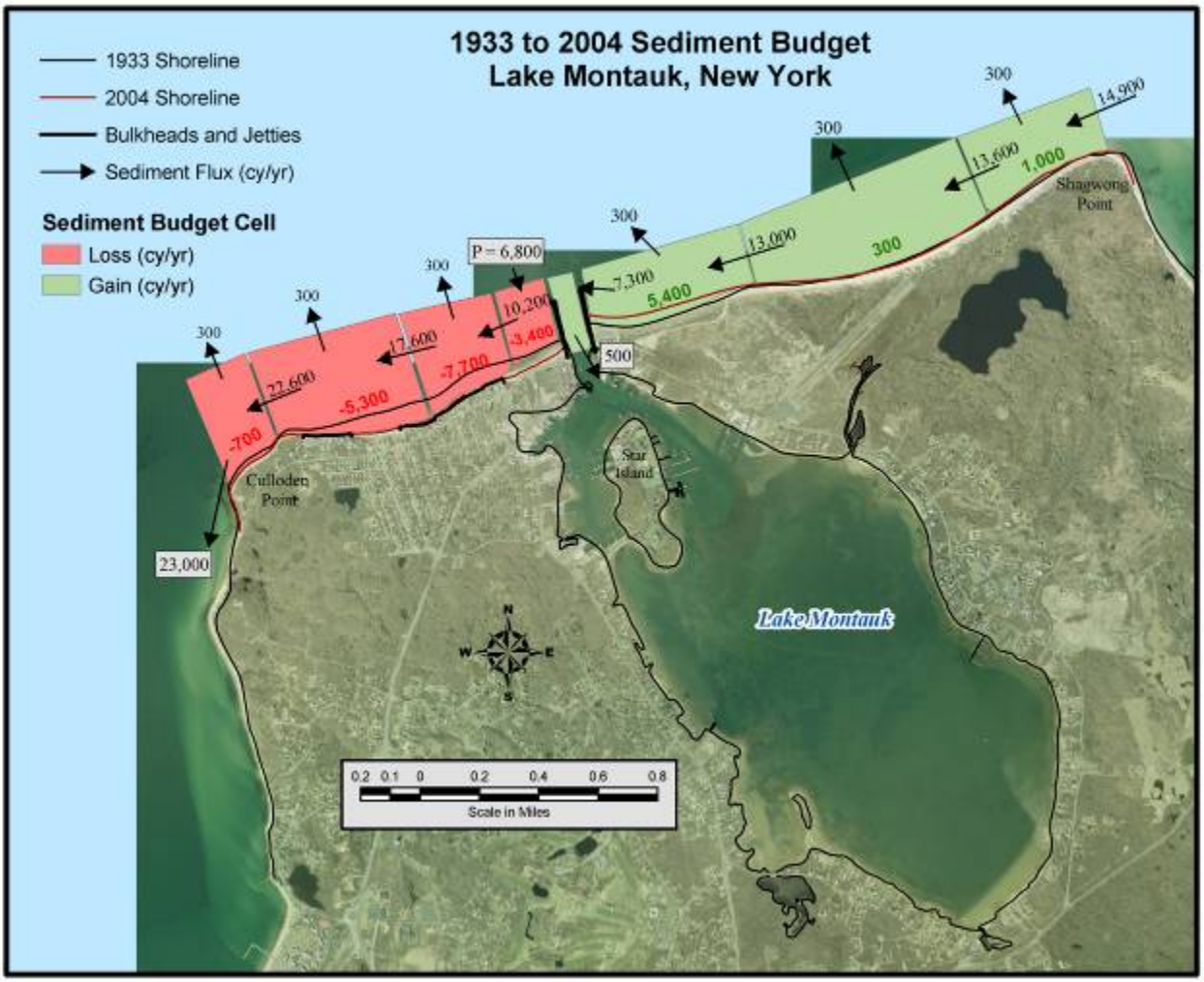

Figure 4: Post-jetty construction sediment budget

Table 3: Lake Montauk Beach Sediment Budget, 1933 to 2004 (Reaches are west to east)

Reach Number	1	2	3	4	5	6	7	8
Input (+)	22,600	17,600	10,200	6,800	7,300	13,000	13,600	14,900
Output (-)	23,000	22,600	17,600	10,200	6,800	7,300	13,000	13,600
Offshore	300	300	300	0	0	300	300	300
Residual	**-700**	**-5,300**	**-7,700**	**-3,400**	**500**	**5,400**	**300**	**1,000**

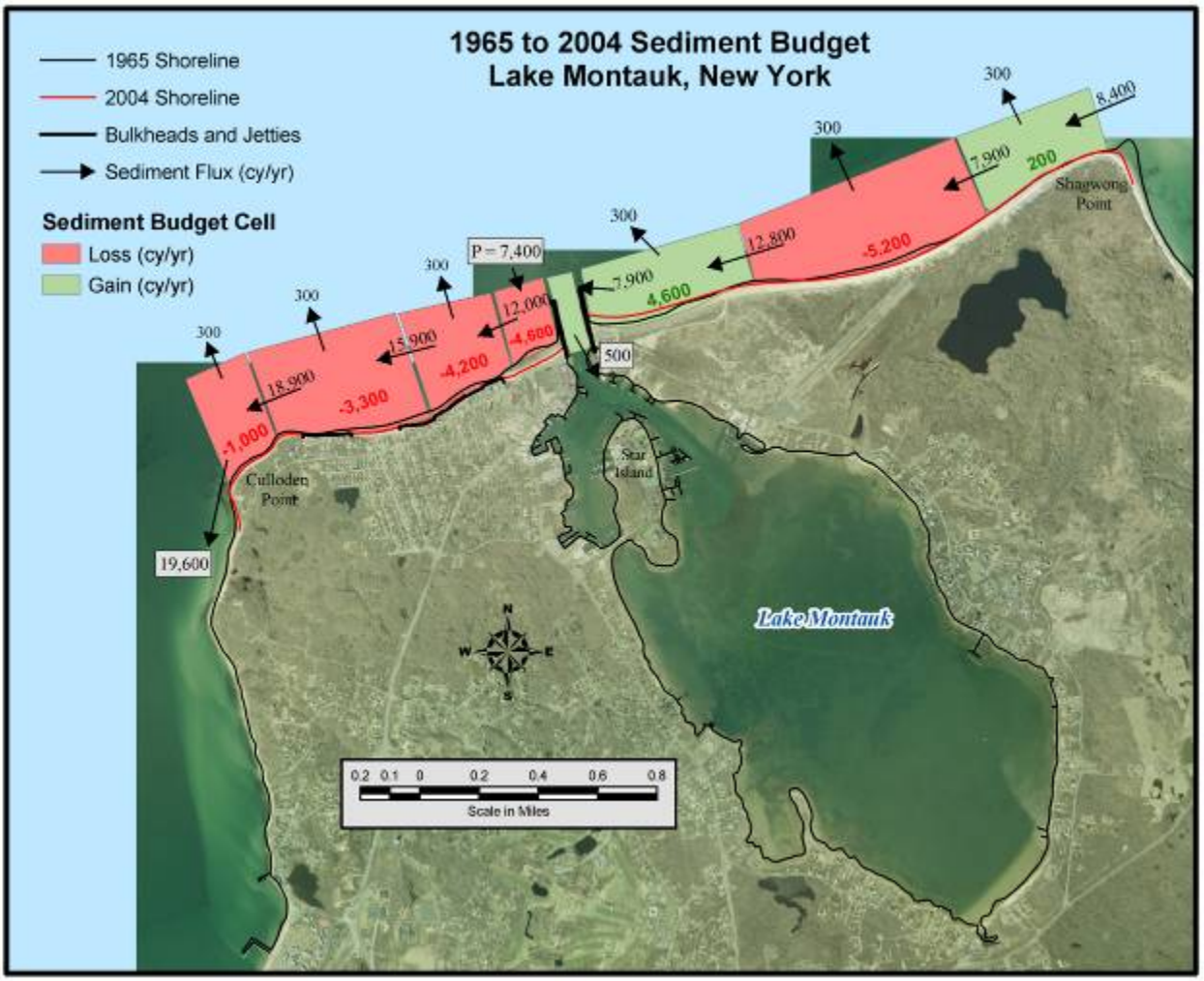

Figure 5: Recent sediment budget

Table 4: Lake Montauk Beach Sediment Budget, 1965 to 2004 (Reaches are west to east)

Reach Number	1	2	3	4	5	6	7	8
Input (+)	18,900	15,900	12,000	7,400	7,900	12,800	7,900	8,400
Output (-)	19,600	18,900	15,900	12,000	7,400	7,900	12,800	7,900
Offshore	300	300	300	0	0	300	300	300
Residual	**-1,000**	**-3,300**	**-4,200**	**-4,600**	**500**	**4,600**	**-5,200**	**200**

2.1.5 Vegetation

There are six vegetation types within the Montauk watershed: tidal wetlands, freshwater wetland, forest vegetation, maritime shrubland, dune vegetation, and pasture land/open field. Additional vegetated cover type designations include two invasive species identified in the study area: Japanese knotweed and common reed. Lake Montauk contains areas of submerged aquatic vegetation including eel grass beds and seaweeds. Tidal wetlands in the study area are generally located around the perimeter of the Lake, or directly adjacent and hydrologically connected to the Lake, according to the survey conducted. These include intertidal marshes, high marsh area, and formerly connected wetland. As stated above, tidal wetlands comprise about 75% of Lake Montauk's shoreline. Finally, there are 4 Federal plant species of concern and 27 state-listed

plant species in the study area. Coordination with the USFWS and NMFS pursuant to Section 7 of the Endangered Species Act is on-going.

2.1.6 Fish and Wildlife

Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) may also occur in the study area. Like all anadromous fish, Atlantic sturgeon are vulnerable to various impacts because of their wide-ranging use of rivers, estuaries, bays, and the ocean throughout the phases of their life. General factors that may affect Atlantic sturgeon include: dam construction and operation; dredging and disposal; and water quality modifications such as changes in levels of dissolved oxygen (DO), water temperature and contaminants. Atlantic sturgeon also exhibit life history characteristics that make them particularly vulnerable to population collapse from overfishing, including: advanced age and large size at maturity, eggs that are numerous and small in relation to body size, and spawning that is episodic and seasonal. Other threats to the species include vessel strikes.

Dredging in riverine, nearshore and offshore areas has the potential to impact aquatic ecosystems by removal/burial of benthic organisms, increased turbidity, alterations to the hydrodynamic regime and the loss of shallow water or riparian habitat. Hydraulic dredges can directly impact sturgeon and other fish by entrainment in the dredge, and dredging may also impact important habitat features of Atlantic sturgeon if these actions disturb benthic fauna, or alter rock substrates. Indirect impacts to sturgeon from either mechanical or hydraulic dredging include the potential disturbance of benthic feeding areas, disruption of spawning migration, or detrimental physiological effects of resuspension of sediments in spawning areas.

The Federally-listed endangered Atlantic ridley (*Lepidochelys kempii*) and leatherback (*Dermochelys coriacea*) sea turtles and threatened loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtles have been identified as transient species through the study area. Recent studies indicate that the nearshore waters within Peconic Bay, Gardiners Bay, Block Island Sound, and Long Island Sound are critical developmental habitat for juveniles of the Atlantic ridley sea turtle and a major feeding area for the loggerhead sea turtle. Juvenile Atlantic ridley sea turtles recorded in Long Island waters represent the largest concentrations ever documented outside the Gulf of Mexico. In the Northeast, during the summer months, juveniles (approximately 2 to 5 years of age) of the Atlantic ridley, loggerhead, leatherback, and green sea turtles migrate from the open ocean to inshore waters including areas along the coast of Long Island.

Federally-listed endangered northern right whales (*Eubalaena glacialis*), usually individuals, are regularly sighted migrating through the nearshore waters off Montauk Point, usually from March through June and have been identified as a transient species by the NMFS (Beach 1992). Small aggregations of Federally-listed endangered finback whales (*Balaenoptera physalus*) feed close to shore from Shinnecock Inlet to Montauk Point from January to March, and Federally-listed endangered humpback whales (*Megaptera novaengliae*) feed all around Montauk Point, primarily between June and September.

Northern Long-eared bats are also documented as being in the vicinity of the study area.

The threatened least bittern (*Ixobrychus exilis*) and northern harrier (*Circus cyanus*), and three species of concern, the red-shouldered hawk (*Buteo lineatus*), whip-poor-will (*Caprimulgus vociferous*), and osprey (*Pandion haliatus*), may potentially nest in the vicinity of the study area.

Piping Plover (*Charadrius melodus*) may also occur in or utilize the study area. Piping plovers are small, sand-colored shorebirds approximately 7 inches long, with a wingspread of about 15 inches. The Atlantic Coast population breeds on coastal beaches from Newfoundland to North Carolina (NC) (and, occasionally, in South Carolina) and winters along the Atlantic Coast from NC southward, along the Gulf Coast, and in the Caribbean.

Piping plovers begin returning to their Atlantic Coast nesting beaches in mid-March. Males establish and defend territories and court females by early April. Piping plovers are monogamous, but usually shift mates between years, and, less frequently, between nesting attempts in a given year. Plovers are known to breed at one year of age, but the rate at which this occurs is unknown. Egg-laying and incubation can start as early as mid-April.

Piping plovers nest on coastal beaches (NC to Newfoundland), sand spits at the end of barrier islands, gently sloping foredunes, blowout areas behind primary dunes, and in overwash-created bare sand areas cut into or between dunes. In the central portions of their Atlantic Coast range (including NY-NJ), they may also nest on areas where suitable dredged material has been deposited. Along the Atlantic coast, development, encroachment of beach vegetation, flooding and erosion are primary factors in the loss of suitable breeding and nesting habitat for piping plover, as well as predation, which has been identified as a major factor limiting piping plover reproductive success.

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

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

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

The roseate tern is about 40 centimeters in length, with light-gray wings and back. Its first three or four primaries are black and so is its cap. The rest of the body is white, with a rosy tinge on the chest and belly during the breeding season. The tail is deeply forked, and the outermost streamers extend beyond the folded wings when perched. During the breeding season the basal three-fourths of the otherwise entirely black bill and legs turn orange-red.

Roseate terns nest on small barrier islands, often at ends or breaks. They nest in hollows or under dense vegetation, debris or rocks hidden from predators. Roseate terns in northeastern North

America almost always nest in colonies with common terns. Roseate terns begin arriving to breeding areas at the end of April and begin laying eggs as early as the third or fourth week of May. They lay about one to two eggs, rarely three, and rely on the more aggressive Arctic and common terns in the surrounding colony to defend them. In the winter, roseate terns migrate south in late August to early September.

The entire Montauk Peninsula complex has been designated as a Significant Habitat Complex of the New York Bight watershed, and contains regionally significant, unique, and relatively pristine coastal complexes including maritime forest communities (USFWS 1997). Also, three areas within the Montauk Peninsula complex that are within or directly adjacent to the Project area have been designated as Significant Coastal Fish and Wildlife Habitats, as recognized by New York State Department of State, including Lake Montauk itself, Culloden Point, and Big and Little Reed ponds. Also, the USFWS has designated Culloden Point as a priority wetlands site under the Federal Emergency Wetlands Resources Act of 1986, and the National Park Service has designated Big Reed Pond as a National Natural Landmark (USFWS 1997).

The National Audubon Society of New York State recognizes Montauk Point (the area east of Montauk Lake to Montauk Point including offshore waters) as an Important Bird Area (IBA). IBAs are designated for sites that represent the most important habitats for the survival of birds and the conservation of bird species. Specifically, Montauk Point was recognized due to its importance to wintering waterfowl, and for supporting the largest winter concentration of sea ducks in the state. In addition, the site's importance to pelagic seabirds, migrant songbirds, and state threatened and special concern species is noted.

The USFWS lists the Montauk Peninsula Complex as a Significant Habitat Complex of the New York Bight Watershed (USFWS 1997). Significant Habitat Complexes are identified by the USFWS to aid in the identification, description, distribution, and population status of key marine, coastal, and terrestrial species occurring within the near-coastal waters, coastal lands, and uplands of the New York Bight watershed. The complex consists of undeveloped maritime communities that support an unusual diversity of rare plants and animals, and the nearshore waters support important concentrations of marine species.

In 1993, the Peconic Estuary, which encompasses Montauk Point, was designated as an estuary of national significance and included in the USEPA's National Estuary Program. The National Estuary Program has identified the Peconic Estuary as embracing diverse resources and habitats, which, in turn, provide values and uses important to all the citizens of New York, as well as to residents of the region.

2.1.7 Essential Fish Habitat

An Essential Fish Habitat (EFH) assessment was prepared and is included in the Environmental Assessment. USACE is currently in coordination with NMFS to assess potential project impacts to EFH.

2.1.8 Socioeconomics

A formal census update of post-Hurricane Sandy demographic information is not currently available, however information from the American Community Survey provides detailed socioeconomic information for the Town of East Hampton, Suffolk County, and New York State. The population of the Town of East Hampton has grown quickly for the area and has experienced relatively strong economic conditions. The population of the Town of East Hampton grew at 3.6% from 2010 to 2017 to 21,935 people. The population of Suffolk County grew at a slower pace of

1.0% from 2010 to 2017, while the population of New York State grew 3.0% over the same period. Employment trends from 2010 to 2017 follow the same pattern as growth in population; the Town of East Hampton experienced a 7.0% increase in employment, while Suffolk county employment grew at 2.1% and employment in New York State grew at 4.6%. Finally, real median household income is a third measure of the Town's socioeconomic status, and has grown by 5.8% to $92,516[1] over 2010 – 2017. Conversely, real median household income fell by 3.6% in Suffolk County and by 1% in New York State

2.1.9 Environmental Justice and Protection of Children

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires Federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its program, policies, and activities on minority and low-income populations in the U.S., including Native Americans. Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks," requires Federal agencies to identify and assess environmental health risks and safety risks that may disproportionately affect children. The 2017 combined minority population is 7% in the Town of East Hampton and 20% in Suffolk County. Moreover, 9.3% of individuals and 6.1% of families were living below the poverty line in the Town of East Hampton in 2017. These figures are of the same magnitude as the 7.2% of individuals and 5% of families who were living below the poverty line in Suffolk County in the same year.

2.1.10 Cultural Resources

The District carried out a Phase 1A cultural resources inventory for the area of potential effect (APE) to identify historic properties, including archaeological sites, and initiated coordination with the New York Historic Preservation Office, Federally-recognized tribes, and local interested parties. The Area of Potential Effect (APE) for the identification of historic properties and the undertaking's effects on historic properties has three parts; the federal navigation channel dredged to -17+2 feet MLLW, the 100 foot wide deposition basin, and the beach to the west of the inlet where the sand will be placed in an area extending 3,000 feet from the western jetty and 46 feet in width—per the Tentatively Selected Plan currently being developed.

Phase 1A Inventory

A preliminary records search of historic properties on New York's Cultural Resources Information System (CRIS) on January 16, 2019 showed that there are no known sites within the project area. Within half a mile of the project area, but outside of the APE there are nine sites (Table 5). Five of these sites are historic and four are prehistoric. The nearest resource is the Caleb Bragg Estate, which is about 150 feet from the federal channel to be dredged. Next, there are three US Coast Guard buildings about 350 feet from the federal channel. Two of these buildings are eligible for the NRHP while the third is ineligible. Then, about ¼ mile (1,500 feet) from the federal channel is the NRHP eligible Star Island Prehistoric Site. The remaining four sites are about ½ mile from the APE. These include the NRHP listed wreck of the HMS Culloden, a British Man-of War that ran aground in 1781 (~2,500 feet west from the sand placement area), and three prehistoric sites: Culloden Point Prehistoric Sites; Culloden Point IV Prehistoric Site; and Culloden Point Area F Extension (all ~2,800 feet from the sand placement area). The first of which is eligible for the NRHP and the other two have undetermined eligibility.

[1] Real median household income is measured in 2017 dollars using the CPI: All Items Less Food and Energy.

Table 5: Sites nearby the project area

USN Number	Site Name	Description	NRHP Eligibility
10303.000077	H.M.S. Culloden Shipwreck Site	A British Man-of-War that ran aground on January 24, 1781	Listed
10303.000140	Culloden Point Prehistoric Sites	4 Woodland Period Prehistoric sites. All lithic scatters with buried components.	Eligible
10303.000192	Culloden Point IV Prehistoric Site	4 Woodland Period Prehistoric sites. All lithic scatters with buried components.	Undetermined
10303.000819	Culloden Point Area F extension (Pedersen/Dixson)	Prehistoric with human remains. Features, lithic scatter with fires cracked rock, ceramics, animal bones.	Undetermined
10303.000816	Star Island Prehistoric Site	Lithic scatter with projectile points.	Eligible
10303.000724	Montauk USCG Station Bldg., Multi-Mission Bldg.	Combined administration/barracks US Coast Guard building constructed in 1939 in Napeague, NY, and relocated to current location in 1954	Eligible
10303.000837	Engineering/Boat Maintenance Building	Axillary building to the Multi-Mission Building. Has more alterations than the Multi-Mission Building.	Eligible, USCG recommends as ineligible
10303.000838	Unaccompanied Personnel Housing (UPH)	Building constructed on USCG complex in 1989.	Not Eligible
10303.000185	Caleb Bragg Estate	Historic residential property built in 1929 containing 7 buildings, circular driveway, tennis courts, docks, parking lot and landscaping.	Listed

Over the years, this project has gone through many iterations. For the period between 2005 and 2006 the recommended plan included constructing two groins along the western beach where the dredge spoils were to be placed. In preparation for this part of the project, the District conducted a remote sensing survey of the area where the groins were to be placed. Since then, the groins are no longer being considered as part of the project, and will no longer be moved forward.

Nonetheless, this remote sensing report is an archaeological survey near the APE that is relevant to the current project. This survey found two magnetic anomalies just offshore the western beach. These anomalies represented fairly small items that were not large enough to be individual shipwrecks, and were not recommended for future study. These anomalies are to the east of the Culloden wreck site. They could be pieces of the ship that had become displaced over the years. Alternatively, they may be insignificant pieces of modern debris. Since this area is no longer part of the APE, future study will not be carried out.

Precontact and Historic Culture History

The Montaukett or Montauk Indians inhabited the area of East Hampton, Napeague, Montauk, and Montauk Point when the first Europeans settled in the area. Seventeenth century deeds between the Europeans and the Montauks describe two forts to the west of Lake Montauk. One was entrenched in the side of Fort Hill overlooking Fort Pond. The fort measured approximately 180 on each of its three sides with the hill forming the fourth side. This site was identified as an "earthwork and ditch on the northeast side of Fort Pond on Fort Hill. A second, older fort was at the west end of Montauk near Napeague Beach. This fort had been abandoned by the time of European settlement. A deed written in 1661 called the site the place "where the old Indian fort stood. A burial ground is also reported to be nearby this area. Recent archaeological investigations in this area have determined that most of the fort has been destroyed, although some graves have been found.

The Montauk peninsula contained plenty of freshwater resulting from the prevalence of kettle-hole ponds. The Montauks also created wells from springs by driving hollow tree trunks into these springs. Subsistence activities centered on the use of marine resources, primarily fish and clams, and the collection of plant foods and hunting. By the time of the arrival of the Europeans, the Montauks were cultivating corn in the fields surrounding Lake Montauk. The Montauks continued to hold these lands throughout the 18th and 19th centuries, until 1885, when their population had dwindled and the land was eventually incorporated in the Village of Montauk.

Throughout the 18th and most of the 19th centuries, the land around Montauk and Lake Montauk was used by the residents of East Hampton as grazing land for their sheep and cattle. The residents of East Hampton constructed dwellings, the First, Second and Third Houses, for the shepherds caring for the livestock at different areas around Montauk. The Montauk Point Lighthouse was first lit in 1797. It was built on land purchased from the residents of East Hampton, on the point of land east of Lake Montauk. When it was first constructed, the light station consisted of the lighthouse, keeper's house and oil vaults for the storage of lamp oil. By the mid-19th century, the lighthouse had been increased in height to accommodate its new lens and a new keeper's dwelling. A coal shed, a smokehouse and an ice house and fog signals were built at the station. In the 1920's businessmen and developer Carl Fisher formed the Montauk Development Company and purchased Montauk, the area around Lake Montauk and Montauk Point, except for the lighthouse. The development planned for the property included a marina, a hotel and golf course. Fisher's company built a number of roads around Montauk and cut a channel through Lake Montauk to provide the boats from Star Island and the planned yacht club with access to deep sea fishing. Carl Fisher's construction plans were stopped with the stock market crash in 1929. However, the development of Montauk continued with the Montauk Beach Company and later, the Montauk Improvement Company.

2.1.11 Coastal Zone Management

The Coastal Zone Management Act of 1972 (16 U.S.C. §§ 1451–1464, Chapter 33) defines the coastal zone as all tidally influenced wetlands, which includes the wetlands of the navigable

waterways in the US. Article 42 of the Executive Law defined coastal area as the State's coastal waters and the adjacent shoreland. Based on these definitions, the Long Island Sound including Block Island Sound, and their connecting water bodies, bays, harbors, shallows and marshes are included in the coastal zone. The project site is located within the New York State Coastal Zone and is also included in Town of East Hampton Local Waterfront Revitalization Plan (EHLWRP). The estuarine habitats of the project area serves important functions to fish, birds, and other wildlife populations. Salt marsh and other wetlands serve as important nursery grounds for larval and juvenile fish, along with reproductive areas for invertebrates such as mussels, crabs and other invertebrates. Areas of sandy beach provide critical habitat to breeding horseshoe crabs (Limulus polyp emus) and various shorebirds. The Lake Montauk area is within the Atlantic flyway and is essential to migrating birds. Lake Montauk and vicinity offers public access to a variety of active and passive recreational opportunities.

As a Federally funded project located within the New York State Coastal Zone, the proposed project must be reviewed by the New York State Department of State for consistency with the policies of the New York State Coastal Zone Management Plan (CZMP) and the applicable local program, Town of East Hampton Local Waterfront Revitalization Plan. Both these programs serve to protect, maintain, promote and enhance various characteristics and functions of the NYS coastal environment. These policies serve to safeguard urbanized and otherwise developed coastal areas as well parklands and public space. Within this purpose the State and local CZM plans protect and maintain significant coastal resources including, water and air quality, fish and wild life and scenic beauty. The CZM policies also provide protection from the discharge of pollutants and the degradation of flood protection capacity, thus protecting and enhancing human life and property. CZM policies also function to promote and enhance water dependent activities including both active and passive recreation.

Both state and local CZM policies were determined to be applicable for the proposed project alternatives. These applicable policies, along with a Federal consistency determination are discussed in Appendix F of the Environmental Assessment.

2.1.12 Floodplains

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities" for the following actions:

- acquiring, managing, and disposing of federal lands and facilities;
- providing federally-undertaken, financed, or assisted construction and improvements;
- conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities.

2.1.13 Hazardous, Toxic, and Radioactive Waste

A preliminary Hazardous, Toxic, Radioactive Waste (HTRW) assessment was performed for regulated sites at the recommended search distances from the study site in accordance with the American Society for Testing and Material (ASTM) E1527-00 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. An assessment of Hazardous, Toxic, and Radioactive Waste (HTRW) in the study area was conducted by reviewing

recent state and Federal data sources. No HTRW sites or New York State-listed Inactive Hazardous Waste Disposal Sites have been identified within the study area (NYSDEC 1998b, USEPA 2002). The initial reconnaissance report (USACE 2005) for the Project included a survey for HTRW in and around the study area. No evidence of HTRW was identified within the study area. However, there were two sites nearby that contain HTRW.

The Montauk landfill is located several miles away from the Project area and was investigated for potential seepage from septic lagoons. However, there is no evidence that any seepage would impact Lake Montauk or any locations within the project study area. Camp Hero, a former military installation, is approximately 3.6 miles southeast of the Project area. Potential HTRW at Camp Hero consisted of underground storage tanks (oil storage), above ground storage tanks, transformers, and a deteriorating sewage treatment plant. Although some seepage from these HTRW sources may have occurred at Camp Hero, there is a very low probability that the contaminants would impact the Project area.

The project site itself, consisting primarily of sand with no history of dumping or nearby outfalls, is not considered to offer an HTRW threat.

2.1.14 Recreation and Scenic Resources

The vessel fleet at Lake Montauk Harbor includes a number of recreational vessels as well as commercial vessels used for recreational fishing charters. Lake Montauk Harbor is the easternmost harbor of refuge in New York and the only harbor of refuge on the south coast of Long Island for vessels westbound to New York Harbor and the New Jersey Coast, or eastbound to the open Atlantic. In addition, the shoreline along Block Island Sound is used for recreation by the respective private owners; the Suffolk County shores east of the inlet are used in the warmer seasons for camping and recreational vehicle (RV) use.

2.1.15 Air Quality

With respect to the National Ambient Air Quality Standards (NAAQS, 40CFR§81.333), Suffolk County is currently classified as in ‘marginal’ nonattainment of the 2008 and 2015 8-hour ozone standards and ‘maintenance’ for the 2006 particulate matter less than 2.5 microns (PM2.5) standard. The county is part of the Ozone Transport Region. Ozone levels are controlled through the regulation of its precursor emissions, which include oxides of nitrogen (NOx) and volatile organic compounds (VOC). Sulfur dioxide (SO2) is a precursor of PM2.5 (USACE 2014).

2.1.16 Noise

Noise is generally defined as unwanted sound. The day-night noise level (Ldn) is the most widely used descriptor of community noise levels. Humans are most sensitive to frequencies in the 1,000 to 5,000 Hz range. Since ambient sound contains many different frequencies, measures of human response to sound assign more weight to frequencies in this range. This is known as the A-weighted sound level. The unit of measurement of the Ldn is the A-weighted decibel (dB-A) that closely approximates the frequency responses of human hearing.

Noise criteria and the descriptors used to evaluate project noise are dependent on the type of land use in the vicinity of the proposed project. In general, land uses near the project site include residences private and commercial, and marine oriented businesses. The primary source of noise in the Project area is vehicular traffic on local roadways and noise associated with the marina such as that from boat engines and noise generated by the various components of marine industry that exist in proximity to the harbor. Noise level measurements have not been obtained in the

Project area. In lieu of measurement, the noise levels in the Project area can be approximated based on the existing land uses. The USEPA document Protective Noise Levels (USEPA 1978) lists typical day-night sound levels at various locations. The primary land use in the Project area is residential and recreational. Typical day-night sound levels in these types of areas range from 39 to 59 dB-A (USEPA 1978). Therefore, it can be assumed that the existing sound levels in the Project area are within this range. Similarly, it can be assumed that sound levels in the Project area are at the lower end of this range due to the lack of heavy development in the area and the large amount of open space.

2.2 The Built Environment

The built environment is the human-made surroundings that provide the setting for human activity such as roads, homes, and businesses. It is the human-made space in which people live, work, and recreate on a day-to-day basis. Humans have greatly influenced the heavily-developed study area.

2.2.1 Access Routes

The study area can be accessed by water via Block Island Sound and the Lake Montauk inlet, by highway via State Route 27, by rail by the Long Island Rail Road, and by air via Montauk Airport. Within the study area is West Lake Drive, part of which runs parallel to the 1,200 foot section of shoreline immediately west of the western jetty. This is a main local roadway, and its disruption would be a threat to public health and safety. Further west is Soundview Avenue, which provides access to the residential and commercial properties along the shore to the vicinity of Culloden Point. Access to the shoreline at the town beach within the 1,200 feet west of the inlet is public. Access to the shoreline fronted by structures is currently restricted to the property owners individually or as part of an association. Access to the Town and County beaches east of the inlet is fully open to the public.

2.3 Existing Navigation

Lake Montauk Harbor can accommodate recreational craft, fishing boats, and other small commercial craft with lengths up to approximately 200 feet. There are currently 18 marinas and five temporary docking and ramp facilities within Lake Montauk Harbor. The marinas have a total of approximately 1,235 dockside slips. Currently, the largest slip is 70 feet long. A few of the marinas have slips designated for transient boats and fishing and charter boats. Lake Montauk Harbor has two town docks, one named Star Island and the other Montauk Dock with 23 and 17 slips, respectively. Nearly all of these slips are occupied.

The heavy volume of vessel traffic using the Federal entrance channel authorized to a depth of -12 feet MLLW consists primarily of pleasure boats and commercial fishing boats. The channel is used by an average of 500 boats per day during the warmer months. Although subject to turnover and change, the commercial fleet has at times comprised as many as 30 trawlers, 12 inshore and 7 offshore lobster boats and 53 long liners, including as many as 32 transient boats from other areas of the east coast. Within the fleet, approximately 11 of the largest vessels are constrained by the current authorized channel depth. These boats all use local service facilities with slips having depths of at least -15 ft. MLLW, including Star Island and Montauk Dock listed above as well as Gozman's and Inlet Seafood. All of these local service facilities are located immediately as the channel enters the harbor and before the boat basin.

To inform discussion of the Federal navigation channel in this report, the tide range and the relation of this range to Mean Sea Level and NGVD29 (for historrical consistency) is provided here.

Table 6: Astronomical Tide Elevations

Tide	Elevation	
	(ft MLLW)	(ft NGVD29)
Mean Higher High Water (MHHW)	+2.46	+1.66
Mean High Water (MHW)	+2.17	+1.37
Mean Sea Level (MSL)	+1.17	+0.37
National Geodetic Vertical Datum (NGVD)	+0.8	0.0
Mean Low Water (MLW)	0.17	-.63
Mean Lower Low Water (MLLW)	0.0	-0.8
Tide	**Elevation**	
	(ft MLLW)	**(ft NGVD29)**
Mean Higher High Water (MHHW)	+2.46	+1.66
Mean High Water (MHW)	+2.17	+1.37
Mean Sea Level (MSL)	+1.17	+0.37
National Geodetic Vertical Datum (NGVD)	+0.8	0.0
Mean Low Water (MLW)	0.17	-.63
Mean Lower Low Water (MLLW)	0.0	-0.8

The costs for recent U.S. Army Corps of Engineers dredging operations are shown in Table 6. One action that is not listed in Table 6 is an advance maintenance dredging conducted by USACE for the NYSDEC under the Support for Others (SFO) program in 1999. The SFO action included removal of 20,980 cubic yards from the navigation channel. These costs (excluding the SFO action from 1999) are used to develop the future without project conditions in Section 3.2 below. To these, approximately $350,000 for construction supervision and administration and 25% overall contingency have been added (last column).

Table 7: Lake Montauk Harbor Maintenance Dredging Costs

Year	Volume (cubic yards)	Contract Cost	Estimated Overall Maintenance Cost
2011	12,000	$400,000	$937,500
2014	19,000	$530,000	$1,100,000
2018	37,000	$780,000	$1,412,500

The approximate annualized cost for maintenance is $300,000. Note that the larger maintenance operation in 2018 allows for a lower annualized maintenance cost of approximately $180,000 while larger operations are conducted.

2.4 Describing Storms and Flood Level and Relative Sea Level Change and Climate Change

2.4.1 Storms and Flood Levels

Storms, including those that cause erosion events, and floods are often defined according to their likelihood of occurring in any given year at a specific location. The most commonly used definition is the "100-year storm" or "100-year flood." This refers to a storm or flood level or peak that has a 1 in 100, or 1 percent chance of being equaled or exceeded in any year (i.e., 1 percent "annual exceedance probability"). Therefore, the 100-year storm or 100-year flood is also referred to as the "1 percent storm or 1 percent flood," or as having a "recurrence interval" or "return period" of 100 years.

A common misinterpretation is that a 100-year storm or 100-year flood is likely to occur only once in a 100-year period. In fact, a second 100-year storm or 100-year flood could occur a year or even a week after the first one. The term only means that the average interval between storms or floods greater than the 100-year storm or flood over a very long period (say 1,000 years) will be 100 years. However, the actual interval between storms or floods greater than this magnitude will vary considerably.

In addition, the probability of a certain storm or flood occurring will increase for a longer period of time. For example, over the life of an average 30-year mortgage, a home located within the 100-year flood zone has a 26 percent chance of being flooded at least once. Even more significantly, a house in a 10-year flood zone is almost certain to be flooded at least once (96 percent chance) in the same 30-year mortgage cycle. The probability (Pr) that one or more of a certain-size flood occurring during any period will exceed a given flood threshold can be estimated as $\mathrm{Pr} = 1 - \left[1 - \frac{1}{T}\right]^n$

where T is the return period of a given flood (e.g., 100 years, 50 years, 25 years) and n is the number of years in the period. The probability of flooding by various return period floods in any given year and over the life of a 30-year mortgage is summarized in Table 7.

Table 8: Examples of Flooding by Various Return Periods

Return Period (years)	Chance of flooding in any given year	Percent chance of flooding during 30-year mortgage
10	10 in 100 (10%)	96%
50	2 in 100 (2%)	46%
100	1 in 100 (1%)	26%
500	0.2 in 100 (0.2%)	6%

Because of the potential confusion, recent USACE guidance documents and policy letters recommend use of the annual exceedance probability terminology instead of the recurrence interval or return period terminology. For example, one would discuss the "1-percent-annual-

exceedance-probability storm" or "1-percent-chance-exceedance flood," which may be shortened to "1 percent storm" or "1 percent flood" as opposed to the "100-year storm" or "100-year flood". This report uses the short form "1 percent storm" or "1 percent flood".

2.4.2 Sea Level Change and Climate Change

The historic rate of sea level rise in the study area was estimated at 0.008 feet/year or 0.8 feet in 100 years. This value represents a forecast based on observed historic changes at nearby gages. Sea level rise is expected to occur, and potentially accelerate over the period of analysis. Sea level rise would add on its own to navigation draft in the without project future conditions. The without project future conditions for any incidental CSRM benefits from placement of material dredged from the channel on this shoreline west of the channel are based upon the continuation of the historic trend. A sensitivity analysis will be undertaken to account for the medium and high rate of relative sea level rise to complete final plan description. Marina and other facilities along the Lake Montauk shoreline, including the harbor, would also be negatively impacted by sea level rise.

Climate change in the Northeastern U.S. is anticipated to result in an increase in the extent and frequency of coastal flooding, a rise in the frequency of severe storms and related damages, and sea level rise of 2-6 feet over the next century (Frumhoff et al. 2007). Increases in sea level and continued coastal storms will result in more inundation of coastal areas, and subsequent increases in shoreline erosion and wetland loss. Inundation of low-lying areas will result in the potential for saltwater to infiltrate into freshwater surface waters and aquifers. Increased flooding and erosion has the potential to negatively impact transportation infrastructure and sewage and septic systems.

Coastal wetlands are vulnerable to the effects of sea-level rise, increasing water temperatures, and increased nutrients. If accretion of river-borne sediment and organic matter is unable to keep pace with the combined effects of sea-level rise and land subsidence, coastal marshes will be reduced or disappear. This will impact the ecological services provided by these areas including buffering coastal areas from waves and erosion, filtering nutrients and pollutants, providing wildlife habitat, and providing nursery areas for fisheries. Because hard-clams and oysters depend on wetland-based food chains, impacts to coastal wetlands are anticipated to impact those fisheries (Frumhoff et al. 2007).

It is difficult to predict the ways in which warming of water temperatures will influence other factors that affect marine ecosystems, including nutrient dynamics, ocean circulation, and plankton production. However, commercial fish and shellfish have water temperature thresholds that define conditions suitable for reproduction, growth, and survival. Increased water temperatures over the last decade have already led to declines in lobster landings in Long Island Sound (Fogarty et al. 2007). In addition, warmer water temperatures also appear to facilitate the spread of shellfish disease, the frequency and intensity of harmful algal blooms, and the ability of invasive species to reproduce and spread (Frumhoff et al. 2007).

Chapter 3: Plan Formulation

Through planning activities, including feasibility studies, USACE Study teams help decision-makers identify water resources problems, conceive solutions to them and compare the importance of the inevitable conflicting values inherent in any solution. The 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Implementation Studies (Principles and Guidelines) lay out an iterative 6-step planning process that is used for all USACE Civil Works studies. The Study team followed this planning process, as described in this chapter, to choose a Tentatively Selected Plan.

3.1 Problem Statement

Problem definition is the detailed description of a problem. It begins with a problem statement; a simple assertion of the basic problem.

Problem statement: There are two problems in the study area:

1. Insufficient channel and harbor depth at various times, such as low tide, due to both the channel's currently authorized depth and it regularly being shoaled in above this depth.
2. In addition, erosion damages due to a combination of a) navigation inlet jetties blocking some sediment flow and b) coastal storm surge and wave attack, resulting in failure of bulkheads and damage to homes and businesses, and also damage to roads.

The existing Federally-authorized -12-foot MLLW channel and harbor depths are only marginally adequate for many of the current commercial vessels. Further, maintaining the channel depth and width has become more difficult with the accretion of sand on the eastern side of the east jetty through and around which sand migrates generally to the west into the Federal navigation channel. Maintenance dredging has been historically necessary every 4 to 5 years, and, as described in Section 2.3 above, in the past several years necessary even as often as every 3 to 4 years (2011, 2014, and 2018). As further described in 2.3 above, in recognition of a need for maintenance dredging at least every 4 years, the U.S. Army Corps of Engineers determined that its maintenance work planned for the fall of 2018 included advance maintenance (of an additional 2 feet of depth) allowing the estimated maintenance cycle to be extended from 4 years to 8 years. Some deeper draft vessels, accounting for a significant portion of the commercial fish landings, must transit the channel only during high tides or must sail at less than their full load capacity to restrict their operating drafts. Vessels with loaded drafts that exceed the authorized -12-foot depth must time their passages to coincide with higher stages of the tide. Further, in the year leading up to the most recent maintenance operation, 9 vessels grounded on the channel bottom even on departure when they were not loaded, including the *Evening Prayer* which has a draft of 11 feet Delays in commercial activity, under-loading of vessels, and potentially unsafe navigation practices can result. Vessel damages from groundings have occurred. Additionally, Lake Montauk Harbor is the easternmost harbor of refuge in New York and the only harbor of refuge on the south coast of Long Island for vessels westbound to New York Harbor and the New Jersey Coast, or eastbound to the open Atlantic. Finally, Lake Montauk Harbor includes a U.S. Coast Guard station, underscoring the importance of efficient operations in the Federal navigation channel for their mission.

In addition, beach erosion along the shoreline west of the western jetty of the Federally-authorized navigation channel is an issue of concern to the local interests. Erosion concerns are considered in accordance with ER 1110-2-1150, which states:

Coastal navigation projects at the entrance to the mouth of any river or at any inlet must be assessed with respect to their effects on the adjacent shores. Particular reference shall be made to erosion and/or accretion for a distance of not less than 10 miles on either side of the entrance.

The area of erosion extends for approximately 5,100 feet along this shoreline west of the inlet. Over the years, property owners have constructed timber bulkheads, some of which have included stone toe protection, to prevent erosion from undermining the residential and commercial structures. Approximately 3,000feet of the 5,100 feet shore to Culloden Point is bulkheaded.

In addition, at the eastern end of this shore (adjacent to the western jetty) there is 500 feet of stone revetment along West Lake Drive. The eroding shoreline is endangering West Lake Drive, the existing bulkheads, the approximately 35 residential and rental properties behind the bulkheads, and the structures behind narrow dunes or bluffs in the unbulkheaded reach. Based on a comparison of historical shorelines, the average long-term erosion on the downdrift shoreline was approximately 2 feet/year up through jetty construction in 1926. Following jetty construction, the shoreline erosion rate increased to approximately 3.3 feet/year until 1980, but recent placement of dredged material every 4 to 5 years since 1980 in combination with shoreline property owners hardening the shoreline in front of their development has, in effect, decreased this erosion rate to 2 feet/year again as also described in Section 2.1.4 above. Storm erosion and wave attack forces from recent nor'easters and Hurricane Sandy has caused additional rapid and extreme shoreline losses, bulkhead failures, and even damages to structures. Very little beach area remains, even at low tide.

3.2 Future Without Project Conditions

The future without project condition serves as the base conditions for all the alternative analyses.

In the future without project condition, over the period of analysis of 2021-2071, the navigation channel would remain essentially the same. Currently and into the future, fishing commerce not able to be fully realized because of the marginal channel depths was estimated in 2011 by surveying vessel captains, including the 11 whose operations are constrained by the channel depth as described above. These results were updated in 2019 by captains of 10 of the 11 whose operations are constrained by the channel. At deeper channel depths, these captains estimated that the following additional commerce, specifically from (1) additional income from getting fish to market fresher, and (2) savings in fuel and supplies per trip. Up to $2,266,000 of annualized navigation benefits would be not realized in the future without project condition.

The Federal interest here is clear given the importance of marine commerce, including commercial fishing, to the regional and national economy. The Federal government maintains the U.S. Coast Guard facilities here which are important to emergency response and homeland security. Suffolk County has limited resources which are already strained by the demand for maintaining several dozen small harbors per year. Assuming the responsibility for improving and then maintaining what is now a large Federal commercial small craft harbor currently maintained by the Federal government would be a significant additional burden on local government and would not be practicable in the long term.

As described in 2.1.4 above, littoral material estimated to be 10,000 to 12,000 cubic yards per year on average is transported westward along the beaches east of the jetties will continue to supply the inlet system with sediment at a rate of 7,000 to 8,000 cubic yards per year, which will need to be dredged and bypassed. Following the maintenance cycle begun in the fall of 2018 the

U.S. Army Corps of Engineers estimated (to justify the advance maintenance performed) that maintenance dredging will be required more often to maintain the authorized channel depth (24,000 cubic yards every 3 years). This determination was based on dredging history (including the past several years), engineering analysis, and sediment budget. More frequent channel maintenance would cause increased disturbance of the area's littoral system. Further, the annualized maintenance costs (100% Federal) would rise significantly beginning in approximately 2026, largely because maintenance dredging would now be required every three or 4 years.

West of the inlet, the shoreline will continue to recede, at approximately 2 feet/year. The existing erosion of the shores downdrift of the west jetty will continue to worsen due to storm waves and surges, and the natural condition in which less sediment is arriving on the western shoreline than is being transported away from it past Culloden Point, as well as the littoral sediment depravation of the western shores from the blocking effects of the jetties at the stabilized inlet channel, as described in 2.1.4 above. There will be an increased threat of undermining of West Lake Drive immediately adjacent to the inlet, and engineering models predict that after 20 years this road will be undermined along any reach that is not hardened. Therefore, it is anticipated that the remaining 700 feet of road would receive riprap protection as the shoreline narrows. Eventually, the entire 1,200-foot-long stretch of road would end up being bulkheaded. The continuing erosion, along with future storm damage, would require repairs to the bulkheads and even the road itself. These future without project conditions damages have been estimated at approximately $1,840,000 on an annualized basis.

3.2.1 Future Without Project Conditions for the Environmental Setting

In the absence of Federal action, the condition of wetlands, air quality, flora & fauna, threatened and endangered species, cultural resources, and HTRW is expected to remain consistent with current conditions. More frequent disturbances may be expected from channel maintenance dredging due to the increased shoaling. Additional bulkheading might be needed along the shore west of the western jetty to protect the residential structures, particularly new bulkheading between Stations 33+00 and 42+00 as well as continued repairs to bulkheading already constructed. Environmental impacts may occur due to new bulkheading and repairs to existing bulkheads. For the narrow beaches seaward of the bulkheads and in dunes and low bluffs not protected by bulkheads, degradation and lowering of the remaining beach will continue to occur leaving little, if any, shorebird foraging area. Finally, for the shore east of the east jetty there will be continued but limited growth of the updrift fillet in terms of beach width and elevation.

3.3 Key Uncertainties

Limitations to the quantity and quality of information result in uncertainties, specifically knowledge uncertainties. Natural variability may also cause uncertainty. The Study team dealt with one major uncertainty.

Relative sea level rise projections: The historic rate of relative sea level rise was estimated at 0.008 feet/year or 0.8 feet in 100 years. This value represents a forecast based on observed historic changes at nearby gages. Over the 50-year period of analysis the historic rate of relative sea level rise is 0.4-foot increase. In the optimization of the Tentatively Selected Plan (TSP), formulation will account for how the project would perform under the intermediate and high rates of projected relative sea level rise, consistent with the ER 1100-2-8162. Analysis of the intermediate and high rates of relative sea level rise may affect the physical dimensions of the project but would not affect the selection of the TSP.

3.4 Opportunities

Opportunities to solve problems in the Study area over the 50-year period of analysis have been identified by the Study team. There are opportunities in the Lake Montauk Harbor project area to:

1. Respond to Problem 1 – Address problems with the safety and efficiency of commercial navigation by providing more reliable channel depths at Lake Montauk Harbor.
2. Respond to Problem 2 – Address erosion damages on the shoreline west of the inlet through potential placement of dredged sand from the navigation channel on the beach, identified as the least costly disposal option, to provide coastal storm risk management as an ancillary benefit to navigation improvements.

3.5 Federal Action

Per the 1983 Principles and Guidelines, the Federal objective of water and related land resources project planning is to "contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements." Water and related land resources project plans are formulated to alleviate problems and take advantage of opportunities in ways that contribute to this objective. Contributions to National Economic Development (NED) are increases in the net value of the national output of goods and services.

3.6 Planning Goal

A Study goal based on problems and opportunities was developed to help create and evaluate alternative plans. It is the overarching intent of the project.

Goal: The project goal is to provide navigation improvement, specifically to provide more sufficient channel depths for commercial vessels and improve public safety as well as provide more efficient Federal channel maintenance.

3.7 Planning Objectives

Plans are formulated to achieve planning objectives. Planning objectives and constraints are inexorably linked to problems and opportunities. A planning objective states the intended purposes of the planning process. It is a statement of what solutions should try to achieve. Objectives provide a clear statement of the Study purpose.

In support of the goal, the planning objectives are to:

1. Provide adequate channel depths to ensure safe and reliable navigation for two-way traffic for the existing and future commercial fleet at Lake Montauk Harbor.
2. Provide for efficient navigation project maintenance.
3. Efficiently utilize beach quality material obtained from channel improvements and future channel maintenance to mitigate erosion on the shoreline between the west jetty and Culloden Point as long as there is no additional cost to the proposed navigation improvement project, or if non-Federal interests agree to pay any increase in cost.

These objectives will be measured by estimating benefits to the commercial fleet from more efficient operations and, if Objective 3 can be achieved, reduced erosion damages west of the inlet jetties.jetties. Assuming the proposed project is expected to be operational in 2021, the

planning period of analysis for the forecast of the future without and with project condition is 2021-2071.

3.8 Environmental Operating Principles

The USACE has reaffirmed its commitment to the environment in a set of "Environmental Operating Principles". These principles foster unity of purpose on environmental issues and reflect a positive tone and direction for dialogue on environmental matters. By implementing these principles within the framework of USACE regulations, the USACE continues its efforts to evaluate the effects of its projects on the environment and to seek better ways of achieving environmentally sustainable solutions in partnership with stakeholders.

The seven "Environmental Operating Principles" are as follows:

1. Foster sustainability as a way of life throughout the organization.
2. Proactively consider environmental consequences of all USACE activities and act accordingly.
3. Create mutually supporting economic and environmentally sustainable solutions.
4. Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the USACE, which may impact human and natural environments.
5. Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
6. Leverage scientific, economic and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner.
7. Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

3.9 USACE Campaign Plan

The U.S. Army Corps of Engineers Campaign Plan guides USACE policy decisions on how we organize, train, and equip our personnel; how we plan, prioritize, and allocate resources; and how we respond to emerging requirements and challenges and meet national priorities. The Campaign Plan is regularly updated and the current version of the plan covers the period of FY2018 to FY2022.

The USACE strategic plan effort towards improvement began in August 2006 with the "12 Actions for Change" and has evolved to four goals and associated objectives. Although the effort originally developed with a focus on missions that seek to manage risk associated with flooding and storm damage, the Campaign Plan Goals and Objectives are applied to all aspects of the USACE service to the nation including its civil works mission. USACE Campaign Plan Goals and Objectives are derived, in part, from the Commander's Intent, the Army Campaign Plan, and Office of Management and Budget guidance. The four goals are (1) Support National Security, (2) Deliver Integrated Water Resource Solutions, (3) Reduce Disaster Risk, and (4) Prepare for Tomorrow.

The goal and associated objectives most closely related to the study and recommendation of a navigation improvement project at Lake Montauk Harbor are:

Goal 2: Deliver Integrated Water Resource Solutions

Objective 2a – Deliver Quality Water Resources Solutions and Services

The Recommended Plan for navigation improvements at Lake Montauk Harbor meets this objective by delivering a project which, within the limits of Federal participation established by

Congress, meets to the extent practicable the expectations of our partners and stakeholders in providing safe and efficient navigation for the commercial fleet operating at Lake Montauk Harbor.

Objective 2c – Develop the Civil Works Program to Meet the Future Needs of the Nation
The Recommended Plan for navigation improvements at Lake Montauk Harbor meets this objective by delivering a project which, within the limits of Federal participation established by Congress, provides sustainable system of channel improvements and improves coastal resilience through beneficial use of the dredged sand to nourish the beach along the shoreline west of the inlet, which, as described in Chapter 2, is subject to erosion by coastal storms. The study and recommendation were conducted with stakeholder engagement and the public provided an opportunity to review and comment on the study and its recommendations through the NEPA process.

Objective 2d – Manage the Life-Cycle of Water Resources Infrastructure Systems to Consistently Deliver Reliable and Sustainable Performance
The project has been formulated with the complete life-cycle in mind, with a consideration of the costs and impacts of both initial construction and future operations and maintenance, to determine the most cost-effective alternative solution to address problems and opportunities with navigation at Lake Montauk Harbor.

3.10 Planning Constraints

Constraints are restrictions that limit the extent of the planning process. They can be divided into universal constraints and Study-specific constraints. Universal planning constraints are the legal and policy constraints to be included in every planning Study. Study-specific planning constraints are statements of things unique to a specific planning Study that alternative plans should avoid. Constraints are designed to avoid undesirable changes between without- and with-plan conditions.

Universal planning constraints include:

<u>General constraints:</u>

1. The plan should meet the needs and concerns of the public within the Study area;
2. The plan should be flexible to accommodate changing economic, social and environmental patterns and changing technologies.
3. The plan should integrate with and be complementary to other related programs in the Study area.
4. The plan should be able to be implemented with respect to financial and institutional capabilities and public consensus.

<u>Technical constraints:</u>

1. Plans should be in compliance with USACE regulations.
2. Plans should be realistic and state-of-the-art while not relying on future research or development.

<u>Environmental constraint:</u>

1. Plans should avoid and minimize environmental impacts to the maximum degree practicable.
2. Plans should not adversely impact threatened or endangered species, and their habitat.

3. Plans should be compliant with all Federal environmental laws, Executive Orders, and guidance.

Regional and Social constraints:

1. All reasonable opportunities for development within the project scope should be weighed, with consideration of state and local interests.
2. The needs of other regions should be considered, and one area cannot be favored to the detriment of another.
3. Plans should maintain existing cultural resources to the maximum degree possible and produce the least possible disturbance to the community.

Institutional constraints:

1. Plans should be consistent with existing Federal, state, and local laws.
2. Plans should be locally supported and signed by local authorities in the form of a local cooperation agreement and guarantee for all items of local cooperation including possible cost sharing.
3. The plan should be fair and find overall support in the region and state.

Study specific constraints:

1. Alternatives will not impact stability of the existing jetties.
2. Any material placed on downdrift beaches will be beach quality material. Any unsuitable material (i.e. silt or clay) removed during channel deepening or maintenance will not be placed on the downdrift beaches because this would be unacceptable to the non-Federal sponsor and other stakeholders.

Study specific considerations:

Though not constraints, study-specific considerations are:
1. Plans (for disposal of dredged material) will be developed, to the extent practical, consistent with the State Coastal Zone Management policies, as specifically adjusted by the Town of East Hampton's Local Waterfront Revitalization Plan (LWRP)
2. Plans will consider the effects of proposed navigation improvements on Lake Montauk's ecosystem.
3. Plans will not increase coastal storm damage risk within Lake Montauk and on shorelines adjacent to Lake Montauk.

3.11 Navigation Improvement Measures

Plans are composed of measures. A measure is an activity or a feature that can be implemented at a specific geographic site to address one or more planning objectives. They can be used individually or combined with other management measures to form alternative plans. Measures were developed to address problems and to capitalize upon opportunities. They were derived from a variety of sources including prior Lake Montauk Harbor studies, the public scoping process, and the project delivery team. The following measures were considered in the Lake Montauk Harbor navigation improvement feasibility Study. The table at the end of this section shows the results of the screening of identified measures.

1. Unconventional drafts. Use of larger vessels with shallower drafts was considered, but this is not the present trend. It is not projected that the commercial fishing fleet at Lake Montauk Harbor will deviate from the general trend of using larger, deeper draft vessels. This measure was removed from further consideration because it does not meet study objective 1, specifically, it does not provide adequate channel depths for the existing fleet. Rather, it would call for the replacement of the existing fleet. It also meets no other study objective.

2. High water transit; Waiting for high tide to traverse the inlet for deeper draft vessels. Astronomical tides in the study area are semi-diurnal, flooding and ebbing twice a day. The mean and spring tides range from 2.0 to 2.4 feet. Waiting for the tide leads to costly delays for commercial fishing vessels, estimated by local fishing captains. The U.S. Coast Guard reports that potentially unsafe navigation practices result from the limited channel depth. This measure is considered a component of Alternative 1 below and is removed from further consideration because it does not meet study objective 1 in that it does not provide reliability nor is it cost effective, based on, for example, at least a portion of the without project commerce not realized.

3. Relocation of the Existing Fleet. Relocation of the existing fleet would be to the nearest major commercial fishing fleet, which is at Shinnecock Inlet. This measure was removed from further consideration because it is not cost effective. Indeed, boats still calling at Lake Montauk Harbor would relocate to another harbor if it were cost effective.

4. Channel Extension East and West of Star Island. Extending the channel into the former yacht basin area, east of Star Island, was also given consideration. The use of the area, maintained by the Town of East Hampton, for purposes including a turning basin for transient vessels and for access to southern portions of the Lake, was investigated. The presence of sea grass beds and productive shellfish areas in the shallow portions of Lake Montauk, south of Star Island, would require a detailed evaluation of potential environmental impacts associated with such extension. The option would likely be less cost effective than other viable plans as there is no advantage for the large fishing boats to transit further into the harbor. Generally, only recreational vessels would benefit from a channel extension and Corps projects cannot be formulated with recreation as a purpose. The Federal Government is restricted from participating in maintenance of private marinas, berthing areas, and access points. In addition, extending the Federal channel into the Coonsfoot Cove area, west of Star Island, was given consideration. However, the large percentage of silts and clays in the sediment would make this material unsuitable as beach fill and would require further environmental testing. This measure was removed from further consideration because it does not meet study objective 1 in that it does not provide adequate channel depths. The requirement for detailed environmental evaluation also makes this measure likely technically not feasible.

5. Channel Widening. The present authorized channel width of 150 feet was determined to be sufficient for two-way vessel traffic clearances. Since channel deepening would inevitably lead to a wider channel also, this option was not given further consideration. It also meets no other study objective.

6. Channel Realignment. Any major shift in the authorized channel due to its large initial costs would likely be not feasible. Shifting the outer channel west of its present position would temporarily improve the present shoaling condition resulting from east jetty leakage, but this plan would not solve the deeper draft requirements of the larger vessels per Objective 1. It also would not provide a long-term safeguard against shoaling because, without jetty rehabilitation, sand bars would begin to form again. This option was not considered as an effective use of resources. It also meets no other study objective, and it was not considered further.

7. Deepening of Boat Basin. Sediment sample analyses indicated the presence of many silts and clays in this area, which is currently authorized at -10 feet MLLW. This may be a disposal hindrance, pending further testing. The area is currently used primarily by shallow draft recreational craft. Based on boating survey conducted in 2005, there are not enough transient vessels or turning basin needs to deepen the existing depth. Further, this measure does not address the channel. It also meets no other study objective. As a result, this option was not considered further.

8. Sand-Bypassing. Based on the results of sediment budget analysis, there is an approximately 12,800 cubic yards per year of sediment supply from the updrift (east) shoreline. Of the total supply, approximately 7,000 cubic yards per year is bypassed to the downdrift beach via channel dredging and approximately 800 cubic yards per year is lost to deep water offshore. The remaining 5,000 cubic yards per year continues to accumulate to the east of the inlet. The east sediment fillet is close to saturation and the accumulated sediment is shoaling the entrance channel both around the east jetty and by migration into the inner channel via gaps in east jetty. The accumulated updrift sediment fillet could be bypassed to the downdrift beach via trucking or hydraulic pumping across the channel to reduce future channel shoaling and maintenance dredging costs. Due to the small bypassing rate, temporary hydraulic pumping equipment or trucking would be more cost-effective than using a fixed bypassing plant which requires a high investment cost (close to $1,000,000) and annual operation, maintenance, and equipment depreciation, which may double the unit trucking cost of $15 to $20/cubic yard to $30 to $40/cubic yard. Further, mechanical dredging has been determined to not be engineeringly feasible based on previous experience in a similar study area at Mattituck, New York.

9. Jetty Rehabilitation. Rehabilitation of the eastern jetty could play an essential in improving the navigation through the channel for the vessel fleet. A large portion of the shoaling material that enters the channel results from leakage through the eastern jetty. Accordingly, this plan component could reduce the future Operation and Maintenance Costs for the navigation channel. The without project future condition would mean continued deterioration of the eastern jetty and a mandate for more frequent dredging (shorter dredging cycles). Since the shoal that results from leakage tends to be localized but quite intrusive at certain channel points, this component could help enhance navigation maneuverability. The U.S. Army Corps of Engineers New York District, under a separate Operations and Maintenance Authority, rehabilitated a section of the eastern jetty from Station 5+55 to 9+55 together with a tie-in at the inshore end in year 1999. Despite this, it is projected that seepage of sand into channel through the voids of the east jetty would continue without further rehabilitation. The jetty rehabilitation component is not included for further consideration because previous analyses showed that it would not be cost effective in reducing the need for navigation maintenance, and it is assumed that future rehabilitations will be conducted under O&M authority.

10. Deepening of the Federal Navigation Channel. There is a trend toward larger, deeper draft commercial fishing vessels. In 1993, there were 24 vessels overall with a loaded draft of 12 to 13 feet that listed Lake Montauk Harbor as a homeport. According to local fishing captains who were recently interviewed, there are approximately 15 large fishing vessels that operate out of the harbor. The vessels range from 50 to 100 feet in length with loaded drafts of 10 to 16 feet. When considering squat requirements, wave allowance requirements, and safety clearances, deepening would be necessary under present guidance and would meet concerns of local interests. Deepening would improve navigation through the channel for the existing and future fleet and would enhance navigation maneuverability. This measure is considered further.

11. Removal of shoal at the inshore end of the East Jetty. A large sand shoal has been developing near the inshore end of the eastern jetty, just northeast of Star Island. It has been infringing upon the authorized channel width. In 1995, 2000, 2004, 2009, 2011, and 2014 the U.S. Army Corps of Engineers New York District removed part of this shoal during maintenance dredging. Local interests have indicated however that it has already begun to shoal in again because the jetty has not been rehabilitated enough to prevent further leakage into this area. However, due to the construction of a bulkhead, complete removal of the shoal will result in flanking of the structure; therefore this measure is no longer technically feasible and does not meet technical constraints.

12. Deposition basin outside the current authorized channel limits. Over the past several dredging cycles (1991, 1995, 2000, 2009, 2011, and 2014), advanced maintenance dredging measures have been employed. Essentially, for a length of channel approximately equal to the existing east jetty length, an additional 50 feet (outside and to the east of the existing channel) is dredged. This additional cut serves as a deposition basin to protect the authorized channel. This is also done for economic reasons because removing larger quantities is more efficient, given the high dredging mobilization and demobilization costs. This practice could be authorized and extended around the bend and into the inner channel, approximately an additional 1,800 foot length. The width of the deposition basin could be extended from 50 feet to 100 feet to increase the capacity. This measure further reduces environmental impacts from more frequent maintenance and the costs caused by the shoal migration into the harbor. This measure is carried forward for further consideration.

Table 9: Measure Screening Summary

Measure	Does the measure…			Carried forward?
	1 - provide adequate channel depths for reliable navigation	**2 - provide for efficient navigation maintenance**	**3 - efficiently utilize all dredged material**	
~~*1. Unconventional drafts*~~	~~No~~	~~No~~	~~No~~	~~No~~
~~*2. High water transit*~~	~~No~~	~~No~~	~~No~~	~~No~~
~~*3. Relocation of the existing fleet*~~	~~No~~	~~No~~	~~No~~	~~No~~
~~*4. Channel Extension East and West of Star Island*~~	~~No~~	~~No~~	~~No~~	~~No~~
~~*5. Channel Widening*~~	~~No~~	~~No~~	~~No~~	~~No~~
~~*6. Channel Realignment*~~	~~No~~	~~No~~	~~Yes~~	~~No~~
~~*7. Deepening of Boat Basin*~~	~~No~~	~~No~~	~~No~~	~~No~~
~~*8. Sand-Bypassing*~~	~~No~~	~~No~~	~~Yes~~	~~No~~
~~*9. Jetty Rehabilitation*~~	~~No~~	~~Yes~~	~~N/A~~	~~No~~
10. Deepening of the Federal Navigation Channel	Yes	Yes	Yes	Yes
11. Removal of Shoal at the Inshore End of the East Jetty	Yes	Yes	Yes	No
12. Deposition Basin Outside the Current Authorized Channel Limits as a Deposition Basin	Yes	Yes	Yes	Yes

(measures not carried forward for further consideration are crossed out)

3.12 Initial Set of Alternatives

Measures that remained after the initial screening were considered for the initial set of alternatives. In the final array of alternatives, navigation improvement measures were combined to arrive at 2 alternatives (Alternative 2 and Alternative 3) for further evaluation and consideration.

Alternative 1, for these evaluations, is the future without project condition. Specifically, Alternative 1 estimates that the current channel at -12 ft. MLLW and the regular practice of having the 50-ft. deposition basin will be maintained approximately every 4 years at a volume of 32,000cy per operation beginning in 2026, which is the date estimated in the formulation of the maintenance conducted in 2018. Measure 2 High Water Transit is an inherent component of this alternative.

The annualized cost of this alternative during the period of analysis over 50 years at an interest rate of 2.875% at FY 2019 price levels is $196,000.

Alternative 2: Uniform dredging of both the 150- foot-wide channel and 50- foot-wide deposition basin: This alternative includes Measures 10 and 12. For this alternative, for both the channel itself and the deposition basin, depths for new Congressional authorization to be considered range from -14 to -18 feet MLLW. All dredged material would be placed on the downdrift beach but with no design (or disposed of offshore using the methods discussed in the next section). The expected maintenance cycle would be 4 years at a volume of 32,000cy per operation beginning in 2025. The annualized cost of the maintenance of this alternative during the period of analysis over 50 years at an interest rate of 2.875% at FY 2019 price levels is $202,000. The difference in the maintenance between this alternative and Alternative 1, the future without project condition, is $6,000 on an annualized basis and is counted as the maintenance cost of this alternative.

Alternative 3: Uniform dredging of both the 150-foot-wide channel and 100-foot-wide deposition basin: This alternative includes Measures 10 and 12 with the option in 12 to widen the deposition basin to 100 feet. For this alternative, for both the channel itself and the deposition basin, depths for new congressional authorization to be considered range from -14 to -18 feet MLLW. All dredged material would be placed on the downdrift beach but with no design (or disposed of offshore using the methods discussed in the next section). The expected maintenance cycle would be 7 years at a volume of 56,000cy per operation beginning in 2028. The annualized cost of the maintenance of this alternative during the period of analysis over 50 years at an interest rate of 2.875% at FY 2019 price levels is $146,000. The difference in the maintenance between this alternative and Alternative 1, the future without project condition, is a cost savings of $50,000 on an annualized basis and is counted as an added benefit of this alternative.

Figure 9 shows the channel and deposition and the stationing to be used. The 150-foot navigation channel and 50-foot deposition basin are shown in red. The eastern 50-foot deposition basin extension proposed in Alternative 3 is shown in blue.

Figure 6: Lake Montauk Harbor

Figures 10 – 13 show typical cross-sections of the alternatives at select depths. The angle of elevation of the sides of the channels are defined by their side slopes and are the standard 1 vertical on 3 horizontal.

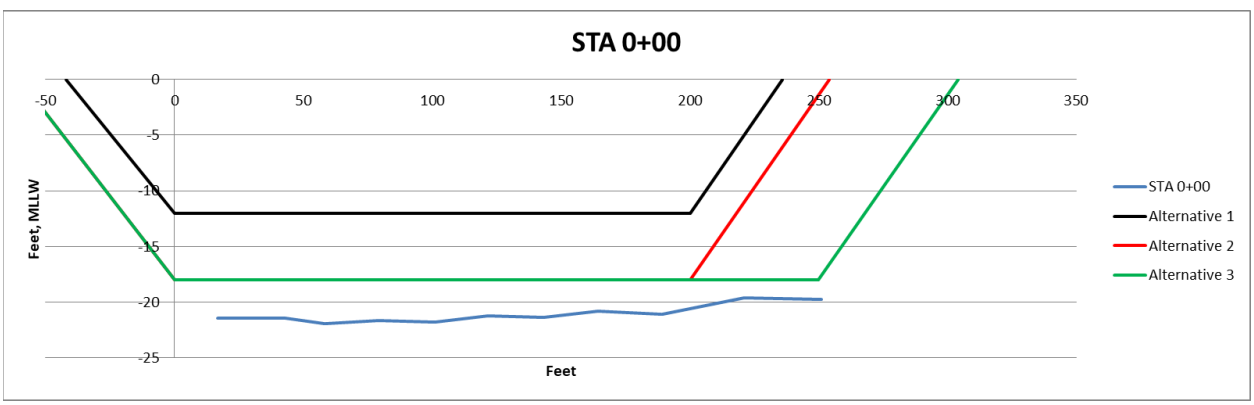

Figure 7: Select Channel Alternatives at Station 0+00

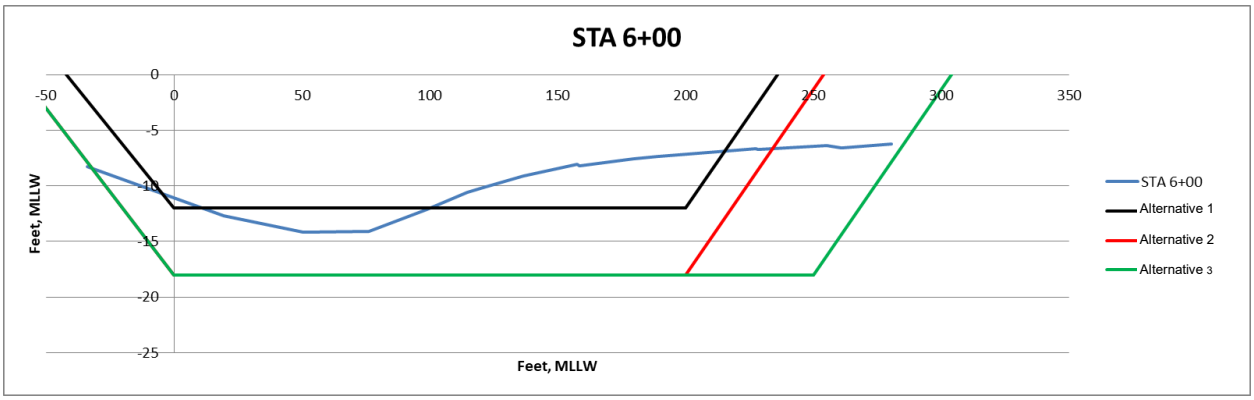

Figure 8: Select Channel Alternatives at Station 6+00

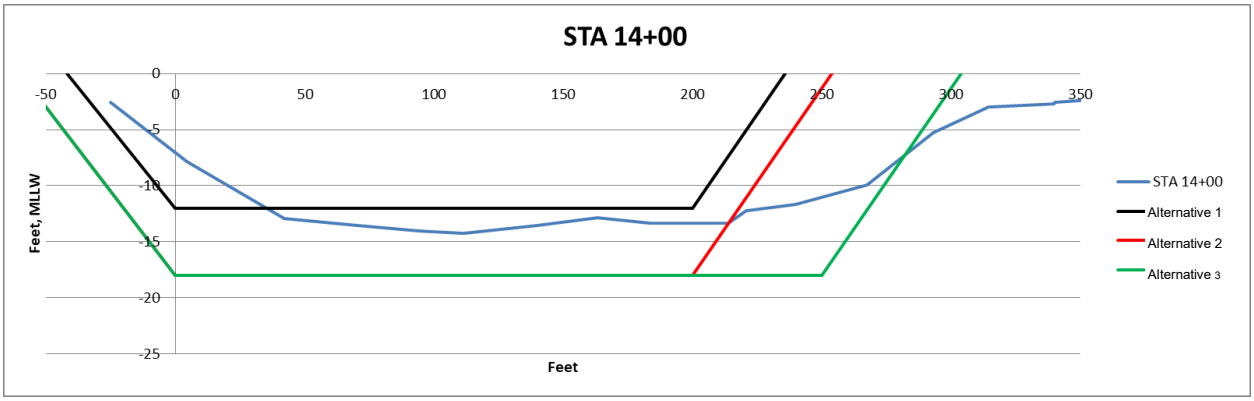

Figure 9: Select Channel Alternatives at Station 14+00

3.13 The Federal Objective

Per the 1983 Principles and Guidelines, the Federal objective of water and related land resources project planning is to "contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements".

Table 10 shows the estimated initial dredging volumes for the channel and deposition basin. These volumes indicate that there are three potential dredge types and methods that could be used. It is noted here that all previous maintenance operations up through the operation conducted in 2018 (during which the channel was dredged below -14 ft. MLLW as advanced maintenance) was done by a cutterhead dredge. Dredging methods and dredged material disposal are interdependent in that some disposal methods are only practicable with certain dredging methods.

Mechanical Dredging: Mechanical dredging is typically accomplished using a barge mounted crane or excavator. A crane with a clamshell bucket can remove all but the most consolidated materials. Some clamshell buckets overlapping jaws and closure flaps to contain the dredged material and are known as environmental buckets, as they minimize loss of material to the water column during ascent. Other clamshells have teeth to facilitate removal of harder materials such as gravel and tills. Barge mounted excavators generally have much heavier gage buckets with heavy teeth to remove harder material such as compacted sands, consolidated tills, and weathered rock that can be ripped. The dredged material is placed in scows which are then towed

by tugs to a disposal or offloading site. Most bucket dredging involves open-water or ocean disposal of the dredged material. The number of scows and tugs used would depend on the distance to the disposal site and the rate of dredging, in order to keep the dredge working while some scows were in transit to or from the disposal site. The nearest open water site is the Eastern Long Island Sound site recently designated by the EPA off the Connecticut coast southwest of New London. That site is 14 miles from Lake Montauk Harbor. Use of this site would place sandy dredged material in deep ocean waters where it would be unavailable to any littoral system processes. This would not be consistent with the USACE policy of using dredged material beneficially wherever practicable. Placement even this close to Lake Montauk Harbor also raises the estimated unit cost to between $15 and $30 per cubic yard of material. Scows can also be offloaded and material moved upland for treatment and or disposal, but this would be at a similar unit cost. Harder materials can often be beneficially used for reef construction. Sands can be placed in nearshore feeder bars off of eroding beaches where spring tides can push some of the material onshore. Mechanical dredging with nearshore placement could be used at Lake Montauk Harbor, however NYSDEC considers this less environmentally acceptable than placing onshore and outside the tidal zone. only a portion of the material placed nearshore would ultimately be made available to the western beaches, limiting achieving Objective 3 unless it is now found less costly than the longstanding practice of dredging contractors using a cutterhead.

Hydraulic Pipeline Dredging: Hydraulic Pipeline Dredging involves the use of a cutter head suction dredge with onboard pump attached to a discharge line that carries the material to the location where the dredged material is deposited. The material is suctioned into the cutter head arm and pump by mixing it with water as a slurry. Depending on the type of material being dredged (silt to sand) the slurry can be as much as 90 percent water. Silty dredged material can be pumped into containments to dewater, or onto other shallow areas for marsh creation. Sand can be pumped directly onto beaches where it can be spread and graded by heavy equipment as beach nourishment and shore protection. Cutter heads on pipeline dredges are general front mounted allow the dredge to dig its way in from deep water. Hydraulic pipeline dredges are typically classified according to their pump or discharge line diameter. Large pipeline dredges are typically employed on larger projects or those with greater dredge depths. Booster pumps, typically on barges, may be required along the discharge line for the slurry to reach more distant placement sites. Elevation can be an issue where the discharge point is significantly above the cutter head's working depth. A hydraulic pipeline cutter head dredge could be used for the improvement of Lake Montauk Harbor, provided it was of sufficient size to reach to the intended -19-foot (17+2) pay removal depth at high tide. The pipeline could be routed directly to the west beach areas in need of nourishment material. With proper site preparation (toe dikes, discharge diffusers) and timely grading of the beachfill this would ensure that the majority of the dredged material reached and remained on the beach. The estimated unit cost of this method is between $10 and $12 per cubic yard of material.

Hopper Dredging: A hopper dredge is similar to a pipeline dredge in that it suctions material from the dredge area. Instead of pumping the material through a pipeline the material is discharged into hoppers onboard the dredge. The dredge then places the material in ocean or open water disposal sites, into nearshore bar systems, or onto other subaqueous sites (such as those used for shellfish habitat creation). Hopper dredges can also work together with barge mounted pump-off equipment which re-fluidizes the dredge material to remove it from the hoppers and pumps it via pipeline to the placement site. Some larger hopper dredged can perform this action without a separate piece of equipment and merely need pipelines to connect to which extend to shore. In this manner beaches more distant from the dredge site than could be reached by a pipeline dredge can be nourished. Most hopper dredges are trailing drag arm suction dredges, with the suction trailing the vessels as it moves forward. This limits the ability of the dredged to make

deep vertical cuts. Hopper dredges also have significant differences in their loaded and unloaded drafts. Even smaller hopper dredges that draw 4 feet unloaded will draw 11 feet loaded making use in shallow draft channels such as the channel at Lake Montauk Harbor difficult and not having been preferred during previous maintenance. The USACE has two shallow draft modified split-hull drag arm hopper dredges (Currituck and Murden) that are used to dredge smaller east coast harbors and typically work in New York and New England in the May to October timeframe. A hopper dredge could be used for the improvement of Lake Montauk Harbor, however it would be limited by several factors that could make such a method impracticable, such as a need to work around the tide in the shallow draft channel.

Based on this analysis, costs have been estimated using a cutterhead with onshore disposal on the shore west of the inlet. This is most similar to longstanding maintenance practice. Table 10 shows the costs for construction of Alternatives 2 and 3 at the depths ranging from -14 feet to -18 feet MLLW (FY 2019 price level and interest rate of 2.875%).

Table 10: First Cost and Annual Cost Summary of Alternatives 2 and 3

	Alt 3: Channel & Depo Deepening +100-Foot Widened Basin					Alt 2: Channel & Depo Deepening				
Depth	**18'**	**17'**	**16'**	**15'**	**14'**	**18'**	**17'**	**16'**	**15'**	**14'**
Total Volume	210,000	179,000	149,000	120,000	85,000	166,000	138,000	111,000	85,000	53,000
Months	2.3	2.0	1.7	1.4	1.0	1.9	1.6	1.3	1.0	0.6
First Cost w/ Cont	$4,080,127	$3,633,422	$3,242,218	$2,778,670	$2,212,233	$3,527,218	$3,105,120	$2,722,511	$2,278,837	$1,736,657
First Cost Annualized	$155,000	$138,000	$123,000	$105,000	$84,000	$134,000	$118,000	$103,000	$86,000	$66,000
O&M Annualized	$0	$0	$0	$0	$0	$6,000	$6,000	$6,000	$6,000	$6,000
Total Cost Annualized	$155,000	$138,000	$123,000	$105,000	$84,000	$140,000	$124,000	$109,000	$92,000	$72,000

3.13.1 Principles and Guidelines Criteria, 1983

The 1983 Principles and Guidelines require that plans are formulated in consideration of four criteria: completeness, effectiveness, efficiency, and acceptability.

Completeness is the extent to which the alternative plans provide and account for all necessary investments or other actions to ensure the realization of the planning objectives, including actions by other Federal and non-Federal entities. For the Lake Montauk Harbor navigation improvement feasibility study, an alternative had to provide benefits to all similarly-situated commercial fishermen to be considered complete.
Effectiveness is the extent to which the alternative plans contribute to achieve the planning objectives. Effectiveness of the alternatives was measured by the benefits that the alternative would provide to the commercial fishermen. Alternatives that have a benefit cost ratio (BCR) lower than one will be eliminated from consideration.
Efficiency is the extent to which an alternative plan is the most cost effective means of achieving the objectives. Efficiency will be measured through a comparison of BCRs and benefits. Plans that provide the same benefits, but at higher cost, will be eliminated from consideration.
Acceptability is the extent to which the alternative plans are acceptable in terms of applicable laws, regulations, and public policies. The alternatives were formulated to be in accord with applicable laws and regulations.

It is necessary to know the preliminary benefits and costs of the alternatives in order to assess their effectiveness and efficiency. Accordingly, the annual costs and benefits for the final array of alternative plans are presented in Table 11. The annual costs come from Table 10 above. Benefits of each alternative come directly from the additional commerce that commercial fishermen can realize and cost savings that they can achieve at each proposed deeper channel depth as they report on the study survey approved by the Office of Management and Budget. Survey results updated in 2019 clearly indicate benefits in the two categories: (1) additional commerce (or income) from getting fish to market fresher, (2) savings in fuel and supplies used per trip. Two captains, for the Megan Marie which draws 15 feet and the Jason & Danielle which draws 16 feet, were the only respondents to report incremental benefits in these three categories from a newly Congressionally authorized depth from -16 to -17 feet MLLW. Further, both reported in follow-up telephone interviews conducted by New York District staff that they would not have additional benefits quantifiable if the channel were to be newly Congressionally authorized at -18 feet MLLW or any deeper depth. Finally, Alternative 3 has an additional benefit for all depths for maintenance costs avoided relative to the future without project condition (Alternative 1) of $50,000/yr on an annualized basis.

Table 11: Annual Costs and Annual Benefits for Final Array of Alternatives (FY 2019 price level and using the FY19 interest rate of 2.875%)

	Depth	*Total Cost Annualized*	*Benefits Annualized*	*Net Benefits Annualized*	*Benefit-to-Cost Ratio (BCR)*
Alt 2: Channel & Depo Deepening	**14'**	$72,000	$743,000	$671,000	10.3
	15'	$92,000	$1,388,000	$1,296,000	15.1
	16'	$109,000	$2,161,000	$2,052,000	19.8
	17'	$124,000	$2,266,000	$2,142,000	18.3
	18'	$140,000	$2,266,000	$2,126,000	16.2
Alt 3: Channel & Depo	**14'**	$84,000	$793,000	$709,000	9.4
	15'	$105,000	$1,438,000	$1,333,000	13.7
	16'	$123,000	$2,211,000	$2,088,000	18.0

Deepening +100-Foot Widened Basin	**17'**	$138,000	$2,316,000	$2,178,000	16.8
	18'	$155,000	$2,316,000	$2,161,000	14.9

Based on having the greatest net navigation improvement benefits, Alternative 3 with a 100-foot-wide deposition basin authorized to a depth of -17 feet MLLW is identified as the Tentatively Selected Plan.

Chapter 4: Tentatively Selected Plan

This section of the report describes the Tentatively Selected Plan (TSP). The TSP will be optimized after agency and public reviews for optimal horizontal dimensions, for example, if the deposition basin will be 100 feet wide over the entire length of the channel or if it may need to be narrowed near the recent development or could be widened in other sections to provide a greater volume for shoaling of incoming updrift sediment.

4.1 Proposed Action/Plan Components

Based on having the highest average annual net benefits of $2,178,000, Alternative 3 authorized to a depth of -17 feet MLLW is the TSP. This alternative consists of dredging the channel and a 100 foot-wide deposition basin to a depth of -17 feet MLLW and maintaining that authorized depth and deposition basin approximately every 7 years. The material dredged during initial construction would be placed along the approximately 3,000 feet west of the western jetty. The berm would not be engineered. The berm height would be no more than 9 feet, and the slope would be 1:20. The approximate berm width would be 44 feet. This berm would then be allowed to erode.

Real estate in the form of easements in the form of a non-standard estate will be needed for at least initial construction. These easements will be needed because beyond the first 1,200 feet west of the inlet, the shoreline is owned by the respective homeowners.

4.2 Benefits of the Plan

Benefits of each alternative come directly from the additional commerce that commercial fishermen can realize and cost savings that they can achieve at each proposed deeper channel depth as they report on the study survey approved by the Office of Management and Budget. Survey results updated in 2019 clearly indicate benefits in two categories of (1) additional commerce (or income) from getting fish to market fresher, and (2) savings in fuel and supplies used per trip[2]. Further details on the economic evaluation are provided in Section 3.12.1 and Appendix C - Economics. Further, as described in the formulation of alternatives, Alternative 3 has a cost savings in future maintenance relative to the future without project condition of $50,000/yr on an annualized basis.

[2] The reader may think of additional potential benefits which are not quantified here. The approved survey requests that the captains estimate the effect of channel depth on three additional attributes: (1) reduction in vessel repair and maintenance, (2) reduction in total loss of fishing vessel, and (3) additional commerce from additional landings of non-quota fish. In these three categories, there was insufficient information for a reliable quantitative assessment. For the first two categories, vessel operators have no experience with the other channel depths and could not therefore provide reliable evidence of the incremental benefits at various channel depths. Responses are not provided for the third category.

To calculate the incidental CSRM benefits for placement of the material dredged as part of the TSP, an At Risk spreadsheet model developed for the study estimates that this initial placement would provide a benefit, annualized over the 50-year life of the recommended plan, of $175,000/year (at the FY19 interest rate of 2.875%) in coastal storm damage reduction benefits to structures in that first 3,000 feet west of the inlet . This benefit would be realized only in the first years of the newly-authorized project. Dredged material during maintenance every 7 years would also be placed along the shoreline beginning at the western jetty; any benefits of this placement of maintenance dredged materials is estimated to be negligible because it is at the same overall rate (8,000 cubic yards per year) as the without project future condition. The methodology for the calculation of the annualized coastal storm damage reduction benefits is detailed in Appendix C – Economics.

4.3 Cost Estimate

A summary of the costs of the Lake Montauk Harbor navigation improvement TSP is presented in Table 12.

Table 12: Total Costs for Lake Montauk Harbor Navigation Improvement (FY 2019 P.L.)

LAKE MONTAUK HARBOR NAVIGATION IMPROVEMENT FEASIBILITY STUDY

October 2018 Price Level

Feasilibity Report Cost Estimate Summary

Feat. Acct.	Description	Qty	UoM	Subtotal	Cont. %	Cont $$	Total Cost
01	LANDS AND DAMAGES	1	LS	$ 207,000	20%	$ 41,400	$ 248,400
02	RELOCATIONS	-	LS	$ -	-	$ -	$ -
06	FISH & WILDLIFE FACILITIES	-	LS	$ -	-	$ -	$ -
12	NAVIGATION PORTS & HARBORS	178,500	CY	$ 2,280,000	25%	$ 569,300	$ 2,849,300
18	CULTURAL RESOURCE PRESERVATION	-	LS	$ -	-	$ -	$ -
30	PLANNING, ENGINEERING & DESIGN	1	LS	$ 273,874	7%	$ 19,319	$ 293,193
31	CONSTRUCTION MANAGEMENT	1	LS	$ 225,015	7%	$ 15,873	$ 240,888
	TOTAL			$ 2,985,889		$ 645,892	$ 3,631,780

The initial project first cost is $3,632,000 (October 2018 price levels). These costs include construction, easements, design, supervision and associated administration costs. The material costs were based on a combination of MII database, RSMeans, quotes, and some historical information. The contingencies were developed using Abbreviated Risk Analysis program (ARA). The summary of the results of this risk analysis, and more detail on the cost estimate, can be viewed in the Cost Appendix.

4.4 Operations, Maintenance, Repair, Replacement, & Rehabilitation

Operations and maintenance costs as described in Chapter 3 are an important, and in fact are a determinative part, of the TSP. Operations and maintenance is estimated to take place every 7 years, during which the channel and deposition basin will be dredged back to their authorized -17 foot MLLW depth. At the FY19 interest rate of 2.875%, the estimated present value of O&M is $3,836,000 or $146,000/year. It is important for the reader to note that this annualized cost is less than the future without project condition which would have maintenance costs of $196,000/yr if the tentatively selected plan was not built; therefore, this cost is shown as 0 for purposes of economic analysis.

4.5 Risk and Uncertainty Analysis

The following uncertainty has been identified: Relative sea level rise projections. The historic rate of relative sea level rise was estimated at 0.008 feet/year or 0.8 feet in 100 years. This value represents a forecast based on observed historic changes at nearby gages. Over the 50-year period of analysis the historic rate of relative sea level rise is 0.4-foot increase. In the optimization of the TSP, formulation will account for how the project would perform under the intermediate and high rates of projected relative sea level rise, consistent with the ER 1100-2-8162. Analysis of the intermediate and high rates of relative sea level rise may affect the physical dimensions of the project but would not affect the selection of the TSP.

Risks of implementation and ongoing maintenance of the TSP have been considered, and all risks have been resolved to an acceptable level.

4.6 Economic, Environmental, and Other Social Effects

Four accounts have been established to facilitate evaluation of alternative plans:

1. National Economic Development (NED) – changes in the economic value of the national output of goods and services
2. Environmental Quality (EQ) – non-monetary effects on significant natural and cultural resources
3. Regional Economic Development (RED) – changes in the distribution of regional economic activity that result from each alternative plan
4. Other Social Effects (OSE) – effects from perspectives that are relevant to the planning process, but are not reflected in the other three accounts.

The Lake Montauk Harbor navigation improvement TSP contributes to National Economic Development by allowing the commercial fishermen to realize more commerce. It also reduces the maintenance costs to the nation in the future. Incidentally, the TSP reduces damages from future coastal storm and flood events.

It further contributes to the RED account. Having the channel authorized to a deeper depth will attract commercial vessels from other ports throughout the northeastern United States and increase local commerce and tax revenue. As identified in the Environmental Assessment, there would be minimal environmental impacts because of the highly developed nature of the project area and the relatively tight footprint of the project. Finally, as for the OSE account, this project will neither contribute to it nor detract from it.

4.7 Environmental and Other Social Effects

For environmental compliance, there are no significant, non-routine controversies. Further, the TSP is not expected to have adverse effects to historic properties. Dredging the Federal channel will have no impact on the terrestrial sites that are nearby and upland of the Federal channel. Likewise, the dredged sand will be placed at a specific location on the beach and is not anticipated to affect either the submerged HMS Culloden or the terrestrial prehistoric sites. USACE does not expect any undiscovered sites to be affected by deepening the Federal channel. This is because the sediment composing the lake basin was deposited in late-glacial times, before humans occupied North America. Thus, the sediment that would be dredged predates the human occupation of North America and would not yield any cultural materials.

The greatest key social factor associated with the TSP (or any plan) would likely be the opportunity for benefits to the commercial fishing fleet.

Chapter 5: Plan Implementation

As non-Federal sponsor, the Town of East Hampton must sign a Project Partnership Agreement (PPA) that will carry the project through the Preconstruction Engineering and Design (PED) phase to project construction. A Project Management Plan (PMP) will be prepared to identify tasks, responsibilities, and financial requirements of the Federal Government and the non-Federal partner during PED and construction. For construction itself, a second PPA for construction will need to be entered into. Alternatively, it is noted that the estimated cost of the recommended plan falls within the limit of the Continuing Authorities Program, Section 107 of the River and Harbor Act of 1960 (33 U.S.C. Section 577) and could be implemented under this continuing authority without congressional authorization; only a single PPA for design and construction would be entered into under this program. A project schedule has been estimated to serve as the basis of the cost estimate based on reasonable assumptions for the detailed design and construction schedules. The schedule and PMP will be refined as more data are available in subsequent phases of the project.

5.1 Institutional Requirements

The Town of East Hampton has indicated its intent to participate in implementation of this project through a strong record of involvement and coordination in the Feasibility Study. A fully coordinated PPA package, which will include the non-Federal partner's financing plan, will be prepared subsequent to the approval of the feasibility phase to initiate design and construction. It will be based on the recommendations of the feasibility Study. East Hampton has agreed to comply with all applicable Federal laws and policies and other requirements that include, but are not limited to:

a. Provide all lands, easements, rights-of-way, and relocations and disposal/borrow areas (LERRD) uncontaminated with hazardous and toxic wastes necessary for construction and future OMRR&R of the project.

b. Provide 10 percent of the recommended project's initial cost for design and for construction or for both design and construction if implemented under the Continuing Authorities Program, Section 107 upfront and then an additional cash contribution either at construction close-out or over up to 30 years at interest if the value of LERRD contributions toward total project costs is less than 10 percent, so that the total share equals 20 percent

c. Provide all improvements required on lands, easements, and rights-of-way to enable the proper disposal of dredged or excavated material associated with the construction, operation, and maintenance of the project. Such improvements may include, but are not necessarily limited to, retaining dikes, waste-weirs, floodwalls, embankments, monitoring features, stilling basins, and dewatering pumps and pipes.

d. 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.e.

e. 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.

f. 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 (P.L.) 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.

g. Assume complete financial responsibility, as between the Federal Government and the non-Federal project partner for 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.

h. 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.

i. 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 Uniform Relocation Assistance Act of 1987 (Public Law 100-17),and the Uniform 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.

J. 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."

k. Provide the non-Federal share of that portion of the costs of 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, in accordance with the cost sharing provisions of the agreement.

l. 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.

m. Not less than once each year inform affected interests of the extent of risk management afforded by the Project.

n. Publicize floodplain 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 coastal storm risk management provided by the project.

o. Provide, during construction, any additional funds needed to cover the non-Federal up-front share of PED costs.

p. Grant the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the non-Federal project partner owns or controls for access to the project for the purpose of inspection and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing or rehabilitating the project.

q. 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.

r. 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.

In an effort to keep the non-Federal project sponsor involved and the local partner informed, meetings were held throughout the feasibility phase. Coordination efforts will continue, including coordination of this Study with other State and Federal agencies. It is currently anticipated that a public meeting will be held upon release of the draft feasibility report and Environmental Assessment for public review.

5.2 Financial Analysis

For purposes of project implementation, East Hampton has indicated its intent to enter into a PPA at the conclusion of the Study. It most recently stated its intention at the Tentatively Selected Plan milestone meeting held on 30 April 2019. The Letter of written Support from East Hampton and Self-Certification of Financial Capability will be requested following the Public and Agency review period and will be included in Appendix F: Pertinent Correspondence Appendix of the final Feasibility Report.

5.3 Real Estate Requirements

The total lands and easements required in support of the project is approximately 2.45 acres of easements in the form of a non-standard estate. Costs to obtain these are currently estimated at $248,000. Please refer to the Real Estate Plan, Appendix E, for further details.

5.4 Preconstruction Engineering and Design

For the Lake Montauk Harbor navigation improvements TSP, PED costs are estimated at $293,000 (Oct. 2018 Price Level), to be cost-shared 90% Federal and 10% non-Federal with an additional 10% required of the non-Federal sponsor after construction is complete in cash or paid back with interest over up to 30 years. The approximate duration for PED is 6 to 9 months for tasks, including detailed field surveys and geotechnical data collection and construction contract award.

5.5 Construction Schedule

The project assumes a construction period of approximately 2.0 to 2.5 months, in the fall in which all Federal and non-Federal funds become available for construction. Construction in the fall is necessary because of environmental windows limiting construction to between September 1 and January 15.

5.6 Cost Sharing and Non-Federal Sponsor Responsibilities

The details behind the initial project first cost as well as expected operations and maintenance estimated at every 7 years of implementing the Tentatively Selected Plan (TSP) are shown in Table 13. The Federal share is 90% of the initial project first cost and the non-Federal share is 10%. An additional 10% will be required from the non-Federal sponsor after project turnover in cash or over up to 30 years at a rate equivalent to current Department of the Treasury bond rates. Future operations and maintenance is 100% a Federal responsibility. However the non-Federal sponsor should understand that budgeting for maintenance of low use small boat harbors is not a priority nationally. The Federal Government will design the project, prepare detailed plans and specifications and construct the project, exclusive of those items specifically required of non-Federal interests.

Table 13: Cost Apportionment (Oct. 2020 Price Level)

Fully Funded Project First Cost	$3,872,000
Federal (90%)	$3,485,000
Non-Federal (10%*)	$ 387,000

*An additional 10% ($340,000) will be required after project turnover from the non-Federal sponsor, allowing for payment to occur for a period of up to 30 years at a rate equivalent to current Department of the Treasury bond rates.

5.7 Views of the Non-Federal Sponsor and Other Agencies

Investigations of the proposed action has received support from the non-Federal current study sponsor, NYSDEC, and the proposed project sponsor, East Hampton. This support is expressed through the Letter of Support which will be requested following the Public and Agency review period. Through project planning and National Environmental Policy Act (NEPA) scoping between 2012 and 2019 a variety of other Federal agencies have been involved in this investigation and support the project goals. It is noted here that the recommendation is only a partial response to the 2002 congressional authorization because NYSDEC and the Town of East Hampton and the Corps could not agree on a TSP for the purpose of coastal storm risk management.

5.8. Major Conclusions and Findings

This Study has determined that overall marginally adequate inlet channel and harbor depth at Lake Montauk Harbor, NY, and, for many vessels, insufficient channel and harbor depth at various times, such as low tide, due to both the channel's currently authorized depth and the channel regularly being shoaled in above this depth are causing problems and economic inefficiencies to the commercial fishing fleet that use the harbor. In addition, periodic coastal storms, such as tropical storms, hurricanes, and nor'easters, pose a severe threat to life and property along the Block Island Sound shoreline, within the first mile west of the harbor inlet. There is an opportunity to provide more reliable navigation in Lake Montauk Harbor and an opportunity to respond to the erosion damages on the shoreline west of the inlet jetties, potentially by placement of dredged sand from the navigation channel on the beach as least cost disposal, which could provide coastal storm risk management as an ancillary benefit to navigation improvements. In response to these problems and opportunities, plan formulation activities considered a range of measures as documented in this draft Feasibility Report. Through an iterative plan formulation process, potential navigation improvement measures were identified, evaluated, and compared.

Alternative navigation improvement plans that survived the initial screening of alternatives included authorizing the existing channel to a deeper depth and creating a deposition basin next to the east side of the authorized channel. Alternative 3 at a depth of -17 feet MLLW was found

to be the most effective and efficient of the two alternatives. It was found to be the alternative having the highest net benefits, making it the Tentatively Selected Plan.

The project includes approximately 250 feet within the inlet along the entire length of the inlet as well as, for disposal of dredged material, the shoreline west of the inlet for approximately a distance of 3,000 feet and a width of 44 feet The exact dimensions of the project will be determined during the optimization phase of the Study, which will follow public and agency reviews of this report.

The estimated total first cost for project implementation is $3,632,000 (FY 2019 Price Level), to be cost shared 90% Federal and 10% non-Federal. The non-Federal sponsor will also be required to make an additional contribution equal to ten percent of the cost of design and construction once initial construction is completed. The present worth of future maintenance of $3,836,000 which will be 100% a Federal expense. It is noted here that this expense is a cost savings to the Federal government relative to the future without project condition. Annual net benefits are in the amount of $2,353,000 (including incidental coastal storm risk management benefits of $175,000/yr) and the benefit cost ratio is 18.1 to 1.

Chapter 6: Recommendations

In making the following recommendations, I have 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, the Town of East Hampton, and other non-Federal interests.

I recommend that the selected plan for navigation improvements at Lake Montauk Harbor, New York, as fully detailed in this draft Feasibility Report and the Environmental Assessment, be authorized for construction as a Federal project, subject to such modifications as may be prescribed by the Chief of Engineers. These recommendations are made with the provisions that local interests will:

a. Provide to the United States all necessary lands, easements, rights-of-way, relocations, and suitable borrow and/or disposal areas deemed necessary by the United States for initial construction and subsequent maintenance of the project.

b. Hold and save the United States free from claims for damages that may result from construction and subsequent maintenance, operation, and public use of the project, except damages due to the fault or negligence of the United States or its contractors.

c. Contribute the local share of non-Federal costs for design and initial construction. This plan consists of authorizing the existing Federal channel to a depth of -17 feet MLLW and creating a deposition basin approximately 100 feet wide immediately east of the channel at a total first cost of $3,632,000 (FY2019 price levels) with a present worth of future maintenance of $3,836,000, which is less than what would have been if the project were not constructed. Under current guidelines, the project will be cost shared on a basis for initial construction of 90% Federal and 10% non-Federal. The sponsor must also make an additional contribution of 10 percent of the cost of design and construction once initial construction is completed which can either be paid in full or over a period of up to 30 years at a rate equivalent to current Department of the Treasury bond rates.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of highest review levels within the Executive Branch. Consequently, the recommendations may be modified (by the Chief of Engineers) before they are transmitted to the Congress as proposals for authorization and implementing funding. However, prior to transmittal to Congress, the partner, the State, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Thomas D. Asbery
Colonel, U.S. Army
Commander