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Shrewsbury River Basin, Sea Bright, New Jersey Coastal Storm Risk Management Feasibility Study

Draft Integrated Feasibility Report & Environmental Assessment

August 2016

U.S. Army Corps of Engineers
North Atlantic Division, New York District
In partnership with the
New Jersey Department of Environmental Protection

Sea Bright, New Jersey after Hurricane Sandy, November 2012.

Shrewsbury River Basin, Sea Bright, New Jersey
Coastal Storm Risk Management Feasibility Study

This report was prepared by the
New York District, North Atlantic Division of the
U.S. Army Corps of Engineers
in partnership with the
New Jersey Department of Environmental Protection

Please send comments or questions about this Draft Environmental Assessment to:
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Pertinent Data

Description

The tentatively selected plan (TSP) includes the elevation of up to 34 structures, and use of a deployable ringwall around 2 structures to address coastal storm damage in Sea Bright, New Jersey. Plan details will be refined following the receipt of agency and public feedback after review of this draft report.

Location

The Borough of Sea Bright is located in Monmouth County, New Jersey in the northern part of the state. It sits between the Atlantic Ocean to the east, and the tidally-influenced Shrewsbury and Navesink Rivers to the west.

Plan Features

Thirty four structures will be elevated between 5 to 7 feet above ground elevation so that their main floor elevations reach +11.2 feet North American Vertical Datum of 1988 (NAVD88). The base flood elevations for structures range from +7 feet NAVD88 to +8 feet NAVD88. Each structure will be elevated more than 3 feet above the base flood elevation to meet the latest local building standards for construction in a floodplain. The plan also includes a temporary ringwall to be deployed around two attached structures prior to storm events. The top of the ringwall will measure approximately 7 feet above ground elevation. The ringwall will be deconstructed after use and stored between storm events.

Economics

Costs and benefits are presented at the October 2015 (Fiscal Year 2016) price level and, where appropriate, are annualized at 3.125% over a 50-year period of analysis (2020 – 2070).

Costs

Fully Funded Cost	$12,109,000
Initial Project Cost	$11,141,000
Average Annual Cost	$450,000
OMRR&R	$2,000
Total Annual Cost	$452,000

Benefits

Average Annual Benefits	$466,000
Average Annual Net Benefits	$14,000
Benefit-to-Cost Ratio	1.0

Real Estate Requirements

The project will require temporary work easements for 0.8 acres, and temporary relocation of residents and businesses while the elevation of structures is underway. No permanent acquisitions are needed.

Cost Apportionment (FY 16 Price Levels)

Project construction will be cost-shared at 65 percent Federal expense and 35 percent non-Federal expense. Because construction will not significantly impact environmental and historic resources, compensatory mitigation is not anticipated. Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) of the deployable ringwall is the responsibility of the non-Federal sponsor.

Cost Category	Federal Share	Non-Federal Share	Total
Initial project cost	$7,242,000	$3,899,00	$11,141,000
Real Estate Credit	-	$529,000	$529,000
Cash Contribution	$7,241,650	$3,370,350	$10,612,000
Total	$7,241,650	$3,899,350	$11,141,000

Executive Summary

The U.S. Army Corps of Engineers (USACE), North Atlantic Division, New York District has partnered with the New Jersey Department of Environmental Protection (NJDEP) to undertake the Shrewsbury River Basin, Sea Bright, New Jersey coastal storm risk management study. This draft integrated feasibility report and environmental assessment presents the results of the study's evaluation of various alternatives intended to manage the risk of damages caused by coastal storm events. Benefits, costs, and impacts caused by implementation of the tentatively selected plan (TSP) are described in this draft report. This report fulfills the requirements of the National Environmental Policy Act of 1969 (NEPA), and was written in accordance with the President's Council on Environmental Quality (CEQ) Rules and Regulations for Implementing NEPA (Title 40, Code of Federal Regulations [CFR], Sections 1500-1508), the USACE's Procedures for Implementing NEPA (Engineer Regulation [ER] 200-2-2), and other applicable Federal and state environmental laws.

The people, economy, and culture of the Borough of Sea Bright, New Jersey are at increasing risk of flood damage caused by coastal storms such as nor'easters, tropical storms, and hurricanes. This is due to its geography, topography, and the anticipated effects of relative sea level rise. The relatively low land is frequently inundated by back bay flooding from the Shrewsbury River. Frequent overtopping of the relatively low river-fronting bulkheads occurs during spring tide events and minor coastal storms. Major storms such as hurricanes occur less frequently but may cause widespread flooding throughout the borough, as was seen during Hurricane Sandy in 2012. The project purpose is to manage the risk of flooding from coastal flooding. USACE considered a range of nonstructural and structural measures that could potentially reduce flood damages in downtown Sea Bright, the borough's most densely populated area. Through an iterative plan formulation process, potential coastal storm risk management measures were identified, evaluated, and compared. The TSP will provide coastal storm risk management and address damages from coastal storm flooding in downtown Sea Bright.

The TSP consists of elevating up to 34 structures so that their main floor elevations are at an elevation of +11.2 feet North American Vertical Datum of 1988 (NAVD88), and deploying a temporary ringwall around two attached structures. The structures to be elevated would be removed from the 1 percent floodplain. The proposed project is part of a comprehensive plan to reduce flood risk to life and property in Sea Bright. It complements other ongoing efforts in the borough to manage flood risk, the most significant of which is the elevation of many homes and other structures out of the 1 percent floodplain. There would be no significant detrimental impacts to the environment due to implementation of the plan. Details of the TSP, including the number of structures included in the plan, will undergo refinement during plan optimization, following the receipt of agency and public feedback of this draft report.

The estimated total first cost for project implementation is $11,141,000 (October 2015 Price Level), to be cost shared 65 percent Federal expense and 35 percent non-Federal expense. The fully funded cost is $12,109,000. The plan would provide $14,000 in annual net benefits. The benefit-to-cost ratio of the plan is 1.0.

The non-Federal study sponsor, the NJDEP, has indicated its support for the Recommended Plan and is willing to enter into a Project Partnership Agreement (PPA) with the Federal Government for the implementation of the Recommended Plan.

Draft Finding of No Significant Impact (FONSI)

The U.S. Army Corps of Engineers, New York District and the New Jersey Department of Environmental Protection (NJDEP) Bureau of Coastal Engineering proposes to implement the Shrewsbury River Basin, New Jersey Coastal Storm Risk Management Project within the Borough of Sea Bright, Monmouth County, New Jersey. The project involves elevating up to 37 structures between 5 to 7 feet above ground elevation so that their main floor elevations reach +11.2 feet North American Vertical Datum of 1988 (NAVD88). A temporary ringwall will be deployed around two attached structures prior to storm events. The top of the ringwall will measure approximately 7 feet above ground elevation. The ringwall will be deconstructed after use and stored between storm events. The proposed project will manage coastal storm risk and address damages from coastal storm flooding in downtown Sea Bright. Federal Interest is warranted in the development of this nonstructural plan, which is supported by the non-Federal sponsor, the NJDEP.

No major, permanent impacts to the human environment are anticipated as a result of implementation of the plan. No wetlands would be affected nor will any other habitat be destroyed, since building elevation and use of a temporary ringwall utilizes the same existing footprint and floodwaters will essentially be allowed to flow as they would under the No Action Alternative. Since levees, floodwalls, or other structures would not be built, impacts to aquatic, wetland and upland habitat would be eliminated. For the same reasons, and because no historic buildings are included in the plan, there would be no impact to historic and cultural resources. Any other impacts, including the environmental impacts associated with building elevation, would be minor and temporary (e.g., temporary relocation of residents during construction).

Detrimental cumulative impacts to the environment are not expected as a result of implementation of the proposed project. There would be no increase in footprint size of the elevated structures, and therefore does not change floodplain characteristics. Use of a deployable floodwall would also not change floodplain characteristics. The Borough of Sea Bright's work to elevate public bulkheads along the Shrewsbury River may reduce some risk from small storm events. Since Hurricane Sandy, many homeowners have or are in the process of elevating their homes. This action mitigates the effects of flood damages to structures. The minimal scale and non-structural nature of the proposed project would not contribute any additional or cumulative impacts to the coastal landscape. All Federal, state, and local laws and regulations would be followed during construction, including those applicable to transport of debris, proper disposal of materials, and environmental protection of the project area during the entire construction period.

Based on my review and evaluation of the environmental effects as presented in the environmental assessment, I have determined that the proposed project is not a major Federal action significantly affecting the quality of the human environment. I have reviewed the proposed action in terms of overall public interest and found that the proposed action does not warrant the preparation of an Environmental Impact Statement.

_____

David A. Caldwell
Colonel, U. S. Army
Commander

_____

Date

Shrewsbury River Basin, Sea Bright, New Jersey
Coastal Storm Risk Management Feasibility Study
Draft Integrated Feasibility Report & Environmental Assessment

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Acronyms

ACM: asbestos-containing materials
APE: Area of Potential Effect
CAFRA: Coastal Area Facility Review Act
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CO: carbon monoxide
CEQ: Council on Environmental Quality
CFR: Code of Federal Regulations
EO: Executive Order
ER: Engineer Regulation
FCSA: Feasibility Cost Sharing Agreement
FEMA: Federal Emergency Management Agency
FWCA: Fish and Wildlife Service Coordination
FY: Fiscal Year
HTRW: hazardous, toxic, and radioactive waste
HMA: Hazard Mitigation Assistance
LBP: lead-based paint
Ldn: day-night noise level
MFE: main floor elevation
NAAQS: National Ambient Air Quality Standards
NACP: Northern Atlantic Coastal Plain
NAVD88: North American Vertical Datum of 1988
NED: National economic development
NEPA: National Environmental Policy Act of 1969
NHPA: National Historic Preservation Act of 1966
NJDEP: New Jersey Department of Environmental Protection
NJNG: New Jersey Natural Gas
NOAA: National Oceanic and Atmospheric Administration
NOx: nitrogen oxides
NRHP: National Register of Historic Places
OMRR&R: Operation, Maintenance, Repair, Replacement, and Rehabilitation
P&G: Principles and Guidelines
P.L.: Public Law
PED: Preconstruction Engineering and Design
PPA: Project Partnership Agreement
RONA: Record of Non-Applicability
RSLC: relative sea level change
SO2: sulfur oxides
TRWRA: Two Rivers Water Reclamation Authority
TSP: tentatively selected plan
VOC: volatiles organic compounds
VLM: vertical land movement
WRDA: Water Resources Development Act
U.S.C.: U.S. Code
USACE: U.S. Army Corps of Engineers
USEPA: United States Environmental Protection Agency
USFWS: U.S. Fish and Wildlife Service
USHUD: U.S. Department of Housing and Urban Development

Chapter 1: Introduction

1.1 Study Purpose & Scope

The U.S. Army Corps of Engineers (USACE), North Atlantic Division, New York District has prepared this draft integrated feasibility report and environmental assessment for the Shrewsbury River Basin, Sea Bright, New Jersey, coastal storm risk management feasibility study ("Shrewsbury study," or "study"). It includes input from the non-Federal sponsor, local governments, natural resource agencies, non-governmental organizations, and the public. The purpose of the study is to investigate potential coastal storm risk management solutions for the Borough of Sea Bright, Monmouth County, New Jersey. A recommendation for Federal participation in a risk management project that is technically sound, economically justified, and environmentally acceptable is presented in this draft report.

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. Pursuant to this, this draft report: (1) summarizes the current and potential water resource problems, needs, and opportunities for coastal storm risk management; (2) presents the results of the plan formulation for water resource management solutions; (3) identifies specific details of the tentatively selected plan (TSP), including inherent risks and (4) details the extent of Federal Interest and local support for the plan.

1.2 Study Authority

The study was authorized by a resolution of the U.S. House of Representatives dated May 7, 1997:

> *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 on the Shore of New Jersey from Sandy Hook to Barnegat Inlet, published as House Document 332, 85th Congress, 2nd Session, the Report of Limited Reconnaissance Study on the entire Shore of New Jersey, dated September 1990, and other pertinent reports, with a view to determining whether any modifications of the recommendations contained therein are advisable at the present time, in the interest of water resources development, environmental restoration, and other allied purposes.*

The resolution was passed in response to frequent flooding from coastal storms such as nor'easters, tropical storms, and hurricanes that affected communities along the New Jersey shore. In response to the authority, USACE completed a reconnaissance report in July 2000 (USACE 2000). The report recommended further Federal investigation into the feasibility of reducing flood risks along the Shrewsbury River at Sea Bright, and the feasibility of aquatic habitat restoration within the region.

A Feasibility Cost Sharing Agreement (FCSA) for a feasibility study was executed between the USACE and the New Jersey Department of Environmental Protection (NJDEP), the non-Federal study sponsor, in August 2001. The study was underway when Hurricane Sandy severely impacted the region in October 2012. In response to the devastation laid forth by the storm, the U.S. Congress passed and the President signed into law the Disaster Relief Appropriations Act of 2013 (Public Law [P.L.] 113-2). The legislation provided supplemental appropriations to address damages caused by Hurricane Sandy and

to reduce future flood risk in ways that will support the long-term sustainability of the coastal ecosystem and communities, and reduce the economic costs and risks associated with large-scale flood and storm events. It allocated $5.35 billion to USACE to address areas impacted by Hurricane Sandy. USACE received $1,000,000 of these funds to complete the study to investigate potential solutions to reduce damages from coastal storms in Sea Bright. A FCSA amendment to complete the study, pursuant to P.L. 113-2, was executed on August 5, 2013.

1.3 Study Scope & History

The reconnaissance study initially focused on potential basin-wide solutions to back bay flooding due to coastal storms from the Shrewsbury River. It was undertaken to identify potential locations for Federal participation in coastal storm risk management projects within the entire Shrewsbury River Basin watershed. There are sixteen New Jersey municipalities that lie wholly within the watershed: Colts Neck, Eatontown, Fair Haven, Holmdel, Little Silver, Long Branch, Marlboro, Middletown, Monmouth Beach, Oceanport, Red Bank, Rumson, Sea Bright, Shrewsbury, Tinton Falls, and West Long Branch (Figure 1). The July 2000 reconnaissance report recommended investigation into potential coastal storm risk management solutions in only Sea Bright and Monmouth Beach, and three ecosystem restoration projects within the basin. After a more refined investigation and coordination with locals, it was determined that a project at Monmouth Beach was infeasible. NJDEP requested that a feasibility study focus only on the potential coastal storm risk management opportunities in downtown Sea Bright. This study focuses on the investigation into the feasibility of such a risk management project.

The feasibility study was initiated in 2001. In early 2012, USACE had identified a potential project that included the elevation of 33 structures in Sea Bright. Hurricane Sandy made landfall in October of that year, completely flooding the borough and underscoring the need for USACE participation in a risk management project. Because the storm caused significant changes to the region, updated engineering and economic data were collected, and new engineering analyses were performed. USACE investigated a wide range of risk management measures, from structure elevations to a storm surge barrier in Sandy Hook Bay. The results of these post-Hurricane Sandy engineering and economic analyses, and a potential plan of action are detailed in this draft report.

1.4 Study Area

The study area is the area within which significant project impacts may occur. As described in Section 1.3, it was determined during the 2000 reconnaissance study that limited opportunities for a coastal storm risk management project exist throughout most of the Shrewsbury River Basin. Specifically, downtown Sea Bright was highlighted in the reconnaissance report as one of the areas most vulnerable to coastal storm flooding in the basin. As discussed in Chapter 3, a variety of alternatives were initially formulated to reduce the risk of coastal storm flooding – including a “regional” plan that would potentially affect a large part of the Shrewsbury River Basin. Because such a “regional” plan was ultimately eliminated from consideration and only plans with “localized” impacts were carried forward for detailed analysis, existing, future with, and future without-project conditions described in this report are specific to downtown Sea Bright, and not the larger Shrewsbury River Basin. The study area, and the discussion in this report about potential impacts and benefits of a coastal storm risk management project focus on the potential implementation of such a project in downtown Sea Bright (Figure 2). Existing, future with-, and future without-project conditions described in this draft report are specific to the study area and not the larger Shrewsbury River Basin.

The downtown area is roughly in the geographic center of the Sea Bright, which occupies a thin strip of coastal spit south of Sandy Hook with the Atlantic Ocean to the east and the Shrewsbury and Navesink Rivers to the west (Figure 3). The modern community of Sea Bright dates to the 1840s, when the area was used for fishing and water sports. Hotels, seasonal cottages, and recreational development soon

followed, and Sea Bright was formally incorporated in 1889. Over time, the community became year-round as supported by a downtown with stores, restaurants, and other office-based businesses located on Ocean Avenue south of the Rumson Bridge (County Route 520). Most land in Sea Bright is occupied by residential development (75 percent of landcover), which is mostly single-family dwellings, though a number of multi-unit residential and low-rise developments can be found. Private residences, and a number of marine-related businesses including marinas, seafood restaurants, boat suppliers and repairers, and small-scale fishing businesses line the Shrewsbury River waterfront. Sea Bright is also home to a number of private and public beach clubs along the oceanfront.

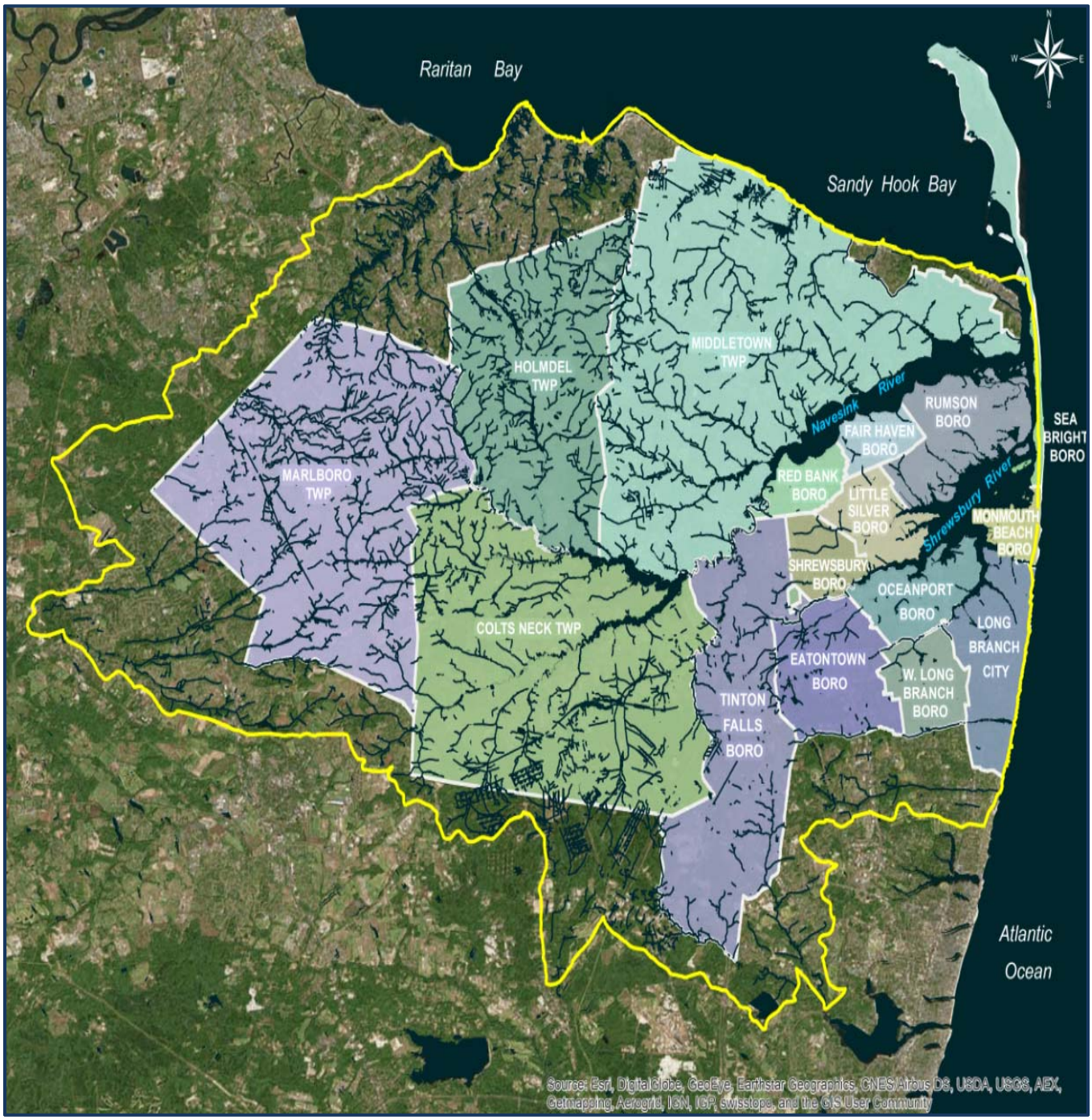


Figure 1: Shrewsbury River Basin, New Jersey.

Figure 2: The study area: downtown Sea Bright.

Figure 3: Borough of Sea Bright, New Jersey.

The study area makes up Sea Bright commercial district and approximately a third of the borough's households. It extends from the Shrewsbury River east to the Atlantic Ocean, and the Rumson Bridge (County Route 520) south to Sandpiper Lane. Businesses line Ocean Avenue, with many apartments located on the second story of the mixed-use buildings (Figure 4). Single- and multi-family residences are primarily located along streets off Ocean Avenue (Figure 5).

Figure 4: Downtown Sea Bright streetscape, Ocean Avenue looking south, 2015.

1.5 Need for Action*

The residents and businesses in Sea Bright have sustained repeated flood damage from coastal storms such as nor'easters, tropical storms, and hurricanes since the borough's settlement in the early 1840s. The community is vulnerable to coastal storm flooding due to its geography and topography. The borough is located on a coastal spit between the tidally-influenced Shrewsbury and Navesink Rivers to the west, and Atlantic Ocean to the east (Figure 3). The relatively low-lying land is subject to frequent coastal storm flooding from the Atlantic Ocean and, more severely, back bay flooding from the Shrewsbury River, as detailed in Section 2.2.

1.6 Prior Studies & Reports

Data from prior reports were used to support the analyses and recommendations presented in this draft report. This includes analysis and reports completed in support of this study. They include:

- Optimization Report, “Shrewsbury River, Flood Risk Management Study; Sea Bright, New Jersey, Optimization of Preliminary Nonstructural Plans” (USACE 2012)
- Draft Preliminary Alternatives Analysis Report, “Shrewsbury River Basin, New Jersey, Flood Risk Management Study Preliminary Alternatives Analysis Report” (USACE 2011)
- USACE Engineer Research & Development Center Coastal Hydraulics Laboratory Letter Report, “Shrewsbury River Flood Control Modeling” (USACE 2006)
- “Shrewsbury River Basin, New Jersey, Reconnaissance Study for Flood Control & Ecosystem Restoration, Section 905(b) (WRDA 86) Preliminary Analysis” (USACE 2000)
- General Design Memorandum, “Atlantic Coast of New Jersey from Sandy Hook to Barnegat Inlet Beach Erosion Control Project” (USACE 1989)

Figure 5: Typical residential streetscape, Center Street looking west to the Shrewsbury River, 2011.

Chapter 2: Existing Conditions*

Existing conditions of the affected environment serve as the basis for the characterization of problem identification and projection of future without-project conditions. The historic and existing conditions, and a forecast of the "future without-project" conditions provide the basis for plan formulation. The future without-project condition is the No Action Alternative. Existing conditions are described here for the environmental setting, the built environment, and the human environment. This description of the affected environment is in accordance with the requirements of National Environmental Policy Act of 1969 (NEPA), and serves as the baseline for Chapter 5 of this draft report.

2.1 Topography

Sea Bright is characterized by extremely low-lying terrain. The majority of the area west of Ocean Avenue is at or below +4 feet North American Vertical Datum of 1988 (NAVD88). The riverfront is stabilized by a relatively low bulkhead at a height of approximately +5 feet NAVD88 for most of its extent. There is a slight rise east to Ocean Avenue to an elevation generally between +4 feet and +6 feet NAVD88. East of Ocean Avenue towards the Atlantic Ocean, the elevations rise again. Landward of the beach and dune, elevations generally vary between +6 feet to +12 feet NAVD88, and generally average +10 feet NAVD88. Along the Atlantic Ocean shoreline, the beach conditions vary, but are generally at an elevation of +10 feet NAVD88. The beach is backed by a seawall through a portion of the study area, with heights up to elevation +16 feet NAVD88. The seawall has a gap approximately a third of a mile long near the Chapel Beach Club and public parking lot. A local project to join the disconnected parts of the seawall is currently under construction.

2.2 Flooding in Sea Bright

Living with water is integral to the culture of Sea Bright. The Atlantic Ocean and Shrewsbury River provide many opportunities for recreation, but also pose the potential for flood risk. Most of the community is within the 1 percent floodplain of the Shrewsbury River. The Shrewsbury River Basin received about 45 inches of precipitation per year. The mean tidal range on the riverside at Sea Bright is 3.15 feet (oceanside range is 5.08 feet). Depending on tidal action, runoff and tidal flow from the river can produce significant currents through the narrows at Sea Bright. Flooding is most severe during coastal storms such as nor'easters and hurricanes.

Frequent overtopping of the relatively low river-fronting bulkheads occurs during spring tide events and due to coastal storms such as nor'easters, tropical storms, and hurricanes. Tidal surge is pushed from Sandy Hook Bay into the Shrewsbury River, and ultimately into surrounding communities. During and after tidal flood events, streets are typically flooded with up to 2 feet of water for hours or days (Figure 6). Large nor'easters have resulted in street, vehicle, and structure flooding, with the most severe flood damages in areas adjacent to or near the Shrewsbury River. Sea Bright is sometimes also flooded when storm surge from the Atlantic Ocean overtops the ocean-fronting beach and seawalls. This happens during severe storms such as Hurricane Sandy, which made landfall south of the borough in October 2012, and inundated the entire borough with storm surge.

Figure 6: Typical street flooding on Beach Street due to a spring tide event, 2014.

2.2.1 Describing Storms and Flood Levels

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 flood.” This refers to a flood level or peak that has a one 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 flood is also referred to as the “1 percent flood,” or as having a “recurrence interval” or “return period” of 100 years. In this report, “1 percent flood” is used to describe this type of event.

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

In addition, the probability of a certain 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 1 percent flood zone has a 26 percent chance of being flooded at least once. Even more significantly, a house in a 10 percent flood zone is almost certain to be flooded at least once (96 percent chance) for the same 30-

year mortgage. The probability (P) that one or more of a certain-size flood occurring during any period will exceed a given flood threshold can be estimated as:

$$P = 1 - \left[1 - \frac{1}{T}\right]^n$$

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 1.

Table 1: 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 recommend use of the annual exceedance probability terminology instead of the recurrence interval or return period terminology. For example, the "1 percent annual exceedance probability flood" or "1 percent chance exceedance flood" is a flood event that has a 1 percent chance of occurring any given year. The terms may be shortened to "1 percent flood," as opposed to oft-referenced but confusing "100-year flood." This draft report uses the short form "1 percent flood."

2.3 Water Surface Elevations

Stage-frequency curves for the study area were acquired from the USACE North Atlantic Coast Comprehensive Study (USACE 2013). The stage and wave frequency curves for a range of return periods, from the 100 percent flood to the 0.1 percent flood, are presented in Table 2.

Table 2: Stage-frequency data for Sea Bright, NJ

Annual Chance of Exceedance (%) "percent flood"	Water Surface Elevation (+ft NAVD88) (based on still water level)
1 year (100%)	2.0
2 year (50%)	2.6
5 year (20%)	3.6
10 year (10%)	4.5
20 year (5%)	5.5
25 year (4%)	6.0
50 year (2%)	7.0
100 year (1%)	8.2
200 year (0.5%)	9.4
500 year (0.2%)	12.7

2.4 Existing Water Resource Projects

There are a number of Federal, local, and private water resource projects in the study area that are in place to reduce the risk of flooding to homes and businesses (Figure 7). They include:

- Borough of Sea Bright's ocean-facing seawall, including an extension currently under construction
- Riverfront bulkheads built and maintained by homeowners
- Riverfront bulkheads built and maintained by the Borough of Sea Bright
- Stormwater outfalls
- USACE Atlantic Coast of New Jersey, Sandy Hook to Barnegat Inlet Beach Erosion Control Project (Section 1 – Sea Bright to Ocean Township, New Jersey) – erosion control project

The following USACE projects that were built and are maintained for navigation purposes are also located in the study area:

- Shrewsbury & Navesink Rivers Federal navigation projects
- Shrewsbury & Navesink Rivers state navigation projects

The ocean-facing seawall was originally built to protect a railroad that traveled through Sea Bright. The stone structure is now currently maintained by the Borough of Sea Bright as a public flood risk management project (Figure 8). It spans most of the study area, and is continuous but for a one-third mile gap near the Chapel Beach Club; the seawall is currently being extended in this area, and is assumed in place for the future with- and without-project conditions. Bulkheads that line the Shrewsbury River are mostly privately built and maintained, and are of various elevations and condition (Figure 9). Most are at or below an elevation of +6 feet NAVD88. The borough built and maintains bulkheads located at the end of public streets. These bulkheads were reinforced and elevated to +7 feet NAVD88 after Hurricane Sandy.

Flapgates have been installed in Sea Bright to promote one-way flow through the stormwater outfalls. Flapgates are water control structures that allow water to pass one way, generally away from streets and homes. These flapgates have proved to be largely ineffective. Significant quantities of water leak through the flapgates and water seeps through privately-owned bulkheads, which are porous due to poor design and/or maintenance. In several locations, the borough has installed manual check valves to seal the outfalls during abnormally high tides (i.e., spring tides or coastal storms). The check valves have proved to be more effective. The valves are operated by the Borough Department of Public Works in cooperation with the Borough Police Department, which operates the community flood warning system. However, local residents sometimes open/close the valves independently and irregularly in response to tidal conditions. Although there are operational problems with the valves, the main problem of recurrent flooding appears to be leakage through and over the bulkheads along the river.

2.5 Socioeconomics

Until the late 19th century, the area now occupied by Sea Bright consisted mainly of undeveloped dunes and a small fishing community known as Nauvoo. Nauvoo changed its name to Sea Bright in 1870, and began importing soil from nearby Rumson and Long Branch on which to build summer houses. From then on the area developed principally as a beachside resort community, with a now-defunct railroad along what is now Ocean Avenue that made Sea Bright easily accessible for residents of New York City. The widespread use and ownership of motor vehicles after World War II ensured that the area would continue to derive much income from tourism and vacationers. Available data suggests that while the populations of the Nation, the State of New Jersey, and Monmouth County have grown over recent decades and will continue to grow for the foreseeable future, the population of Sea Bright has experienced slower overall growth in recent decades and has reached a more or less stable level.

Figure 7: Existing and planned water resource projects (approximate location of seawall currently under construction shown as dashed line).

Figure 8: Sea Bright's seawall, 2015.

Figure 9: Typical bulkheads on the Shrewsbury River, 2006.

Population densities for the State of New Jersey and for Monmouth County are 1,218.1 persons per square mile and 1,337 persons per square mile, respectively (U.S. Census 2010). Because of the physical constraints of the Atlantic Ocean and the Shrewsbury River, Sea Bright is more densely populated, with 1,412 persons per square mile. According to the 2010 U.S. Census, incomes and the value of owner-occupied housing units in Sea Bright is generally significantly higher than those in the rest of Monmouth County and the State of New Jersey. Household income and home values in the downtown area are generally less than those in other parts of the borough. It is assumed that the majority of the working population is employed at locations outside Sea Bright. The 2010 census data records that 86.1 percent of the employed population commute to work by car, and 7.2 percent by public transportation. The mean travel time to work is 33.6 minutes.

Downtown Sea Bright is the business and cultural center of the borough. Many important businesses are located on Ocean Avenue. They include marinas, retail shops and restaurants that are important to the regional economy. Seasonal rentals and tourists contribute a lot to the economy of the seaside town. Borough Hall, a fire department, and police headquarters are also located on Ocean Avenue. The temporary location of the J.W. Ross Cultural Arts Center and Library is inside the United Methodist

Church on Ocean Avenue and River Street; the buiding that housed the library and cultural center was destroyed during Hurricane Sandy. A weekly seasonal farmers market is held in the municipal parking lot adjacent to the public beach during growing season.

2.6 Environmental Justice

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, National origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. USACE used 2009 – 2013 American Community Survey data from the U.S. Census to help understand community demographics, and if communities at risk would be negatively or disproportionately impacted by a proposed project. Sea Bright has noticeably fewer individuals living below the poverty line (5.5 percent) than the state (10.4 percent) or county (7.0 percent) overall. Based on the data, there are no significant minority populations and/or low-income populations in the study area (Table 3).

Table 3: Select demographics (ACS, 2009 – 2013).

	Sea Bright	Monmouth County	State of New Jersey
Median household income	$82,821	$84,526	$71,629
% families below poverty line	3.7%	5.1%	7.9%
% individuals below poverty line	5.5%	7.0%	10.4%
% minority* population	8.1%	17.2%	31.4%

* defined as black or Hispanic or Latino; African-American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Other, or two or more races. Data from the 2010 U.S. Census.

2.7 Critical Infrastructure

Critical infrastructure is defined as the infrastructure that is essential for the functioning of a society and economy. The Nation's critical infrastructure provides the essential services that underpin American society and serve as the backbone of our Nation's economy, security, and health. Most commonly associated with the term are facilities for security services (police, military); electricity generation, transmission and distribution; telecommunications; water supply (drinking water, waste water/sewage); heating (natural gas, fuel oil, district heating); public health (hospitals, ambulances); and transportation systems (evacuation routes, railway networks, airports, harbors). Critical infrastructure in the study area includes an evacuation route, fire department, police department, and Borough Hall (Figure 11).

Ocean Avenue is a state highway (NJ-36) that serves as the only designated evacuation route for Sea Bright. It spans north-south through the borough, traveling south to neighboring Monmouth Beach. It links in the north to the Highlands Bridge that connects the boroughto Highlands, New Jersey. The road also connects to the Rumson Bridge (County Route 520) to the west. Prior to storm events, residents from Sea Bright and neighboring communities use the road to evacuate inland to temporary shelters, hotels, and other places of safety. Though on relatively high ground, the road is sometimes inundated by storm surge, as was the case during Hurricane Sandy. Surge waters usually bring with it debris and sand, blocking access to and travel within the borough. Hurricane Sandy covered Ocean Avenue with a few feet of sand, the removal mission for which took days and prevented residents' repopulation and recovery after the storm.

The Borough of Sea Bright police department, fire department, and Borough Hall are all located along Ocean Avenue. The police force's 20 officers serve to protect life and property during emergency and non-emergency events. The fire department, Sea Bright Fire & Rescue, is a volunteer organization operating out of one firehouse, which houses a truck and engine. The fire department also has access to boats and a wave runner. Borough Hall is home to the Borough of Sea Bright Office of Emergency Management, which coordinates emergency mitigation and response efforts prior to, during, and after

emergency events. Police officers, volunteer firefighters, and other local emergency responders contribute greatly to emergency mitigation and response. They respond to emergency calls, assist with mandatory evacuations, clear roads, and generally enhance safety in the community (Figure 10).

Figure 10: Firefighters clean the Sea Bright fire station after Hurricane Sandy, 2012.

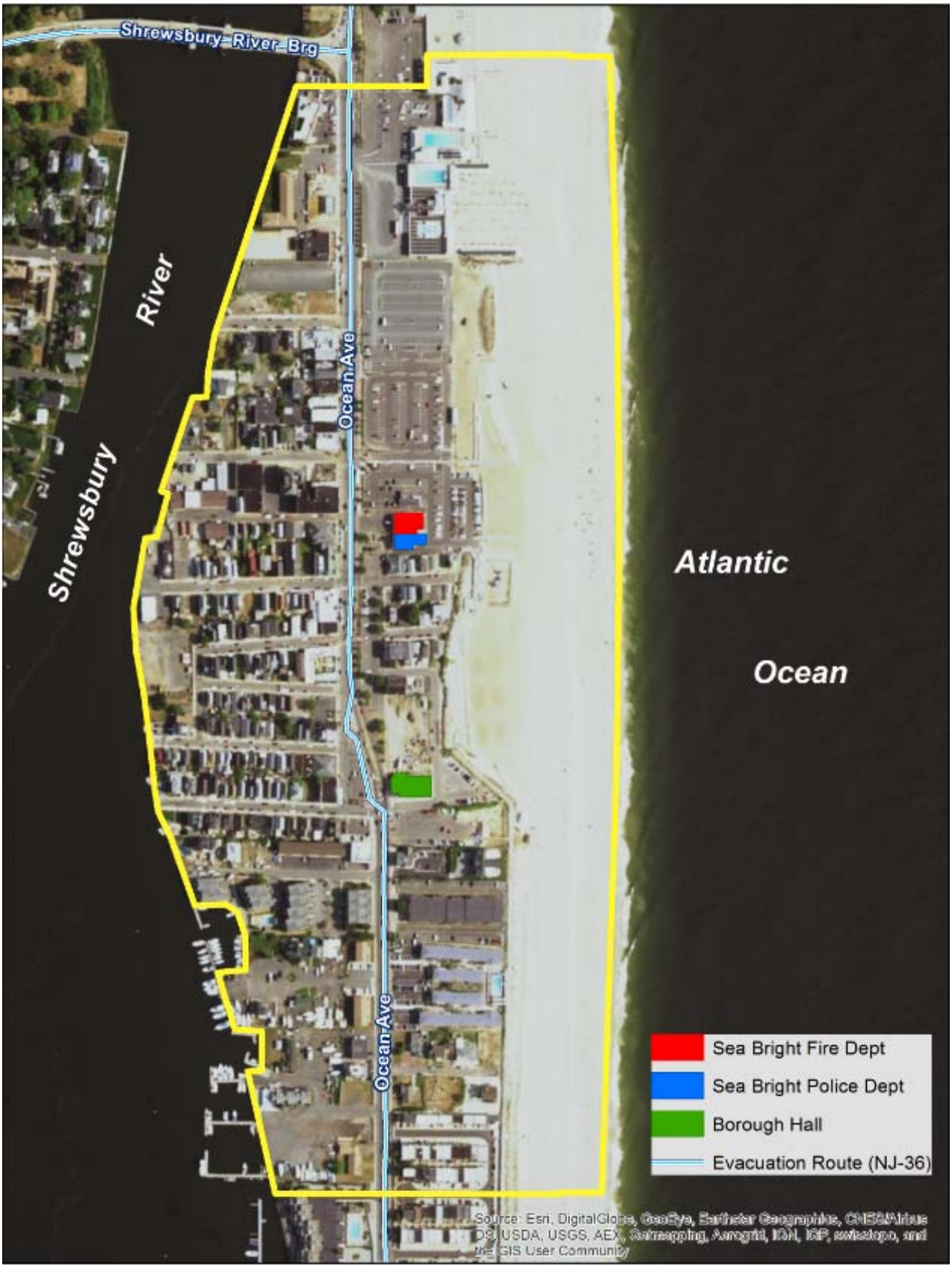


Figure 11: Critical infrastructure in Sea Bright.

2.8 Water Resources

2.8.1 Groundwater

The study area is located directly above the Northern Atlantic Coastal Plain (NACP) aquifer system, which is a Nationally-designated Sole Source Aquifer (USEPA 1988). This aquifer system is a complex, multi-layered system underlain by semi-consolidated to unconsolidated sediments that consist of silt, clay, and sand, with some gravel and lignite (Trapp and Horn 1997). Sole Source Aquifer designation is one tool to protect drinking water supplies in areas with few or no alternative sources to the ground water resource, and where if contamination occurred, using an alternative source would be extremely expensive. The designation protects an area's ground water resource by requiring EPA to review all proposed projects within the designated area that will receive federal financial assistance.

The New Jersey Coastal Plain Aquifer System is the local component of the NACP in the study area and covers about 4,200 square miles. More than half of the land area is below an altitude of fifty feet above sea level. The area is largely surrounded by salty or brackish water and is bounded by the Delaware River on the west, Delaware Bay on the south, the Atlantic Ocean on the east, and Raritan Bay on the north. The New Jersey Coastal Plain Aquifer discharges to the surface through streams, springs, and evapotranspiration. Many streams ultimately flow into bays or directly into the ocean. Development of ground water as a water supply source constitutes another discharge component which today accounts for a significant portion of discharge from the overall system. In certain areas (e.g., along the Delaware River) heavy pumping has caused a reversal in the normal discharge from the aquifer (Raritan-Magothy) such that the surface stream (Delaware River) now recharges the aquifer. This phenomenon implies that, in addition to the New Jersey Coastal Plain Area, the Delaware River Basin within Delaware, New Jersey, Pennsylvania and New York must be regarded as a stream flow source zone (an upstream headwaters area which drains into a recharge zone), which flows into the Coastal Plain Area (USEPA 1988).

The primary source of groundwater extraction in the study area is from the Potomac-Raritan-Magothy aquifer. The source of recharge for this aquifer is through precipitation and infiltration (Trapp and Horn 1997). Groundwater quality of the Potomac-Raritan-Magothy aquifer is generally good, with a median chloride concentration of 11.6 milligram/liter (mg/L), soft groundwater (0-60 mg/L as calcium carbonate), iron concentrations routinely exceeding the National drinking-water standard of 300 micro-gram/liter (µg/L), and nitrate plus nitrite levels being consistently 0.11 mg/L or less (Moody et al. 1988). The predominant ions in most New Jersey groundwater are calcium, magnesium, and bicarbonate (Moody et al. 1988).

2.8.2 Surface Water

The key surface water feature in the study area is the Shrewsbury River. The Shrewsbury River is a wide tidal river surrounded by mostly residential development and separated from the Atlantic Ocean by developed barrier beaches. A few dredged material and salt marsh islands exist at the confluence of the river. The Shrewsbury River forms the entire western boundary of the study area. There are no open creeks or streams in downtown Sea Bright that flow into the Shrewsbury River. The river is classified by NJDEP as “SE1(C1),” which indicates salt water estuarine category 1 waters. The Shrewsbury River is the main source of back bay flooding in the study area.

2.9 Vegetation

2.9.1 Uplands

The study area is almost fully developed with closely spaced homes and businesses. There are no significant vegetation communities. Upland plants are those typical in urban settings and include ornamental shrubs, grasses, and trees adjacent to houses.

2.9.2 Wetlands

The study area is almost fully developed with closely spaced homes and businesses. There are no significant wetland vegetation communities in the study area. Bulkheads are present on the shoreline adjacent to the Shrewsbury River below the high tide zone, resulting in total loss of fringing wetlands and mud flats in the Shrewsbury River.

2.10 Fish & Wildlife

2.10.1 Amphibians & Reptiles

The study area has minimal and poor to no habitat for amphibians and reptiles. Amphibians possibly residing within the area include Northern Spring Peeper (*Pseudacris crucifer crucifer*) and American Bullfrog (*Rana catesbeiana*). Reptiles possibly occurring include Diamondback Terrapin (*Malaclemys terrapin*), Common Snapping Turtle (*Chelydra serpentina*), and Eastern Box Turtle (*Terrapene carolina carolina*).

2.10.2 Birds

The North American Breeding Bird Survey conducts a survey route in nearby Keyport, New Jersey. Species observed in the Keyport route would likely be observed in and around Sea Bright. Bird species observed were typical of an urban setting. These species include Herring Gull (*Larus argentatus*), Double-crested Cormorant (*Phalacrocorax auritus*), Canada Goose (*Branta canadensis*), Killdeer (*Charadrius vociferous*), Rock Pigeon (*Columba livia*), Mourning Dove (*Zenaida macroura*), Turkey Vulture (*Cathartes aura*), Hairy Woodpecker (*Picoides villosus*), Downy Woodpecker (*Picoides pubescens*), Blue Jay (*Cyanocitta cristata*), American Crow (*Corvus brachyrhynchos*), European Starling (*Sturnus vulgaris*), Brown-headed Cowbird (*Molothrus ater*), Red-winged Blackbird (*Agelaius phoeniceus*), Common Grackle (*Quiscalus quiscula*), House Finch (*Carpodacus mexicanus*), Song Sparrow (*Melospiza melodia*), Eastern Towhee (*Pipilo erythrophthalmus*), Northern Cardinal (*Cardinalis cardinalis*), House Sparrow (*Passer domesticus*), Northern Mockingbird (*Mimus polyglottos*), Gray Catbird (*Dumetella carolinensis*), American Robin (*Turdus migratorius*), Mallard (*Anas platyrhynchos*), Great Blue Heron (*Ardea herodias*), and Red-tailed Hawk (*Buteo jamaicensis*) (USGS 2013). The study area is surrounded by estuarine and coastal habitat extensively used by migratory birds, waterfowl, wading and shore birds for their lifecycle needs, however the existing habitats of the proposed project sites are limited. Food sources mostly include garden flowers, feeders and scavenged waste.

2.10.3 Mammals

Mammals within the study area are presumed to be those typically found in urban settings. These species include opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), muskrat (*Ondatra zibethica*), gray squirrel (*Sciurus carolinensis*), red squirrel (*Tamiasciurus hudsonicus*), Norway rat (*Rattus norvegicus*) and skunk (*Conepauts mesoleucus*).

2.10.4 Finfish, Shellfish, and Benthic Resources

As downtown Sea Bright is entirely terrestrial, there are no existing fish, shellfish, or benthic habitat or resources in the study area.

2.11 Threatened and Endangered Species

2.11.1 Federal Threatened & Endangered Species

The U.S. Fish and Wildlife Service (USFWS) lists the Federally-threatened Piping Plover (*Charadrius melodus*), Red Knot (*Calidris canutus rufa*), seabeach amaranth (*Amaranthus pumilus*), and Northern Long Eared Bat (*Myotis septentrionalis*) as potentially occurring in the study area. The nearest occurrences of the Piping Plover nesting are Seven Presidents Park to the South (approximately 3 miles) and Sandy Hook National Seashore to the north (between 4 and 7 miles). However, there is no designated critical habitat for any of the listed species in the study area, and the USFWS has no records of any of the listed species occurring there.

Piping Plover

A review of the USFWS Information for Planning and Conservation website shows that the endangered Piping Plover is present within a 3.5 mile radius of the study area (USFWS 2016). USACE has conducted Piping Plover monitoring along the New Jersey shore since the 1990s. While there has been Piping Plover activity on the beach outside the study area, there has been no evidence of piping plover activity within it. Coordination with the USFWS pursuant to Section 7 of the Endangered Species Act has been initiated and documented.

Seabeach Amaranth

There is a known occurrence of the Federally-listed threatened plant seabeach amaranth within 3.5 miles of the project area. However, there is no seabeach amaranth habitat within the study area. USACE has conducted seabeach amaranth monitoring along the New Jersey shore in the past number of years. While there has been seabeach amaranth identified outside the study area, there has been no evidence of seabeach amaranth activity within it.

Northern Long Eared Bat

The Northern Long Eared Bat is a Federally-listed threatened and endangered species that inhabits specific habitat within this area of New Jersey. There are no known roosting trees or hibernacula of northern long-eared bat in or nearby the study area. Although there are no elements of preferred bat habitat of dense forests or known hibernacula in the study area, the Northern Long Eared Bat is known to nest in houses, and especially attics or eaves. Coordination with the USFWS will occur during the design phase to determine if it is necessary to for the potential presence of Northern Long Eared Bat roosts prior to project implementation.

Essential Fish Habitat

Essential Fish Habitat is designated for the waters surrounding the study area. A coordination letter will be sent to NOAA to inform them of our proposed actions on dry land and assuring them that best management practices will be employed to prevent impacts to aquatic habitat.

2.11.2 New Jersey State Threatened and Endangered Species

The NJDEP Division of Fish and Wildlife manages the state's lists of threatened and endangered species. A review was conducted of the agency's online database that maps threatened and endangered species habitat within the study area. There are no known state-listed threatened or endangered species in in the study area,

Transient bald eagles (*Haliaeetus leucocephalus*) or peregrine falcons (*Falco peregrinus*), both listed as endangered in New Jersey, may pass through the study area. However, none are expected to breed or roost in it. The osprey, listed as threatened in New Jersey, may use the adjacent Shrewsbury and Navesink River estuaries for feeding and nesting activities, thereby flying over or passing through the project area. However, there are no osprey or osprey nests within the study area.

2.12 Cultural Resources

As a Federal agency, USACE has certain responsibilities for the identification, protection and preservation of cultural resources that may be located within the Area of Potential Effect (APE) associated with a proposed project. Present statutes and regulations governing the identification, protection and preservation of these resources include the National Historic Preservation Act of 1966 (NHPA), as amended; NEPA; Executive Order 11593; and the regulations implementing Section 106 of the NHPA (36 Code of Federal Regulations [CFR] Part 800, Protection of Historic Properties, August 2004). Significant cultural resources include any material remains of human activity eligible for inclusion on the National Register of Historic Places (NRHP).

As established by 36 CFR Part 60, a historic property (generally a property over 50 years of age) is eligible for listing in the National Register if it possesses "integrity of location, design, setting, materials, workmanship, feeling, and association," and it meets at least one of four criteria:

- It is associated with events that have made a significant contribution to the broad patterns of our history; or
- It is associated with the lives of persons significant in our past; or
- It embodies the distinctive characteristics of a type, period, or method of construction, or it represents the work of a master, or it possesses high artistic values, or it represents a significant and distinguishable entity whose components may lack distinction; or
- It has yielded, or may be likely to yield information important in prehistory or history.

The identification of historic properties is coordinated with the New Jersey Historic Preservation Office (NJHPO). The Advisory Council on Historic Preservation, Native American Tribes, other interested parties and the public are given opportunities to participate in the process. NJHPO has determined that the New Jersey barrier islands have a low potential for archaeological resources (Personal Communication, West-Rosenthal, June 2015). In addition, NJHPO has determined since Hurricane Sandy and the associated demolition and rebuilding, none of the structures in the APE are eligible for the NRHP as an historic district or as individual structures.

2.13 New Jersey Coastal Zone

Pursuant to the Coastal Zone Management Act of 1972 and the Coastal Zone Reauthorization Act Amendments of 1990, the State of New Jersey has defined its coastal zone boundaries and developed policies to be utilized to evaluate and issue permits for activities located within the designated coastal zone, as set forth in New Jersey's Rules on Coastal Zone Management (NJAC 7:7, NJAC 7:7E). The NJDEP administers the coastal permit program through the Coastal Area Facility Review Act (CAFRA, New Jersey State Act 13:19-1 et seq.), the Wetlands Act of 1970 (NJSA 13:9A-1 et seq.), and

the Waterfront Development Law (NJSA 12:5-3). Each of these acts provides a slightly different definition of the coastal zone; therefore, the designated coastal zone consists of the cumulative total of these three definitions.

The coastal zone boundary defined by CAFRA includes the study area. The Waterfront Development Law defines the coastal zone as any tidal waterway within the coastal area as defined by CAFRA, up to and including the high water line. Based on these definitions, the entire study area is located within the designated coastal zone.

2.14 Air Quality

The Clean Air Act requires the United States Environmental Protection Agency (USEPA) to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants. These commonly found air pollutants (also known as criteria pollutants) are particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide (CO), sulfur oxides (SO2), nitrogen oxides (NOx), and lead. The USEPA calls these pollutants criteria air pollutants because it regulates them by developing human health-based and/or environmentally-based criteria (science-based guidelines) for setting permissible levels. Limits based on human health are called primary standards. The USEPA also can establish a second set of limits intended to prevent environmental and property damage, which are referred to as secondary standards. In every case except for SO2, the secondary standards established by the USEPA for the criteria pollutants are identical in level and form to their respective primary standards.

When a NAAQS is established or revised, the USEPA goes through a formal process to designate all areas of the country as either in attainment or in nonattainment. The Federal Clean Air Act further classifies ozone, carbon monoxide, and some particulate matter nonattainment areas based on the magnitude of an area's problem. Nonattainment classifications may be used to specify what air pollution reduction measures an area must adopt, and when the area must reach attainment. The technical details underlying these classifications are discussed in 40 CFR 81.

States with areas designated as nonattainment for any criteria pollutant must develop plans that show how they will bring those areas into attainment of the standard by their designated attainment dates. Once an area meets its attainment date, it can be re-designated to attainment, but states must submit maintenance plans for these areas to the USEPA to insure continued attainment of the areas over a period of 10 years. These re-designated areas are referred to as maintenance areas. Currently, Monmouth County is located within the NY-NJ-LI-CT nonattainment area for annual PM2.5 and 24 hour (daily) PM 2.5 NAAQS and within the NY-NJ-LI-CT moderate nonattainment area for 8-hour ozone.

2.15 Aesthetics and Scenic Resources

The aesthetics and scenic resources of Sea Bright are related to its proximity to the Atlantic Ocean on the east and the Shrewsbury River on the west. The borough is regionally known as a shorefront destination with a public beach and picturesque downtown (Figure 12).

2.16 Recreation

Sea Bright is a popular New Jersey shore community visited by many in the region, mostly in the summer months. The public beach fronting the Atlantic Ocean is the focal point of many recreational activities. The borough has a number of private and public beach clubs along the oceanfront, including seven private beach clubs, more than any other New Jersey community. As well as private residences, the Shrewsbury River shoreline is the location for a number of marine-related businesses including marinas, seafood restaurants, boat suppliers and repairers, and small-scale fishing businesses. Sea

Bright lies along Ocean Avenue (New Jersey State Route 36), a busy through route that connects the Garden State Parkway with various communities along the south shore of Raritan Bay and Sandy Hook Bay before following the shoreline south into Long Branch, then turning east and terminating at the Garden State Parkway in Eatontown. Public transportation in the study area is provided by New Jersey Transit, with local bus services connecting the shoreline communities with larger population centers. The nearest passenger rail station is in the City of Long Branch, approximately four miles south of Sea Bright, with direct services provided by New Jersey Transit to Newark, Hoboken, and New York City.

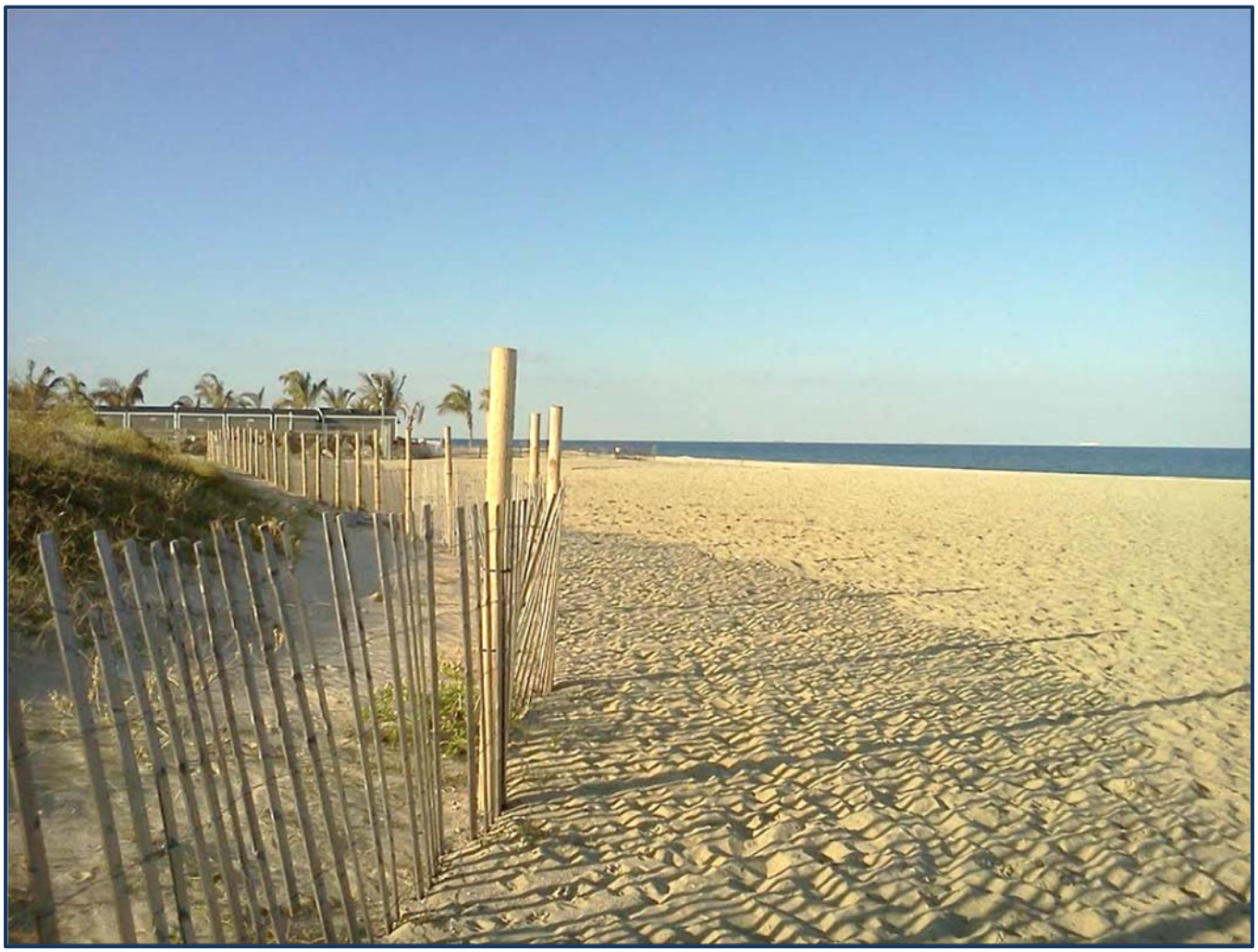


Figure 12: Sea Bright is a popular Jersey shore community, 2015.

2.17 Noise

Noise is defined as unwanted sound. The day-night noise level (Ldn) is widely used to describe noise levels in any given community (USEPA 1978). The unit of measurement for Ldn is the "A"-weighted decibel (dBA), which closely approximates the frequency responses of human hearing. The primary source of noise in the study area is vehicular traffic on Ocean Avenue (NJ-36), local roadways, and local construction projects that may be underway. Although noise level measurements have not been obtained in the study area, they can be approximated based on existing land uses. The typical Ldn in residential areas ranges from 39 to 59 dBA (USEPA 1978). It is assumed that the existing sound levels in the study area are roughly within this range. The Code of the Borough of Sea Bright, Chapter 144-7 Section B(3) prohibits noise disturbance due to construction and demolition activities (except

emergency work) between the hours of 6:00 pm to 7:00 am on weekdays and 6:00 pm to 9:00 am on Saturdays, Sundays, and Federal holidays.

2.18 Infrastructure

2.18.1 Public Utilities & Services

New Jersey Natural Gas (NJNG) is the principal subsidiary of New Jersey Resources and provides natural gas to the project area. NJNG is one of the fastest-growing local distribution companies in the United States, serving more than 450,000 customers in New Jersey's Monmouth, Ocean, Middlesex and Morris Counties. There are many natural gas lines located below-ground in the study area. Jersey Central Power & Light/First Energy supplies electricity to nearly one million commercial and residential customers in New Jersey. Its parent company, GPU Incorporated, is one of the largest investor-owned electric utilities. GPU Energy also provides a variety of services, free of charge, to assist companies with relocation and expansion. Services include a computerized listing of available commercial and industrial sites, community profiles and statistics, and data on government regulations and financing options. Along with technical assistance, GPU Energy can calculate potential power needs, and suggest programs for optimum efficiency and reduced power costs. The company provides electric to all residences and businesses in Sea Bright.

Public water service is provided by New Jersey-American Water, a subsidiary of American Water Works. The service area extends through 120 square miles of Monmouth County, including numerous residential and commercial centers and tourism destinations. The majority of the County's water is provided from surface sources and processed at two large facilities: the Swimming River Reservoir and Treatment Plant in Colts Neck, and the Jumping Brook Treatment Plant in Neptune. The service provides water to all residences and businesses in Sea Bright. In 1965, six municipalities - Monmouth Beach, West Long Branch, Oceanport, Fair Haven, Little Silver and Shrewsbury - joined to create a regional sewerage authority to service communities with their wastewater disposal and water reclamation. As a result, the Northeast Monmouth County Regional Sewerage Authority was formed. Because its service area borders the Navesink and Shrewsbury Rivers, the Authority, in November 2001, adopted the new name Two Rivers Water Reclamation Authority (TRWRA). The TRWRA treatment plant is not located in the study area. It is located to the south in Monmouth Beach. It is a secondary type treatment plant. The sludge is thickened, and trucked offsite for incineration. The effluent is discharged into the Atlantic through an offshore outfall at Monmouth Beach

2.18.2 Storm Water

The Borough of Sea Bright adopted the applicable design and performance standards for storm water management measures as outlined in NJAC 7:8-5 to reduce the negative impact of storm water runoff on water quality and quantity, and loss of groundwater recharge in receiving water bodies. The Borough of Sea Bright Storm Water Management Plan (adopted August 17, 2007) and Ordinance Nos. 15-2007 & 18-2010 (Storm Water Surface Run Off & Requiring Retrofitting of Existing Storm Drains) documents the strategy for the Borough of Sea Bright to address stormwater related impacts. There are a number of stormwater outfalls in the study area, as detailed in Section 2.4.

2.19 Land Use and Zoning

Sea Bright is almost entirely developed: very little undeveloped land remains, and the likelihood of significant intense redevelopment is low. Most land in Sea Bright is occupied by residential development, which is mostly single-family dwellings, but the borough also contains a number of multi-unit residential and low-rise developments. The small downtown commercial area is dominated by stores, restaurants, and other office-based businesses. There is no heavy industrial development in

Sea Bright, and only very minor light industrial development. Land use is approximately 75 percent residential, with another 22 percent commercial and office-based businesses.

The Borough of Sea Bright building codes require that, in areas of special flood hazard, residential construction be built to a minimum of two feet above the base flood elevation. Many homes in the study area were built at- or near-grade prior to enactment of the current building codes. Because of this, many homes were severely damaged by Hurricane Sandy (Figure 13). Many residents have chosen to rebuild or elevate their homes above the base flood elevation to reduce the risk of flood damage.

Figure 13: Hurricane Sandy water mark in Sea Bright, 2012.

Chapter 3: Plan Formulation

Plan formulation is the process of building alternative plans that meet planning objectives and avoid planning constraints. Alternative plans are a set of one or more management measures functioning together to address one or more planning objectives. A management measure is a feature or activity that can be implemented at a specific geographic site to address one or more planning objectives.

This chapter presents a summary of problems and opportunities; inventory and forecast; and plan formulation, evaluation, comparison, and selection.

3.1 Problems & Opportunities

Problem Statement: The people, infrastructure, and property of downtown Sea Bright experience significant damages due to back bay flooding from the Shrewsbury River due to coastal storms such as nor'easters, tropical storm, and hurricanes.

As discussed in Section 2.2 "Flooding in Sea Bright," an understanding of the Shrewsbury River Basin watershed and Sea Bright's geography is integral to understanding the study area's problems. The low lying borough is frequently inundated by spring tide events and coastal storms, most significantly from the Shrewsbury River. Flooding from the Atlantic Ocean occurs less frequently, typically only during large nor'easters and hurricanes. This is because the beach fronting the ocean, generally at an elevation of +10 feet NAVD88, is higher than that of areas fronting the Shrewsbury River. In addition, the beach is backed by a seawall with heights up to +16 feet NAVD88. An extension of the seawall, which will further reduce risk, is currently underway. Note that reducing flood risk from the more frequent and severe back bay flooding, not flooding from the ocean, is the focus of this study.

Over $81,000,000 in National Flood Insurance Program claims have been dispersed since the program's inception in 1978. Most recently, a nor'easter in March 1984 caused up to 3 feet of flooding in areas along the Shrewsbury River. The Halloween 1991 nor'easter, also known as "the Perfect Storm," caused major flooding from the Shrewsbury River and overtopping of the Atlantic Ocean seawall, forcing 200 people to evacuate. Hurricane Irene in August 2011 caused major beach erosion and flooding in Sea Bright and other communities in Monmouth County. Hurricane Sandy in 2012 caused very heavy damage throughout the borough (Figure 14 through Figure 17). Many residents shared that "the river met the sea" when storm surge from Hurricane Sandy flooded Sea Bright. The widespread damage Sea Bright sustained during the storm underscored the need for action.

Many residents have elevated or demolished their homes in response to frequent flood damage (Figure 18). The availability of post-Hurricane Sandy grant funding has only accelerated this trend. The Borough granted permits for at least 46 structures in the study area to be elevated, and 30 structures to be demolished after Hurricane Sandy. Despite recurring flood damage, many homes remain at or near grade.

Local initiatives will help mitigate the risk of coastal storm damage. The borough's post-Hurricane Sandy work to elevate publically-maintained bulkheads along the river to an elevation of +7 NAVD88 may help localized but not widespread flooding. The extension of the seawall currently under construction, as well as periodic nourishment of the beach, will reduce the risk of coastal storm flooding from the Atlantic Ocean. Even with these efforts, there remains an opportunity in downtown Sea Bright to manage the risk of coastal storm surge flooding to residents, infrastructure, and property.

Figure 14: Flooding from the Shrewsbury River during Hurricane Sandy, 2012. Photo taken from the Rumson Bridge (County Route 520) looking south. The Shrewsbury River is on the right.

Figure 15: Flooding from the Shrewsbury River during Hurricane Sandy, 2012. Photo taken from Ocean Avenue looking west down Church Street, looking at the Shrewsbury River. The Shrewsbury River is in the background.

Figure 16: Sea Bright Mayor Dina Long walks along Ocean Avenue past a destroyed house that fronted the Shrewsbury River, 2012.

Figure 17: Clean up on Ocean Avenue after Hurricane Sandy, 2012.

Figure 18: Many homes have been elevated after Hurricane Sandy, 2014.

3.2 Future Without-Project Conditions

Sea Bright will continue to be subject to coastal storm flooding from the Shrewsbury River. It will continue to experience road flooding during spring tides and structural damages during storms as water from the Shrewsbury River comes through and over bulkheads, threatening the safety of residents and resilience of the cultural economy (Figure 19). The replacement of private and public bulkheads is beyond the financial capacity of the borough. The borough will continue to flood, with homes and businesses sustaining damages. Expected annual equivalent damages in the future without-project condition from 2020 to 2070 are in the amount of $1,533,000 (October 2015 price level).

Relative Sea Level Change

Engineer Regulation (ER) 1100-2-8162 “Incorporating Sea Level Change in Civil Works Programs” requires that future sea level rise projections be incorporated into the planning, engineering design, construction and operation of all civil works projects. Relative sea level change (RSLC) considers the effects of (1) the eustatic, or global, average of the annual increase in water surface elevation due to the global warming trend, and (2) the “regional” rate of vertical land movement (VLM) that can result from localized geological processes, including the shifting of tectonic plates, the rebounding of the Earth’s crust in locations previously covered by glaciers, the compaction of sedimentary strata and the

withdrawal of subsurface fluids. Regional movement varies by location, and is specific to a point on the Earth. Figure 20 shows the low, intermediate, and high estimates for sea level rise based on the Sandy Hook gauge through the 50-year period of analysis (2020-2070). The Shrewsbury River area is experiencing relative sea level rise.

Figure 19: New Jersey Governor Chris Christie, Housing and Urban Development Secretary Shaun Donovan, and Sea Bright Mayor Dina Long walk along closed businesses on Ocean Avenue, 2013. A number of businesses have yet to reopen.

This range of potential rates of RSLC is based on findings by the National Research Council (NRC 1987) and the Intergovernmental Panel for Climate Change (IPCC 2007). The historic rate of future sea level rise is determined directly from gauge data gathered in the vicinity of the study area. Tide conditions at Sandy Hook (National Oceanic and Atmospheric Administration [NOAA] Station #8531680) best represent the conditions experienced in Sea Bright. A 75-year record (1932 to 2006) of tide data gathered at Sandy Hook, New Jersey indicates a mean sea level trend (eustatic sea level rise + the local rate of VLM) of 4.06 mm per year, or 0.014 feet per year (published rate at the National Oceanic and Atmospheric Administration [NOAA] Sandy Hook gauge). As calculated using the methodology detailed in ER 1100-2-8162, the region is projected to experience up to 2.61 feet of relative sea level rise through 2070. For comparison, Key West, Florida is projected to experience up to 1.96 feet; Norfolk, Virginia up to 2.95 feet; Galveston, Texas (Pier 21) up to 3.01 feet; and Grand Isle, Louisiana up to 3.48 feet during the same timeframe (all NOAA gauges at stated locations). Relative sea level rise further increases flooding issues.

Nonstructural and structural components of the proposed alternatives in consideration of the "low," "intermediate," and "high" potential rates of future RSLC for both future with- and without-project conditions will be evaluated during plan optimization, after release of this draft report.

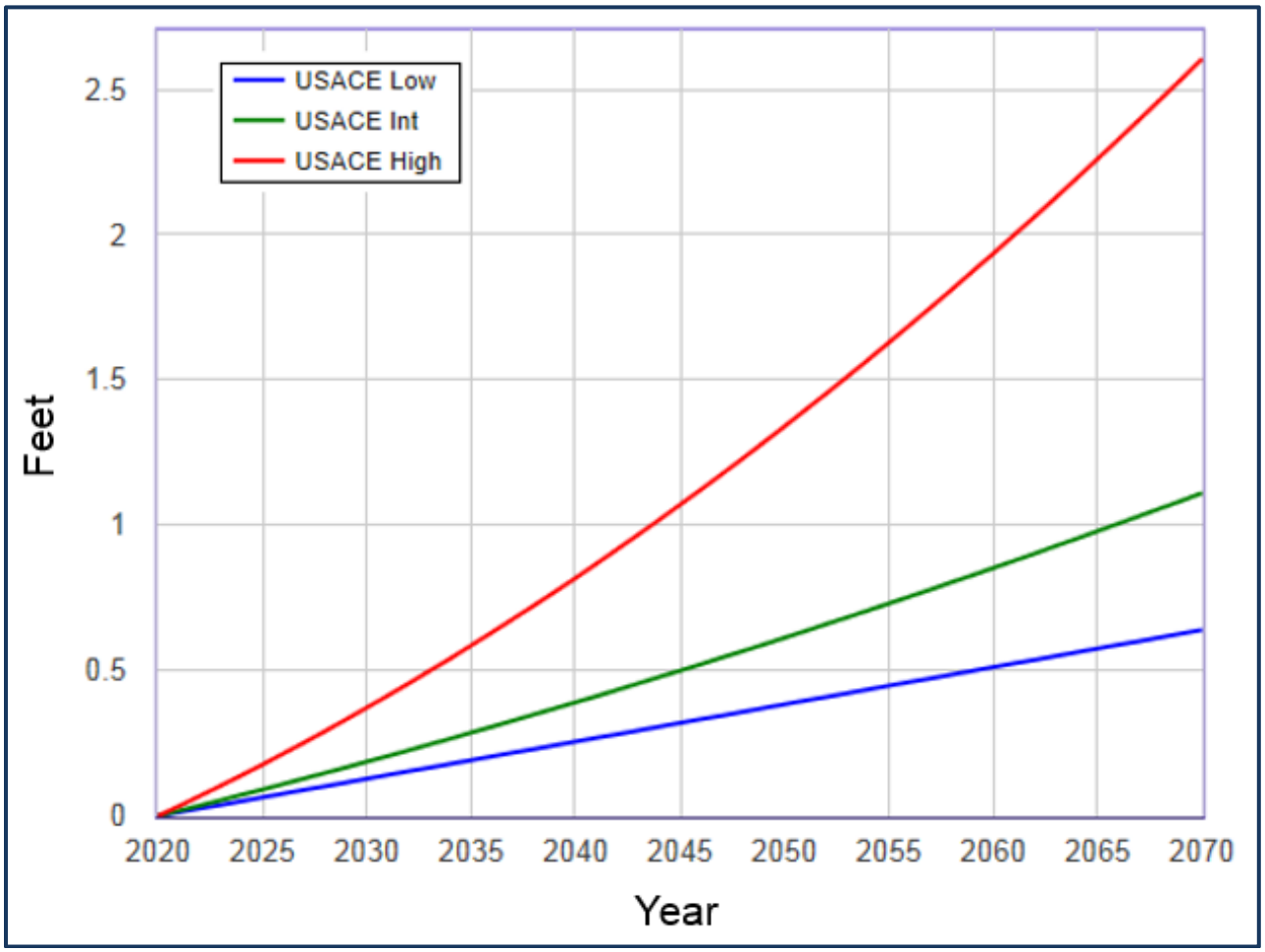


Figure 20: Relative sea level change projections at the Sandy Hook, New Jersey gauge. Calculations based on those set forth in ER 1100-2-8162.

3.3 Planning Goal & Objectives

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, and is based on the problems and opportunities detailed in Section 3.1. The period of analysis for this study is 2020 to 2070.

Study Goal: Manage the risk of coastal storm surge flooding to residents, infrastructure, and property due to back bay inundation from the Shrewsbury River in downtown Sea Bright (Figure 21).

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:

- Manage the risk of damages from back bay flooding from the Shrewsbury River in downtown Sea Bright through 2070.
- Support community resilience and cohesion in Sea Bright through 2070.

Figure 21: Sea Bright post office after Hurricane Sandy, 2012.

3.4 Planning Constraints & Considerations

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 the with- and without-project conditions.

Study-specific constraints include:

- **Physical constraints:** The project cannot greatly impact existing infrastructure and homes. In many areas, there is little room to implement large-scale risk management measures.
- **Navigation:** The project cannot impact the Federal Shrewsbury River navigation project.

Considerations are those issues or matters that should be taken into account during the planning process, but do not necessarily limit the extent of the process as do constraints. One matter that was taken into consideration during plan formulation and selection is that both the NJDEP and the Borough of Sea Bright have expressed their concerns about the impact of a structural solution, specifically the raising of existing bulkheads, on the community. Their concern is two-fold:

- Borough residents generally do not want to lose their view of the river through elevation of the existing bulkhead. Specifically, the community does not want to elevate the bulkheads higher than +7 feet NAVD88. The borough has passed an ordinance restricting the raising of bulkheads above +7 NAVD88.

- The residual risks of flooding associated with a bulkhead at elevation less than or equal to +7 feet NAVD88 are significant. The elevation corresponds roughly to that of a 50 to 20 percent flood event, including wave set up. USACE has concerns about the residual risk of flooding associated with a bulkhead elevation less than or equal to this height. Residual risk is the flood risk that remains after all efforts to reduce the risk are completed. It is the exposure to loss remaining after other known risks have been countered, factored in or eliminated. A bulkhead at or below +7 feet NAVD88 would be frequently overtopped, even by certain spring tide or relatively small coastal storm events. It would provide no meaningful flood risk reduction for larger flood events.

3.5 Key Uncertainties

The following two key uncertainties informed plan formulation.

Relative Sea Level Change: The USACE "historic" or "low" projection of RSLC was used during the initial plan formulation, screening, and selection. Based on available information, it is not thought that the screening of alternative and plan selection would change under the USACE "intermediate" or "high" scenarios. The effect of higher rates of RSLC will be addressed during plan optimization, which will investigate the performance of the plan under accelerated rates of sea level change.

Plan Participation Rate: Participation in USACE nonstructural projects is voluntary for property owners. It is assumed that participation in a nonstructural project would be popular with many homeowners in Sea Bright. Many homeowners in Sea Bright and other communities affected by Hurricane Sandy have or are in the process of elevating their homes. Based on coordination with non-Federal and local interests, and current rebuilding strategies, an at- or near-100 percent participation rate is likely.

3.6 Management Measures

Measures were developed to address problems and to capitalize upon opportunities. They were derived from a variety of sources including prior studies, the public scoping process, and the team. The following measures were considered:

- Nonstructural Measures
- Floodwalls (Bulkheads)
- Levees
- Road Raising
- Beach and Dune Fill
- Storm Surge Barrier
- Pumps
- Ringwalls

3.6.1 Nonstructural Measures

A combination of nonstructural flood risk management features, including dry floodproofing, wet floodproofing, structure elevation, ringwall construction, rebuilding, acquisition, evacuation plans, and floodplain development zoning changes/enforcement were considered. The Borough of Sea Bright is encouraging residents to elevate their homes. Because of this and the availability of post-disaster grants to do so, many houses in this area have been elevated post-Hurricane Sandy. Various nonstructural techniques were considered as elements of a comprehensive solution.

Buy-outs: Permanent evacuation of areas subject to erosion and/or storm inundation involves the acquisition of the impacted land and its structures either by purchase or by exercising the powers of eminent domain. Following this action, all development in these areas is either demolished or relocated. Before Hurricane Sandy, the cost of this plan including land and relocation was deemed to be prohibitively expensive and was dropped from consideration as a comprehensive solution. However,

more limited buy-outs (to be investigated on an individual structure basis) may be a viable means of enhancing or supplementing the coastal storm risk management provided by other features, especially considering the change of home prices in affected areas post-Hurricane Sandy.

Zoning: Through proper land use regulation, floodplains can be managed to ensure that their use is compatible with the severity of the flood hazard. Several means of regulation are available, including zoning ordinances, subdivision regulations, and building and housing codes. Their purpose is to reduce losses by controlling the future use of floodplain lands and would not be effective in mitigating the existing hazard. It should be noted that zoning is a local issue and is not within the jurisdiction of the Federal government. However, any Federal project will have a floodplain management plan component that includes requirements on the use of flood prone lands.

Building Retrofit: Building retrofit is a body of techniques for preventing flood damages by making adjustments to both structures and their contents. Such adjustments can be applied by an individual or as part of a collective action. Retrofits involve keeping water out (dry flood proofing) as well as reducing the effects of water entry (wet flood proofing). Flood proofing techniques can also include elevating structures above the design flood level. Retrofitting techniques can be undertaken when structures are under construction, during remodeling or expansion activities, or during a structure retrofit. While flood proofing measures can work to reduce damages to structures and their contents, residents must still be evacuated during flood conditions to ensure their safety.

Elevation (Raising) of Frequently Flooded Structures: This technique lifts an existing structure. Elevation can be performed using fill material, or on extended foundation walls, or on piers, post, piles, and columns, or some combination thereof.

Rebuilding: If the estimated cost of any other nonstructural alternative exceeds the estimated cost to demolish a structure and rebuild an equivalent structure, rebuilding the structure above the design flood elevation may be an economically viable nonstructural alternative.

3.6.2 Structural Measures

Floodwalls: Riverside bulkhead floodwalls generally consist of cantilevered steel sheet pile extending below the river mud line, installed as close as possible on the water side of existing bulkheads. These features would be integrated with inland floodwalls (tie backs) consisting of cantilevered steel sheet pile to required embedment depth below grade. The inland floodwalls generally tie off the alignment into high ground or an elevated road at the inland design still water elevation. Floodwalls along the river frontage would require additional height above the still water level to contain wave overtopping.

Levees: Levees generally consist of a trapezoidal shaped mound of earth with 1 vertical:3 height vegetated side slopes. Levee sections could be utilized in lieu of the inland floodwalls or landward of the existing shorefront bulkhead or beachfront.

Raised Roads: Road raising (elevation) is an alternative that can be used to facilitate tie-backs of alignment to high ground. Road raising is preferable to closure gates, which cause traffic interruption during storms when the gates would be closed.

Beach and Dune Fill: This measure includes the construction of beaches and dunes fronting the Shrewsbury River. Because of the topography of the study area, and existing development in the study area, beach and dune fill would have to extend entirely into the river to avoid significant adverse impacts to property use. Beach and dune fill requires approximately 250 feet of footprint extending out

from the existing bulkhead, which would entirely block the 200-foot wide river flow and the Shrewsbury River navigation project.

Storm Surge Barrier: A storm surge barrier could be constructed within the river to serve as a flood risk management structure. A barrier could be constructed near the mouth of the Shrewsbury River from Highlands, New Jersey, extending to Sandy Hook.

Pumps: Pumps would remove water from downtown Sea Bright. Water would likely be pumped into the Shrewsbury River. They would be complimentary to other project features.

Ringwalls: Ringwalls are intended to reduce the frequency of flooding to one or a group of structures on a small-scale basis. They can be temporary (deployable) or permanent.

3.7 Plan Formulation Strategy

The general plan formulation strategy was to maximize NED benefits while considering technical feasibility, environmental impacts, economic implications, social consequences, and technical criteria.

Technical Feasibility: Consideration was given to all feasible nonstructural and structural measures. Sound engineering judgment was utilized in selecting the structural components for each alternative. Existing topography, wetlands, structures, roadways, and drainage patterns were some of the local features that had to be accommodated in the design process.

Environmental Impacts: Impacts to the environment were evaluated for each alternative. Field data and literature were used to assess existing conditions and potential impacts.

Economic Implications: Construction costs were estimated for each alternative. These costs were developed for screening purposes only and did not reflect detailed designs and environmental assessments accomplished later for the more developed alternatives. Economic benefits of the alternatives were developed for the with- and without-project conditions. This information was used to compare alternatives.

Social Consequences: The public may experience negative impacts of property acquisitions, environmental impacts, visual aesthetics (floodwalls or levees), and inconvenience due to construction, but the minimization of flooding or flood damage will greatly improve the quality of life.

Technical Criteria: Alternative plans were developed to manage the risk from storm inundation. Detailed analysis of the alignment features could indicate that variations or uncertainty in some design conditions, such as storm surge elevation and overtopping, could present a risk of damage below the top elevation of the risk management structures. These uncertainties could combine to reduce the estimated economic benefits.

3.8 Screening and Combination of Measures

Management measures were retained for further consideration based on their ability to meet the following measures screening criteria:

1. Does the measure meet objectives?
2. Does the measure avoid constraints?

Measures eliminated from further consideration are shaded (Table 4).

Table 4: Screening of measures.

Measure	Does the measure…			
	Objective 1: Manage the risk of damages	Objective 2: Support community resilience and cohesion	Constraint 1: Avoid physical constraints	Constraint 2: Avoid impacts to navigation
Nonstructural Measures	Yes	Yes	Yes	Yes
Floodwalls	Yes	Yes	Yes	Yes
Levees	Yes	Yes	No	Yes
Road Raising*	Yes	Yes	No	Yes
Beach and Dune Fill	Yes	No	No	No
Storm Surge Barrier**	Yes	Yes	Yes	Yes
Pumps	Yes	Yes	Yes	Yes
Ringwalls	Yes	Yes	Yes	Yes

* screened as a stand-alone measure

** investigated at the request of the non-Federal sponsor. Determined to not be cost effective during preliminary plan formulation.

Nonstructural Measures: Nonstructural measures are those that reduce human exposure or vulnerability to a flood hazard without altering the nature or extent of that hazard. Nonstructural measures were carried forward for further consideration. It should be noted that additional nonstructural measures would not reduce the problems of street flooding, including auto damage, lost income, and adverse effects on businesses located on Ocean Avenue.

Floodwalls: Based upon an assessment of site conditions, floodwalls are well suited to address the flooding problem. They were considered for further alternative development.

Levees: Levees were dropped from further consideration because of the significantly large footprint requirements (50-foot width) with associated prohibitively significant property use reduction and real estate impacts.

Road Raising: This measure would significantly impact existing infrastructure and thus was dropped for consideration as a stand-alone feature. However, this measure could provide an efficient tie-in location for a structural alignment and to allow unimpeded traffic flow. It has been considered for further alternative development as part of a plan with floodwalls.

Beach and Dune Fill: Beach and dune fill were dropped from further consideration. The measure is not consistent with current riverfront geomorphology and land use. Construction and maintenance of a beach and/or dune would require major re-engineering of the landscape, which would greatly impact existing infrastructure and homes (Constraint #1). In addition, placement of sand and maintenance of a beach and/or dune would have a prohibitive impact on the adjacent river flow and the Shrewsbury Federal navigation project (Constraint #2).

Storm Surge Barrier: This measure could prevent storm surge from traveling up the Shrewsbury River. A likely location for such structures could be near the mouth of the Shrewsbury River near Highlands, New Jersey. The non-Federal sponsor requested consideration of this measure.

Ringwalls: Based upon an assessment of site conditions, ringwalls could be well suited to prevent storm damage to homes and businesses. Because they would be redundant features when in concert with another structural measure they were considered individually during a last-added analysis for nonstructural alternatives, as decribed later in this chapter.

3.9 Initial Array of Alternative Plans

The initial array of alternative plans includes the following:

- Nonstructural Alternatives
- No Action Alternative
- Floodwall Alternatives
- Storm Surge Alternative

No Action Alternative

If USACE takes no action, downtown Sea Bright would continue to experience back bay flooding from the Shrewsbury River during coastal storms. Substantially damaged structures would be elevated beyond the base flood elevation after storm events, as required by local flood risk management ordinances. (The base flood elevation is the computed elevation to which floodwater is anticipated to rise during the base flood. The base flood is that which has a 1 percent chance of being equaled or exceeded in any given year, which is colloquially referred to as the "100-year flood.") This plan fails to meet the USACE study objectives or needs for the majority of the study area. It will, however, provide the baseline against which project benefits are measured. Expected annual equivalent damages for the No Action alternative from 2020 to 2070 are in the amount of $1,533,000 (October 2015 price level). The No Action Alternative assumes that:

- Construction of the ocean-fronting seawall is complete
- River-fronting, municipally-maintained bulkheads are reinforced and elevated to +7 feet NAVD88
- All new development will be built above the base flood elevation

Nonstructural Alternatives

The nonstructural alternatives consist of implementing one or more of the following measures:

- Wet floodproofing
- Dry floodproofing
- Elevation
- Rebuilding
- Acquisition
- Evacuation Plans
- Floodplain development zoning changes/ enforcement

Different nonstructural scenarios were developed, each affecting a greater number of structures. A 2014 structure inventory identified 238 structures, 234 (98 percent) of which are located in the footprint of the 1 percent floodplain. The Borough of Sea Bright issued permits after Hurricane Sandy for the elevation of 46 and demolition of 30 of these structures; the remaining 162 structures were considered during formulation and analysis. The main floor elevation (MFE), or the elevation lowest habitable floor, was estimated for these structures using information from the structure inventory. Of the 162 structures, 112 had MFEs at or below the 1 percent flood water surface elevation (Table 2).

Three alternatives were formulated by grouping structures with MFEs. The groupings that were used were structures with a MFE less than or equal to the 10 percent, 4 percent, and 1 percent still water surface elevations. The nonstructural alternatives are:

- Nonstructural Alternative 1: structures with a MFE less than or equal +4.5 feet NAVD88 (the 10 percent flood water surface elevation)

- Nonstructural Alternative 2: structures with a MFE less than or equal to +6.0 feet NAVD88 (the 4 percent flood water surface elevation)
- Nonstructural Alternative 3: structures with a MFE less than or equal to +8.2 feet NAVD88 (the one percent flood water surface elevation)

Structures would be elevated in order for their main floors to be at a height of +11.2 feet NAVD88. This height takes into consideration: 1) the 1 percent flood still water level (+8.2 feet NAVD88), 2) anticipated sea level change of 0.7 feet over 50 years (rounded to 1 foot), and 3) the Borough of Sea Bright's ordinance requiring that all new construction be at a height of at least 2 feet above the base flood elevation. As defined by the Federal Emergency Management Agency (FEMA), the base flood elevation is the elevation of surface water resulting from a flood that has a 1 percent chance of equaling or exceeding that level in any given year (the "1 percent flood"). The base flood elevations for affected structures range from +7 feet NAVD88 to +8 feet NAVD88. The final height of the structures would be more than 3 feet above the base flood elevation.

An engineering tool, based on a matrix developed by the USACE National Nonstructural Floodproofing Committee, identified the most appropriate treatment for each structure. It has been used for other USACE feasibility studies with nonstructural components, most recently by USACE for the Leonardo, New Jersey coastal storm risk management feasibility study. The tool identified elevations and ringwalls as the most appropriate treatments in the study area, given the amount of inundation and structure types involved (Appendix A). Table 5 shows a breakdown by structure type (residential and commercial/nonresidential) for each of the nonstructural alternatives.

Table 5: Detailed breakdown of potential number of structures included in nonstructural alternatives.

	Elevations		Ringwalls*		Total # Structures
	Residential	Commercial/ Non-residential	Residential	Commercial/ Non-residential	
Structures at/below 10 percent WSEL** (+4.5 feet NAVD88)	1	0	1	7	**9**
Structures at/below 4 percent WSEL (+6.0 feet NAVD88)	33	0	2	30	**66**
Structures at/below 1 percent WSEL (+8.2 feet NAVD88)	66	3	5	38	**112**

* maximum number of structures behind ringwalls, as explained in detail later in this section
** WSEL = water surface elevation

To identify the most efficient and cost effective nonstructural plan, structure elevations and ringwalls were considered separately, as described in Section 3.10. For the initial array, nonstructural plans that included only structure elevations were used for comparison and screening of the initial array of alternatives. Ringwalls that were economically justified on their own, or incrementally justified, were added to the plan later in the planning process. Table 6 shows alternatives were used for initial screening.

Table 6: Nonstructural alternatives.

Nonstructural Alternatives	Description	Features
Alternative NS 1 Structures at/below 10 percent WSEL** (+4.5 feet NAVD88)	Elevations only for structures with a MFE at or below the 10 percent WSEL of +4.5 feet NAVD88	1 structure elevation
Alternative NS 2 Structures at/below 4 percent WSEL (+6.0 feet NAVD88)	Elevations only for structures with a MFE at or below the 4 percent WSEL of +6.0 feet NAVD88	34 structure elevations*
Alternative NS 3 Structures at/below 1 percent WSEL (+8.2 feet NAVD88)	Elevations only for structures with a MFE at or below the 1 percent WSEL +8.2 feet NAVD88	69 structure elevations

* one structure that was originally included within a ringwall is included in this plan
** WSEL = water surface elevation

Floodwall Alternative

This alternative would reduce risk to the most vulnerable and frequently flooded parts of the downtown area. The alignment would span from the Rumson Bridge (County Route 520) to just south of Osborne Street, about a half mile (Figure 23). It would tie into relatively higher elevation at Ocean Avenue to the east. The floodwalls would likely look like existing bulkheads that front the Shrewsbury River.

Figure 22: Typical bulkhead along the Shrewsbury River in Sea Bright, 2014. A floodwall would be visually similar to it, but would be higher in elevation.

Figure 23: Floodwall alternative alignment.

Because of physical (space) constraints, there is only one possible for the floodwall alignment along the riverfront. Various crest heights along this alignment were considered (Table 7). The crest elevations of the tieback components were controlled by the need to prevent induced flooding and by site conditions at the southern end of the project, where the raised road dimensions are restricted by the topography, the proximity of existing structures, and drainage issues. Pumps were considered in combination with bulkheads, but were found to be less cost effective than the raised bulkhead by itself.

Table 7: Floodwall dimensions considered.

	Floodwall Crest Elevation (+ft NAVD88)	Percent Flood Event (based on still water level)
Alternative F1	7.0	2%
Alternative F2	8.5	1%
Alternative F3	9.5	0.5%
Alternative F4	11.5	0.3%

Storm Surge Barrier Alternative

This alternative was originally proposed for the USACE/NJDEP coastal storm risk management feasibility study of Highlands, New Jersey, and was included for analysis at the request of the Mayor of Sea Bright. The alternative would provide a comprehensive solution to flooding in the Shrewsbury River Basin. It would reduce the risk of storm surge coming from the Shrewsbury River. It would include a surge barrier extending across Sandy Hook Bay at the mouth of the Shrewsbury River. The structure would likely tie into raised ground or a raised road. Closure gates would be constructed to allow for navigation on the Shrewsbury River (Figure 24).

The total breakwater alignment is approximately 4,500 feet, crossing a broad shoal area on the Sandy Hook side. At the location of the existing navigation channel approximately 500 feet from the state bulkhead, a 200-foot wide navigation sector gate will be installed to allow for a 100-foot clear opening for navigation transit when the gate is in the open position. Prior to potential major storm events, the sector gate will be closed during a period of lower tide, sealing the inner basin, providing additional runoff storage leeward of the barrier.

Mean bay-bottom elevation along the breakwater alignment is roughly –4 feet NAVD88 or less, except across the navigation channel where it is an average of –19 to –21 feet NAVD88. The crest of the breakwater will be set at elevation +12.4 feet NAVD88. The crest elevation was selected to limit the effect of storm waves, reduce overtopping damage to the leeward side of the breakwater, and avoid water buildup from overtopping wave effects. There is insufficient storage leeward of the breakwater to store storm water runoff buildup to below elevation +5 feet NAVD88 with the sector gate closed, therefore a pump station will be required. Based on gross approximations, a 4,000 cubic feet per second pump station would be necessary to prevent residual damages from the closed gate.

It should be noted that the USFWS does not support the storm surge barrier alternative, as per its Fish and Wildlife Service Coordination Act (FWCA) preliminary comment letter dated July 2, 2002. In the letter, the USFWS recommended against the construction of any new hard structures where none currently exist. The USFWS strongly advocated for nonstructural alternatives.

Figure 24: Storm surge barrier alternative.

3.9.1 Screening of the Initial Array of Alternative Plans

The 1983 Principles and Guidelines (P&G) 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. All structural alternatives had to provide risk management along the entire length of the alignment to be considered complete. Any "holes in the fence" would threaten the success of the entire project.

- **Effectiveness** is the extent to which the alternative plans contribute to achieve the planning objectives. Effectiveness of the alternatives was measured by the reduced damages in the with-project condition against a 1 percent flood design elevation. Alternatives that had a benefit-to-cost ratio under 1 were eliminated from consideration.

- **Efficiency** is the extent to which an alternative plan is the most cost effective means of achieving the objectives. Efficiency was measured through a comparison of benefit-to-cost ratios and reduced damages. Plans that provide the same level of performance, but at higher cost, were 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 in accordance with applicable laws and regulations.

The most expeditious way to evaluate the alternatives against the P&G criteria is through the criterion of effectiveness. An estimate of annual costs were considered against the annual benefits for the alternatives (Table 8). This allowed for an initial screening of alternatives.

Table 8: Economic performance of the initial array of alternatives (October 2015 price level).

	First Cost	Annual Cost	Annual Damages	Annual Benefit	Net Benefit	BCR*
Alternative NS 1 Structures at/below 10 percent WSEL**	$282,635	$11,000	$11,000	$7,000	-$5,000	0.6
Alternative NS 2 Structures at/below 4 percent WSEL	$7,890,927	$314,000	$314,000	$395,000	$81,000	1.3
Alternative NS 3 Structures at/below 1 percent WSEL	$14,641,429	$583,000	$583,000	$583,000	$1,000	1.0
Alternative F 1 +7.0-foot NAVD88 floodwall	$10,203,000	$736,574	$737,000	$479,000	-$258,000	0.7
Alternative F 2 +8.5-foot NAVD88 floodwall	$10,605,000	$764,427	$764,000	$508,000	-$257,000	0.7
Alternative F 3 +9.5-foot NAVD88 floodwall	$10,832,000	$780,127	$780,000	$562,000	-$218,000	0.7
Alternative F 4 +11.5-foot floodwall	$11,897,000	$853,763	$854,000	$587,000	-$267,000	0.7
Storm Surge Barrier	$374,579,000	$19,538,000	$19,538,000	$14,200,000	-$5,338,000	0.7

* benefit-to-cost ratio / ** WSEL = water surface elevation

This initial screening showed that of the alternatives, Alternative NS 2 and Alternative NS 3 provide positive net benefits. As such, they were the only alternatives carried forward for consideration. Both alternatives meet the remaining P&G criteria of completeness, efficiency, and acceptability. Because Alternative NS 2 provides a greater net benefits of the two plans, it was identified as the TSP. The plan includes the elevation of 34 structures with a MFE at or below the 4 percent WSEL of +6.0 feet NAVD88. Refined costs and benefits were developed for Alternative NS 2, as presented in Chapter 4.

3.10 Consideration of Ringwalls in the Plan

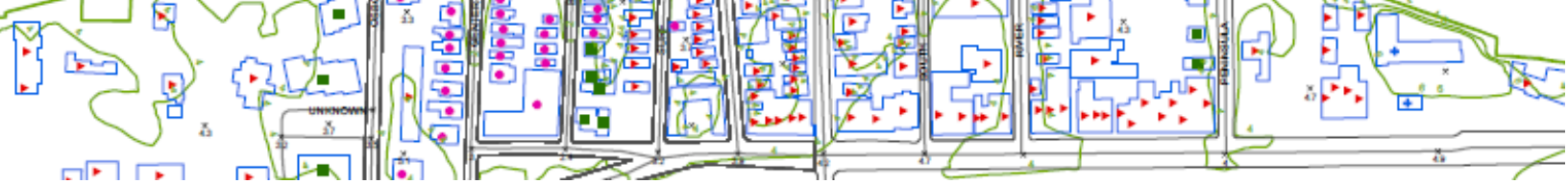
Ringwalls were individually considered in a last-added analysis to reduce residual risk. Many different ringwall designs were considered. Considering current land uses, deployable ringwalls are the most appropriate for the study area (Figure 25). Permanent ringwalls would impede the operation of businesses and potentially impact Ocean Avenue, a major evacuation route. For consistency with the proposed height of structure elevations, the ringwalls were designed to a height of +11.2 feet NAVD88. Detailed ringwall design will be developed prior to construction, in coordination with the NJDEP and Borough of Sea Bright. Costs and benefits were calculated for individual ringwalls identified in Table 5, and were compared (Table 9). Of the ringwalls in Alternative NS 2, one ringwall had positive annual net benefits of $42,000. Ringwall #10 is located around two attached structures, and would be up to 7 feet tall. The ringwall was added to Alternative NS 2. Refined costs and benefits were developed for Ringwall #10, as presented in Chapter 4.

Figure 25: Deployable ringwall concepts. Counter clockwise from top left: Portadam, FloodBreak, AquaFence, and a rapid deployment floodwall.

Figure 26: Ocean Avenue after Hurricane Sandy, 2012.
Many storefronts are located directly adjacent to the sidewalk.

Table 9: Economic performance of ringwalls (October 2015 price level).

	First Cost	Annual Cost	Annual Benefits	Annual Net Benefits	BCR
Ringwall 1	$5,660,000	$232,000	$172,000	-$60,000	0.7
Ringwall 2	$2,840,000	$116,000	$48,000	-$68,000	0.4
Ringwall 3	$3,856,000	$158,000	$40,000	-$118,000	0.3
Ringwall 4	$5,981,000	$244,000	$73,000	-$172,000	0.3
Ringwall 5	$1,843,000	$79,000	$32,000	-$47,000	0.4
Ringwall 6	$2,026,000	$83,000	$11,000	-$72,000	0.1
Ringwall 8	$2,927,000	$120,000	$59,000	-$61,000	0.5
Ringwall 9	$2,880,000	$118,000	$29,000	-$89,000	0.2
Ringwall 10	$1,958,000	$80,000	$122,000	$42,000	1.5
Ringwall 11	$3,702,000	$152,000	$60,000	-$92,000	0.4
Ringwall 18	$2,599,000	$106,000	$10,000	-$96,000	0.1



Chapter 4: Tentatively Selected Plan*

4.1 Plan Components

Alternative NS 2 (elevation of structures with a main floor elevation at or below +6.0 feet NAVD88), including the one ringwall with positive annual net benefits has been identified as the TSP. The plan includes the elevation of 34 structures and use of one deployable ringwall system around two adjoined structures (Figure 27). The estimated first cost of the project is $11,141,000. The plan has annual net benefits of $14,000. Plan details will be refined following the receipt of agency and public feedback after review of this draft report; specifically, the number of structures included in the plan may change. The USACE effort is complementary to ongoing Hurricane Sandy recovery efforts, and will not include structures that already have been or will be elevated through other means.

The 34 structures will be elevated between 5 to 7 feet so that their main floor elevations are at +11.2 feet NAVD88, removing them from the 1 percent floodplain. A temporary ringwall will be deployed around two attached structures prior to storm events. The top of the ringwall will measure approximately 7 feet above ground elevation. It will be deconstructed after use and stored between storm events.

Construction techniques will vary depending on the structure foundation type. The structures would have their foundations extended into the ground for stability as part of elevation; the space between the elevated structure and ground surface may be partially enclosed or left open. Diagrams illustrating the construction technique for each foundation type can be found in the Appendix A.

4.2 Benefits of the Plan

Refined benefit estimates were developed for the TSP after the initial screening described in Chapter 3. The benefits of implementing the proposed plan represent flood damages avoided with project implementation. Benefits were calculated as the difference in damages before and after project implementation. Benefits were then amortized over a 50-year period to identify equivalent annual benefits using October 2015 price levels and an interest rate of 3.125% (Table 10).

Table 10: Costs and benefits of the TSP.

Total First Cost	$11,141,000
Average Annual Cost	$452,000
Average Annual Benefits	$466,000
Annual Net Benefit	**$14,000**
Benefit-to-Cost Ratio	**1.0**

Figure 27: The tentatively selected plan.

4.3 Cost Estimates

Refined project costs were developed for the TSP after the initial screening described in Chapter 3. The initial project cost is $11,141,000 and the fully funded cost is $12,109,000 (Table 11). These costs include construction, lands and damages, design, supervision and associated administration costs. The material costs were based on a combination of MII database, RSMeans, quotes, and historical information. Equipment rates were obtained from Region 1, and Davis Bacon Wage Rates for Monmouth County, NJ were utilized for labor costs. The contingencies were developed via an ARA. A summary of the results of this risk analysis, and more detail on the cost estimate, can be found in Appendix B.

Table 11: Project annual costs.

Initial Project Cost (FY15 price level)	$11,141,000
Annualized Initial Cost*	$450,000
Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) Costs	$2,000
Total Annual Cost*	**$452,000**

**Discounted at 3.125% over a 50-year period ending in 2070*

4.4 Operation, Maintenance, Repair, Replacement & Rehabilitation Considerations

OMRR&R are the responsibility of the non-Federal sponsor. There will be no OMRR&R expenses for individual property owners as a result of the proposed elevation of structures. Annual OMRR&R of the deployable ringwall is estimated to cost $2,000 per year.

4.5 Risk and Uncertainty Analysis

The TSP does not contribute to risk in an overall sense, as it does not encourage development in the floodplain. In this sense, the plan is compliant with Executive Order (EO) 11988 “Floodplain Management,” which requires Federal agencies to minimize and prevent encouragement of development in the floodplain in their planning and project implementation. It should be noted, however, that Sea Bright is mostly developed and there is generally little room for additional development within the community, regardless of which alternative is under consideration.

A key uncertainty as described in Chapter 3 of this draft report relates to implementation of the TSP. Participation in nonstructural projects is voluntary for property owners. Theoretically, it is possible for the project to have a benefit-to-cost ratio above one for the purposes of authorization, but below one in implementation if some of the property owners elect not to participate. Based on coordination with non-Federal and local interests to date, lack of participation is not anticipated for this project.

4.5.1 Residual Risk & Damages

Flood risk to people and structures at any location in a floodplain is the function of flood hazard at the location, and their exposure and vulnerability to the flood hazard. Residual risk is the flood risk that remains after all efforts to reduce the risk are completed. Residual risk is the exposure to loss remaining after other known risks have been countered, factored in, or eliminated.

The proposed project is part of a comprehensive plan to reduce flood risk to life and property in Sea Bright. The plan complements other ongoing efforts in the borough to reduce flood risk. Most significantly, many residents are elevating their homes above the 1 percent floodplain. After Hurricane

Sandy, the Borough of Sea Bright issued permits for the elevations or demolition of 76 structures in the study area. Because of the availability of post-Hurricane Sandy grants and nonprofit volunteer labor, residents continue to elevate their homes to reduce the risk of flood damages. In accordance with local regulations, new construction is built to an elevation at least two feet above the base flood elevation.

The Borough's completion of the seawall project, which is currently under construction, will reduce the risk of storm surge inundation from the Atlantic Ocean. Other future efforts to elevate existing river-fronting bulkheads along the Shrewsbury River may also reduce the risk of inundation in Sea Bright.

In comparison to some of the larger and more comprehensive alternatives evaluated the TSP carries relatively high residual risk, as only 30 percent of the structures with a MFE at or below the 1 percent floodplain still water elevation are included in the plan. Other properties within the 1 percent floodplain could receive assistance or funding for nonstructural treatments through other sources, but there would still be residual risk even if every structure within the floodplain were included in the plan. The fundamental risk associated with a nonstructural plan is that access routes would become inaccessible due to flooding from coastal storms, stranding individuals who choose not to evacuate when directed to prior to future coastal storm events.

With the proposed project in place, flood damages from coastal storms will not be totally prevented, only reduced. The project will not eliminate all flood risk to life and property. Residual damages can occur from very high storm surge, rainfall events, and hurricane winds and windblown debris. The proposed project will provide net benefits of $14,000 annually. With plan implementation, there will still be public and private properties that are vulnerable to coastal storm damages. Assistance and aid for owners of these other properties may come from other Federal agencies, such as FEMA and the U.S. Department of Housing and Urban Development (USHUD), or from programs run by the State of New Jersey.

4.5.2 Risk to Life Safety

Sea Bright and other coastal communities have always existed with the threat of coastal storms. Residents generally understand the severe implications of staying in harm's way when a storm is forecasted to affect the area. Because there is typically 2 to 7 days' notice prior to incidents of major coastal storm flooding, people are given sufficient warning to evacuate prior to storm events. Prior to severe storms, the Borough of Sea Bright aids residents in evacuating out of harm's way by implementing its robust evacuation plan. Ocean Avenue, Sea Bright's only emergency evacuation route, is cleared of sand and debris prior to and following storm events in order to allow residents, emergency responders, and recovery workers to exit and enter the area. Loss of life can only be totally prevented by evacuating people well before expected coastal flood events. The inherent erratic nature and unpredictability of a storm's path and intensity requires early and safe evacuation. A policy of early, total evacuation should be continued even with the project in place.

4.6 Economic, Environmental, and Other Social Effects

The 1983 Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (USWRC 1983) presents four accounts to facilitate evaluation and display of effects of alternative plans:

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

In reducing damages from future storm and flood events, the proposed project would contribute to NED. A small nonstructural project neither contributes to nor detracts from the EQ and RED accounts. As detailed in Chapter 5, there would be minimal environmental impacts due to implementation of the plan. No wetlands will be affected nor will any other habitat be destroyed because the project footprint is limited to structure elevation, which utilizes the existing footprint; floodwaters will essentially be allowed to flow as they would under the No Action Alternative. For the same reason, and because no historic buildings are included in the project, there will be no impact to cultural resources. Any other impacts, including the environmental impacts associated with building elevation, will be minor and temporary.

The proposed project would contribute to community resilience, which is the measure of the sustained ability of a community to utilize available resources to respond to, withstand, and recover from adverse situations (Figure 28). Because structures included in the plan would not be damaged as frequently or as severely as others in the area, the community would be able to recover quickly after storm events. People would not be displaced for months or years because their homes were severely damaged by a storm, as was the situation after Hurricane Sandy. Businesses would be able to return quickly if they are not flooded, and people would be able to return to work. Furthermore, the proposed project would not detract from water views or water access, both of which are important to the community.

Figure 28: Hurricane Sandy response and recovery operations on Ocean Avenue outside of the Sea Bright Fire House, 2012.

Since only a subset of the community is included in the plan, some property owners who experience flood damages and need help would not receive it via the proposed project. Other sources of Federal and non-Federal assistance for property owners are available via FEMA, USHUD, the State of New Jersey, and nonprofit organizations.

4.7 Executive Order 11988

EO 11988 "Floodplain Management" requires Federal agencies such as USACE, when taking an action, to avoid short- and long-term adverse effects associated with the occupancy and the modification of a floodplain. The agency must avoid direct and indirect support of floodplain development whenever floodplain siting is involved. In addition, the agency must minimize potential harm to or in the floodplain and explain why the action is proposed. USACE implementation guidance for EO 11988 was issued as ER 1165-2-26 "Water Resources Policies and Authorities, Implementation and Executive Order, Engineer Regulation 11988 on Flood Plain Management."

The wise use of floodplains concept, as described in EO 11988, was incorporated as a life safety consideration as part of the study. This approach was based on study objectives of applying qualitative rather than quantitative analysis; use of existing data/inventory; and professional judgment. The eight-step evaluation process outlined in EO 11988 is included here, with a discussion of how it was considered during plan formulation and selection.

Step 1: Determine if a proposed action is in the base floodplain (that area which has a 1 percent or greater chance of flooding in any given year, i.e., 1 percent flood).

The TSP is within the defined base floodplain.

Step 2: Conduct early public review, including public notice.

USACE has coordinated with the NJDEP, the Borough of Sea Bright, and the public during the course of the study. This draft report allows for a formal public review of the proposed action. The final report will include a recommendation for action.

Step 3: Identify and evaluate practicable alternatives to locating in the base floodplain, including alternative sites outside of the floodplain.

All practicable alternatives were identified by following the USACE six-step planning process. A wide range of measures and plans using available information, engineering analysis, professional judgment, and risk-informed decision-making were evaluated. Practicable alternatives considered, and the reasons they were screened from consideration are discussed in Chapter 3.

Step 4: Identify impacts of the proposed action.

As detailed in Chapter 5, there would be minimal environmental impacts due to implementation of the plan. The plan will support community resilience and cohesion by reducing flood risk to residents, businesses, and infrastructure.

Step 5: If impacts cannot be avoided, develop measures to minimize the impacts and restore and preserve the floodplain, as appropriate.

The proposed project is the plan that maximizes NED benefits while being consistent with the requirements of EO 11988. The plan would avoid short-term and long-term adverse effects associated with the occupancy and modification of the existing floodplain.

Step 6: Reevaluate alternatives.

Plan formulation, evaluation, comparison, and selection are detailed in Chapter 3 and Appendix E.

Step 7: Present the findings and a public explanation.

The final report will present the USACE's findings.

Step 8: Implement the action.

The NJDEP is willing to enter into a Project Partnership Agreement (PPA) with the Federal Government for implementation of the plan.

4.8 Optimization of the Tenatively Selected Plan

The TSP will be refined after release of this draft report to incorporate public comments and the most up-to-date information about the structures included in the plan. Since rebuilding is an ongoing process, the number of structures included in the plan will likely change (Figure 29). Engineering and economic analyses will be revised as appropriate to reflect any revisions to the plan. The final version of this report will describe changes to the plan.

Figure 29: Rebuilding flooded home on New Street, 2014.

Chapter 5: Environmental Impacts*

This chapter describes the environmental consequences of implementing the TSP and taking no action, as required by NEPA. The No Action Alternative consists of USACE not implementing the proposed coastal storm risk management project. The proposed action consists of implementing the TSP described in Chapter 4. The following resources are not present in the study area, and thus are not included in the discussion of potential environmental impacts:

- Wetlands
- Threatened and endangered species
- Aquatic resources
- Cultural resources
- Low income and minority communities (environmental justice)

5.1 Socioeconomics

No Action: Structures, businesses, and streets would continue to be inundated by storm surge from the Shrewsbury River. There would be a continuation of negative socioeconomic impacts due to flood induced damages, including destruction of property and potential loss of life. Damages to structures with relatively high MFEs would generally be lower than those with lower MFEs. Local building ordinances require that new construction be built at least 2 feet above the base flood elevation, potentially mitigating damages for future construction.

Ocean Avenue and other streets would continue to be inundated by storm surge from the Shrewsbury River. With completion of the borough's ocean-fronting seawall project, storm surge from the Atlantic Ocean will likely not inundate Ocean Avenue and other streets during storm events.

Proposed Action: The economy of Sea Bright may accrue socioeconomic benefits as a result of implementation of the proposed project. Recurrent costs to affected residents of cleaning up and rebuilding after floods would be mitigated, allowing the community to focus on community-building activities rather than on preparing for and recovering from storm surge events. Due to use of a deployable ringwall around two attached flood-prone structures, less time would be lost for businesses on their ground flood compared to a flood situation without the ringwall. Use of the ringwall would allow businesses and residents who operate or live in the structures to resume normal operations and recovery actions in a shorter period of time following a storm event.

Ocean Avenue and other streets would continue to be inundated by storm surge from the Shrewsbury River, though costs and time associated with clean-up and debris removal would be reduced. With completion of the borough's ocean-fronting seawall project, storm surge from the Atlantic Ocean will likely not inundate Ocean Avenue and other streets during storm events.

5.2 Water Resources

5.2.1 Ground Water

No Action: No significant impacts to groundwater resources are expected as a result of the No Action Alternative.

Proposed Alternative: No significant impacts to groundwater resources are expected as a result of implementation of the proposed project since construction activities would be limited to the immediate areas of the individual structure foundations. Foundations would not be built any deeper than they are at present, and thus groundwater flow would not be affected.

5.2.2 Surface Water

No Action: No significant impacts to surface water resources are expected as a result of the No Action Alternative. There would be a continuation in high water flood events and inundation of low-lying areas.

Proposed Alternative: No significant impacts to surface water resources are expected as a result of implementation of the proposed project.

5.3 Vegetation

5.3.1 Uplands

No Action: No significant impacts to surface upland resources are expected as a result of the No Action Alternative.

Proposed Alternative: Implementation of the proposed project would affect existing, largely cultivated vegetation in front and back yards because it would be removed to provide safe access for construction equipment when necessary. However, subsequent post-construction landscaping would mitigate the impact of cultivated vegetation loss.

5.4 Fish and Wildlife

5.4.1 Amphibians and Reptiles

No Action: There is no significant impact expected to amphibian and reptiles, and their habitat from the No Action Alternative, as no significant populations are located in the study area.

Proposed Alternative: There are no significant populations of amphibians and reptiles located within the footprint of structures included in the TSP. Construction staging areas would be located on streets or parking lots. Since noise and dust generation would be extremely limited in space and time, no significant impacts are anticipated due to the proposed action. Any amphibians and reptiles near the construction activities would be able to relocate. Disturbance leading to movement and relocation would not impose a minor risk of mortality in an urban construction environment. This would be an insignificant adverse impact.

5.4.2 Birds

No Action: There is no significant impact to birds and bird habitat from the No Action Alternative.

Proposed Alternative: There would be no significant impacts on birds due to implementation of the proposed project. There are no birds located within the footprint of structures included in the TSP. Construction staging areas would be located on streets or parking lots, and since noise and dust generation would be extremely limited in space and time, no significant impacts are anticipated due to the proposed action. Any birds near the construction activities would be able to relocate. Disturbance

leading to movement and relocation would not impose a minor risk of mortality in an urban construction environment. This would be an insignificant adverse impact. Some landscape vegetation and possibly trees on the affected properties would be removed or pruned to provide construction access. Depending upon the season, contractors would have to be attentive to nesting birds. This would be a potential minor adverse impact to some birds for the period of construction. However, construction would also involve restorative landscaping that could mitigate potential impacts.

5.4.3 Mammals

No Action: There is no significant impact to mammals and their habitat from the No Action Alternative, as no significant populations are located in the study area.

Proposed Alternative: There would be no significant impact on mammals due to implementation of the proposed project. There are no mammals located within the footprint of proposed structures. Construction staging areas would be located on streets or parking lots. Since noise and dust generation would be extremely limited in space and time, no significant impacts are anticipated due to the proposed action. Any mammals near the construction activities would be able to relocate. Disturbance leading to movement and relocation would not impose a minor risk of mortality in an urban construction environment. This would be an insignificant adverse impact.

5.5 New Jersey Coastal Zone

No Action: There would be no impacts to the New Jersey Coastal Zone from the No Action Alternative.

Proposed Alternative: No significant impacts on the coastal zone are anticipated as a result of implementation of the proposed project. The on-site elevation of structures would be coordinated with the NJDEP to provide ample time to comply with coastal zone regulations. A Federal consistency determination is required since the project area is within the New Jersey coastal zone. See Appendix B for the New Jersey Coastal Zone Act Consistency Statement.

5.6 Hazardous, Toxic, and Radioactive Waste

No Action: The No Action Alternative would result in recurrent flooding impacts, causing more destruction of low lying residences that may collapse or have to be demolished. This could lead to local exposure to lead based paint (LBP), asbestos-containing materials (ACM), mold, and dust. Additionally, there could be fuel tank failures causing local contamination of soil and water.

Proposed Alternative: No significant impact to the environment from hazardous, toxic, and radioactive waste is expected as a result of implementation of the proposed action. All activities are anticipated to occur within the footprint of an existing structure. All houses slated for elevation will be inspected for any potential environmental issues, e.g., LBP, ACM, and fuel storage tanks. Any LBP and ACM items identified in specific buildings will remediated and disposed of appropriately in compliance with Federal, state, and local regulations. Fuel tank issues will be addressed, if they occur, in accordance with Federal, state, and local regulations. Products used in construction activities that are potentially toxic would be handled according to proper procedures and/or disposed of appropriately. A walk through inspection of the house footprint will be conducted by the contractor or its sub-contractor(s). The contractor or its sub-contractor(s) will identify, mark and collect samples from flooring, walls, counter spaces, ceilings or other areas with the potential for LBP and ACM. Removal and disposal of LBP and ACM will be conducted in accordance with Federal and State regulations. Fuel storage tank issues could also arise, as some tanks may require removal/replacement or location

modification under the specific building elevation plans. Removal of home heating oil tanks would involve pumping out the tanks, excavating the tanks if necessary, cutting them open to remove any sludge, and transporting them from the site as scrap metal. If there is evidence of impacted soil, soil samples will be collected. All visibly impacted soil will be excavated, staged on site, and sampled. The excavation will also be sampled for impacts. Once analytical results are in the contractor or its sub-contractors will dispose of the soil in accordance with Federal and state regulations.

5.7 Air Quality

No Action: There would be no impact to air resources from the No Action alternative. As noted in Chapter 2, Sea Bright is located in a non-attainment zone, so there are extant air quality issues that will remain with or without the proposed project

Proposed Alternative: Based on a preliminary, qualitative assessment of the estimated construction schedule (18 months), it is anticipated that the proposed project would be within the de minimis levels in any one construction year. This assessment is based on a comparison with the proposed nonstructural house raising for the nearby USACE Leonardo, New Jersey project. Both proposed projects are of approximate similar size and construction duration. As Leonardo is calculated to conform to the General Conformity requirements, it is expected that the Shrewsbury project will conform as well. As there would be no significant impact to the quality of the air due to the proposed action, General Conformity Compliance will be achieved through a Record of Non-Applicability (RONA).The RONA will be supported by an emission inventory based on the M2 construction analysis of the proposed project to evaluate the applicability of the General Conformity regulations of 40 CFR 93 Subpart B. The calculated emissions of NOx, volatile organic compounds, and CO for the project are anticipated to be less than the 100 ton-per-year conformity threshold for each pollutant as established by 40 CFR 93.153 (b). Each of these three pollutants is calculated at less than 1 ton per year. The proposed action is not considered regionally significant under 40 CFR 93.153(i). Any fugitive dust generated due to construction activities would be contained according to proper standards and procedures. As noted in Chapter 2, Sea Bright is located in a non-attainment zone, so there are extant air quality issues which will remain with or without the proposed project.

5.8 Aesthetics and Scenic Resources

No Action: There would be no impact to aesthetics and scenic resources from the No Action Alternative

Proposed Alternative: Although Sea Bright is a closely-spaced, low rise community, implementation of the proposed project may cause disruption of loss of views for some residents. Any visual impacts associated with elevating structures would be minimized through proper design and construction, while conforming to local and state building codes. Some landscape vegetation on the affected properties could be removed or pruned to provide construction access. This is a potential minor adverse impact to viewsheds during construction. However, construction could also involve restorative landscaping that could mitigate the impacts.

5.9 Recreation

No Action: There would be no impact to recreation resources from the No Action Alternative

Proposed Alternative: There are no identified impacts on recreation by the proposed plan. All construction activities would take place within the footprint of an existing structure. Construction staging areas would be located on streets or parking lots. Since noise and dust generation would be extremely

limited in space and time, they would have no significant impacts on recreation areas, which would remain available to residents throughout the construction duration.

5.10 Noise

No Action: There would be no change to noise disturbances from existing conditions under the No Action Alternative.

Proposed Alternative: There would be no significant impacts from noise disturbances due to the proposed action. Construction activities related to the proposed action would be limited to day time hours, out of the noise disturbance prohibitions required by the Borough of Sea Bright (no noise disturbance between the hours of 6:00 pm to 7:00 am on weekdays and 6:00 pm to 9:00 am on Saturdays, Sundays, and Federal holidays). Noise which is not in violation of the local ordinances might still disturb neighbors who live within earshot. Best management practices for contractors may lessen or abate these occurrences or provide a complaint mechanism to remedy them. Construction noise is a potential minor impact.

5.11 Infrastructure

No Action: Infrastructure such as Ocean Avenue and power lines would continue to be impacted by storm surge from the Shrewsbury River. Their clean-up, removal, and repair would commence after storm events that would impact this infrastructure. With completion of the borough's ocean-fronting seawall project, storm surge from the Atlantic Ocean will likely not inundate Ocean Avenue and other streets during storm events.

Proposed Alternative: There would be no significant impact on utility infrastructure as a result of the proposed action. There are potential minor adverse impacts associated with construction traffic, construction induced changes to traffic flow and other inconveniences caused by the construction activities. Electric power, gas, water and sewage service (as well as any other utilities) would be temporarily taken out of service during construction periods at individual building sites. This would be in accordance with local and utility codes for community/construction worker safety and fire prevention. Utilities would be returned to normal working conditions as soon as possible after construction completion at each of the proposed structures, and should be elevated to a height above the base flood elevation (i.e., above the 1 percent floodplain). Because utilities for buildings would be relocated above the floodplain, they would likely not be impacted by frequent, small storm events, allowing for residents and businesses who operate or live in the structures to resume normal operations and recovery actions in a shorter period of time following a storm event. The same is true for utilities for those structure that are behind the temporary ringwall during a storm event.

Infrastructure such as Ocean Avenue and power lines would continue to be impacted by storm surge from the Shrewsbury River. Impacts to this infrastructure is similar for the No Action Alternative.

5.12 Land Use and Zoning

No Action: There would be no impact to land use and zoning from the No Action Alternative. Local building ordinances require that new construction be built at least 2 feet above the base flood elevation, potentially mitigating damages for future construction.

Proposed Alternative: Land use zoning would remain the same and all parcels would continue to be used as residential properties. There would be no significant impact as a result of implementation of

the proposed project on land use. Local building ordinances require that new construction be built at least 2 feet above the base flood elevation, potentially mitigating damages for future construction.

5.13 Cumulative Impacts*

Cumulative impacts are the effects on the environment that result from the incremental direct and indirect impacts of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from actions that individually are minor, but collectively result in significant actions taking place over time (Section 1508.7 40 CFR Parts 1500-1508). The Council on Environmental Quality's (CEQ) "Considering Cumulative Effects Under the National Environmental Policy Act" (CEQ 1997) provides an 11-step framework for cumulative effects analysis that was utilized to conduct the cumulative impact assessment for this study.

The following describes the cumulative effects or impacts for the No Action and proposed alternatives by describing both the spatial (United States, New Jersey, and study area) and the temporal (past, present and reasonably foreseeable future (50-year period of analysis) actions of other coastal storm risk management projects, and the potential contribution of the proposed action to these impacts.

Federal, state, and local governments, and homeowners are taking action to reduce the risk of flooding in many communities located in floodplains. Federal agencies including USACE and FEMA are working to reduce the risk of flooding and flood damages through different authorizes and programs. Specifically, the USACE is involved in the planning and construction of many risk management projects that include the construction of levees, floodwalls, pumps, and other structural measures, as well as nonstructural measures such as structure elevations. FEMA manages the distribution of Hazard Mitigation Assistance (HMA) funds that provide funding for eligible mitigation activities that reduce disaster losses and risk to life and property from future disaster damages. These National initiatives compliment similar risk management projects by state and local governments. In addition, many homeowners who have been recently impacted by flooding are elevating their homes via FEMA HMA grants or private funding. Since Hurricane Sandy, many homeowners have or are in the process of elevating their homes. This action mitigates the effects of flood damages to structures. Elevation of homes is generally encouraged in post-disaster communities such as Sea Bright, as seen throughout the northeast after Hurricane Sandy.

In Sea Bright, the proposed action would complement the following post-Hurricane Sandy rebuilding and recovery activities that could potentially mitigate for flood damages:

- Elevation of many homes above the floodplain via FEMA HMA or private funds (Figure 30)
- Borough of Sea Bright building ordinances requiring that new construction be built at least 2 feet above the base flood elevation
- Completion of the borough's ocean-fronting seawall project
- Elevation of existing riverfront bulkheads by homeowners

The Borough of Sea Bright is currently applying for Federal and state grants, funding from which could be used to construct risk management projects. Though not included in the scope of this analysis, it is nevertheless important to note that these and other projects/actions could impact future conditions and thus cumulative impacts in the study area.

Due to the minimal scale and nonstructural nature of the proposed project, it would not contribute any significant cumulative impacts to the coastal landscape. Detrimental cumulative impacts to the environment are not expected as a result of implementation of the proposed project. There would be no increase in footprint size of the elevated structures, and therefore it does not change floodplain characteristics. Use of a deployable floodwall would also not change floodplain characteristics. The

proposed project is consistent with post-Hurricane Sandy rebuilding strategy by many homeowners in Sea Bright - that is, elevation of structures out of the 1 percent floodplain.

The proposed action is one of many USACE coastal storm risk management projects along the northern New Jersey coast. They include the Port Monmouth, Union Beach, Highlands, and Leonardo studies. Construction of these projects could cumulative add to the reduction of risk from coastal storm flooding.

Figure 30: Home elevation in Sea Bright, 2014.

Chapter 6: Summary of Environmental Compliance*

Federal laws and Executive Orders applicable to all USACE recommended plans, their applicability to the proposed project, and, if applicable, their status is presented below:

N/A Non-applicable
C In compliance
P Compliance pending

STATUS	PUBLIC LAW (US CODE)/EXECUTIVE ORDER
N/A	Abandoned Shipwreck Act of 1987 (43 U.S.C. 2101)
N/A	American Indian Religious Freedom Act (42 U.S.C. 1996)
N/A	Agriculture and Food Act (Farmland Protection Policy Act) of 1981 (7 U.S.C. 4201)
N/A	American Folklife Preservation Act of 1976, As Amended (20 U.S.C. 2101)
N/A	Anadromous Fish Conservation Act of 1965, As Amended (16 U.S.C. 757a et seq)
N/A	Antiquities Act of 1906, As Amended (16 U.S.C. 431)
C	Archeological and Historic Preservation Act of 1974, As Amended (16 U.S.C. 469)
N/A	Archeological Resources Protection Act of 1979, As Amended (16 U.S.C. 470)
N/A	Bald Eagle Act of 1972 (16U.S.C. 668)
N/A	Buy American Act (41 U.S.C. 102)
N/A	Civil Rights Act of 1964 (Public Law 88-352) (6 U.S.C. 601)
C	Clean Air Act of 1972, As Amended (42 U.S.C. 7401 et seq)
C	Clean Water Act of 1972, As Amended (33 U.S.C. 1251 et seq)
N/A	Barrier Resources Act of 1982 (16 U.S.C. 3501-3510)
P	Coastal Zone Management Act of 1972, As Amended (16 U.S.C. 1451 et seq)
N/A	CERCLA of 1980 (42 U.S.C. 9601)
N/A	Conservation of Forest Lands Act of 1960 (16 U.S.C. 580 mn)
N/A	Contract Work Hours (40 U.S.C. 327)
N/A	Convict Labor (18 U.S.C. 4082)
N/A	Copeland Anti-Kickback (40 U.S.C. 276c)
N/A	Davis-Bacon Act (40 U.S.C. 276)
N/A	Deepwater Port Act of 1974, As Amended (33 U.S.C. 1501)
N/A	Emergency Flood Control Funds Act of 1955, As Amended (33 U.S.C. 701m)
N/A	Emergency Wetlands Resources Act (16 U.S.C. 3901-3932)
C	Endangered Species Act of 1972 (16 U.S.C. 1531)
C	EO 11988, Floodplain Management
C	EO 11990, Protection of Wetlands
C	EO 12898, Environmental Justice
N/A	Estuary Protection Act of 1968 (16 U.S.C. 1221 et seq)
N/A	Equal Opportunity (42 U.S.C. 2000d)
N/A	Farmland Protection Policy Act (7 U.S.C. 4201 et seq)
N/A	Federal Environmental Pesticide Act of 1972 (7 U.S.C. 136 et seq)
N/A	Federal Water Project Recreation Act of 1965, As Amended (16 U.S.C. 4601)
P	Fish and Wildlife Coordination Act of 1958, As Amended (16 U.S.C. 661)
N/A	Flood Control Act of 1944, As Amended, Section 4 (16 U.S.C. 460b)
N/A	Food Security Act of 1985 (Swampbuster) (16 U.S.C. 3811 et seq)
N/A	Hazardous Substance Response Review Act of 1980, As Amended (26 U.S.C. 4611)
N/A	Historic and Archeological Data Preservation (16 U.S.C. 469)

C	Historic Sites Act of 1935 (16 U.S.C. 461) Note: Superceded by NHPA, Section 106
N/A	Jones Act (46 U.S.C. 292)
N/A	Land and Water Conservation Fund Act of 1965 (16 U.S.C. 4601)
N/A	Magnuson Fishery Conservation and Management Act (16 U.S.C. 1801)
N/A	Marine Mammal Protection Act of 1972, As Amended (16 U.S.C. 1361)
N/A	Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1401)
N/A	Migratory Bird Conservation Act of 1928, As Amended (16 U.S.C. 715)
N/A	Migratory Bird Treaty Act of 1918, As Amended (16 U.S.C. 703)
C	NEPA of 1969, As Amended (42 U.S.C. 4321 et seq)
C	National Historic Preservation Act of 1966, As Amended (16 U.S.C. 470)
C	National Historic Preservation Act Amendments of 1980 (16 U.S.C. 469a)
N/A	Native American Religious Freedom Act of 1978 (42 U.S.C. 1996)
N/A	Native American Graves Protection and Repatriation Act (25 U.S.C. 3001)
N/A	National Trails System Act (16 U.S.C. 1241)
N/A	Noise Control Act of 1972, As Amended (42 U.S.C. 4901 et seq)
N/A	Rehabilitation Act of 1973 (29 U.S.C. 794)
N/A	Reservoir Salvage Act of 1960, As Amended (16 U.S.C. 469)
N/A	Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901-6987)
N/A	River and Harbor Act of 1888, Section 11 (33 U.S.C. 608)
N/A	River and Harbor Act of 1899, Sections 9, 10, 13 (33 U.S.C. 401-413)
N/A	River and Harbor and Flood Control Act of 1962, Section 207 (16 U.S.C. 460)
N/A	River and Harbor and FC Act of 1970, Sects 122, 209 and 216 (33 U.S.C. 426 et seq)
N/A	Safe Drinking Water Act of 1974, As Amended (42 U.S.C. 300f)
N/A	Shipping Act (46 U.S.C. 883)
N/A	Submerged Lands Act of 1953 (43 U.S.C. 1301 et seq)
N/A	Superfund Amendments and Reauthorization Act of 1986 (42 U.S.C. 9601)
N/A	Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201-1328)
N/A	Toxic Substances Control Act of 1976 (15 U.S.C. 2601)
N/A	Policy Act of 1970, As Amended (43 U.S.C. 4601)
N/A	Utilization of Small Business (15 U.S.C. 631, 644)
N/A	Wild and Scenic River Act of 1968 (16 U.S.C. 1271 et seq)

Assuming that the proposed project does not expand beyond the scope described in this draft report, the project is in compliance with NEPA.

Chapter 7: Plan Implementation

As non-Federal sponsor, the NJDEP must sign a PPA that will carry the project through the Preconstruction Engineering and Design (PED) phase to project construction. A Project Management Plan will be prepared to identify tasks, responsibilities, and financial requirements of the Federal Government and the non-Federal sponsor during PED and construction. A project schedule has been developed based on current assumptions for the detailed design and construction schedules. It will be refined as more data are available in subsequent phases of the project.

7.1 Institutional Requirements & Local Cooperation

NJDEP has indicated its intent to implement the proposed project through a strong record of involvement and coordination throughout the study. A fully coordinated PPA package, which will include the non-Federal sponsor'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 study. NJDEP has agreed to comply with all applicable Federal laws and policies and other requirements that may include, but are not limited to:

a. Provide a minimum of 35 percent of initial project costs assigned to coastal and storm damage reduction, plus 100 percent of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits, and as further defined below:

   (1) Provide, during design, 35 percent of design costs allocated to coastal and storm damage reduction in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

   (2) Provide all lands, easements, rights-of-way, and perform or assure performance of all relocations, including utility relocations, as determined by the Federal government to be necessary for the initial construction, periodic nourishment or operation and maintenance of the project;

   (3) Provide, during construction, any additional amounts necessary to make its total contribution equal to 35 percent of initial project costs assigned to coastal and storm damage reduction plus 100 percent of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits;

b. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

c. Inform affected interests, at least yearly, of the extent of protection afforded by the flood risk management features; participate in and comply with applicable federal floodplain management and flood insurance programs; comply with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12); and publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with protection levels provided by the flood risk management features;

d. Operate, maintain, repair, replace, and rehabilitate the completed project, or function portion of the project, at no cost to the Federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and state laws and regulations and any specific directions prescribed by the Federal government;

e. For so long as the project remains authorized, ensure continued conditions of public ownership and use of the shore upon which the amount of Federal participation is based;

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

g. At least twice annually and after storm events, perform surveillance of the project and provide the results of such surveillance to the Federal government;

h. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;

i. Hold and save the United States free from all damages arising from the initial construction, periodic nourishment, operation, maintenance, repair, replacement, and rehabilitation of the project, except for damages due to the fault or negligence of the United States or its contractors;

j. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence are required, to the extent and in such detail as will properly reflect total cost of the project, and 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 CFR, Section 33.20;

k. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 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 necessary for the initial construction, periodic nourishment, operation and maintenance of the project;

l. Assume, as between the Federal government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way required for the initial construction, periodic nourishment, or operation and maintenance of the project;

m. Agree, as between the Federal government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and, 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;

n. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, (42 U.S.C. 1962d-5b) and Section 101(e) of the WRDA 86, Public Law 99-662, as amended, (33 U.S.C. 2211[e]) which provide that the Secretary of the Army shall not commence the construction

of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

o. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4601-4655) and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way necessary for construction, operation, and maintenance of the project including those necessary for relocations, the borrowing of material, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

p. 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; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c); and

q. Not use funds from other Federal programs, including any non-federal contribution required as a matching share therefore, to meet any of the non-Federal sponsor's obligations for the project unless the Federal agency providing the funds verifies in writing that such funds are authorized to be used to carry out the project.

7.2 Real Estate Requirements

The project will require USACE to obtain up to 34 individual Rights of Entry for Construction. The project requires Rights of Entry for Construction affecting a total of 0.83 acres of land (Table 12). In addition to Rights of Entry for Construction, Temporary Work Area Easements may be required. The need for such easements will be determined following the publication of this draft report and prior to construction of the project (Appendix C).

Table 12: Real estate requirements.

Cost Category	Total
Lands and Damages Costs	$441,000
Contingency (20%)	$88,000
Total Lands & Damages*	$529,000

7.3 Relocations

Property owners and occupants of eligible residential structures who willingly participate in the residential elevation program are not considered displaced persons (in accordance with 49 CFR Part 24), and therefore are not entitled to receive relocation assistance benefits. However, displaced tenants of eligible residential structures to be elevated may be eligible for temporary relocation assistance benefits in accordance with Uniform Relocation Assistance and Real Property Acquisition Policies for Federal and Federally Assisted Programs of 1970 (49 CFR 24.101[a][2]). Eligible tenants that temporarily relocate would be reimbursed for the cost of temporary alternate housing, meals and incidentals (such as laundry services), and the fees for disconnection and connection of utilities at the

temporary residence. Alternate housing could be hotels or apartments, depending upon availability in the community.

Comparable Housing Payment: This includes the sum of the amounts by which the cost of a temporary comparable dwelling exceeds the out of pocket cost of the displacement dwelling, per diem and laundry service as temporary accommodations generally do not include required facilities, and the reasonable expenses incidental to the temporary comparable dwelling. Comparable housing payment was determined by assuming a displaced person has owned and occupied his/her dwelling for at least 180 days prior to initiation of negotiations. Currently, by Federal law the sum of total of payments are not to exceed $22,500, unless under housing of last resort. Based on an average New Jersey household size of 2.68 persons from the 2010 United States Census, comparable housing payments are estimated at approximately $21,400 per displaced tenant household.

Moving Expense Payment: The 2012 Fixed Residential Moving Cost Schedule approved by the Federal Highway Administration does not apply to the proposed project as the relocations are temporary, not permanent. An estimated figure of $1,000 is used to account for the displaced person's move into and out of a temporary comparable dwelling. The total estimated relocation assistance benefits paid in support of the proposed plan is approximately $128,400.

7.4 Financial Analysis

For purposes of executing the PPA, NJDEP has a source of funding for coastal storm risk management projects and has indicated its intent to enter into a PPA at the conclusion of the study.

7.5 Preconstruction Engineering and Design

Because the study is included as a project under study as part of the P.L. 113-2 response to Hurricane Sandy, PED could be cost shared under a PPA (which typically only covers construction), if there are sufficient P.L. 113-2 funds to complete initial construction of the project. A separate Design Agreement for PED is not required unless P.L. 113-2 funds are insufficient to complete initial construction of a project.

Given the modest scale of the proposed project and that it is a nonstructural project with no beach element that will require future periodic nourishment, it is anticipated that completion of the study will be followed by PPA execution, once the Assistant Secretary to the Army (Civil Works) (ASA [CW]) provides notification to the Committee on Appropriations of the U.S. House of Representatives and the Senate.

PED costs are estimated at $1,349,000 (October 2015 price level), to be cost-shared 65 percent Federal and 35 percent non-Federal.

7.6 Design and Construction Considerations

A construction start date of May 2019 was assumed because of the lack of technical complexity and small scale of the project. The construction schedule also assumes that five homes would be worked on at once by one contractor with multiple crews working five days a week. A single home will take approximately eight weeks to accomplish with one group of five overlapping with the next group by one week (Table 13). Assuming work will not be done the months of December, January, and February because of weather and the potential for disconnected plumbing to freeze and due to the difficulty of masonry to cure, the overall duration will be 18 months with a completion date in November 2020.

7.7 Cost Sharing and Non-Federal Sponsor Responsibilities

The details behind the total first cost of implementing the TSP are shown in Table 14. The Federal share of the project's total first cost is 65 percent of the total. The Federal Government will design the project, prepare detailed plans/specifications and construct the project, exclusive of those items specifically required of non-Federal interests. The non-Federal share of the estimated total first cost of the proposed project is 35 percent of the total. The non-Federal share consists of a number of components including LERRDs (of which the Non-Federal portion is deducted from the Non-Federal cash contribution) and cost-sharing for PED and construction.

The cost of any work requested by homeowners that is outside the scope of this project will be the responsibility of the homeowner, and will be accounted for during design. For example, if a homeowner would like their home elevated an "extra" 3 feet, the cost of this work beyond the Federal action will be required from the landowner. The procedure for design modifications and payments will be agreed to prior to construction.

Table 13: Construction schedule.

Task	Duration	Start	Finish
Contract Award	1 day	March 1, 2019	March 1, 2019
Notice to Proceed	1 day	March 4, 2019	March 4, 2019
Preconstruction Submittals	60 days	March 5, 2019	May 27, 2019
Group #1: 5 Structures	Begin May 28, 2019 Typical 48 days from Preconstruction to Demobilization/ Completion	Various – dependent on weather and other factors	Construction end November 20, 2020
Group #2: 5 Structures			
Group #3: 5 Structures			
Group #4: 5 Structures			
Group #5: 5 Structures			
Group #6: 5 Structures			
Group #7: 4 Structures			

Table 14: Project cost.

Cost Category	Federal Share	Non-Federal Share	Total
Initial project cost	$7,242,000	$3,899,00	$11,141,000
Real Estate Credit	-	$529,000	$529,000
Cash Contribution	$7,241,650	$3,370,350	$10,612,000
Total	$7,241,650	$3,899,350	$11,141,000

7.8 Views of the Non-Federal Sponsor and Other Agencies

USACE coordinated with a number of Federal and state agencies throughout the planning process (Appendix E). NJDEP has indicated its support of the study and its intent to implement the proposed project. As indicated by ongoing recovery from Hurricane Sandy, many residents of Sea Bright generally support elevating their homes and businesses out of the floodplain. The TSP, as one component of reducing flood risk in Sea Bright, complements the recovery efforts currently underway.

Chapter 8: Coordination, Public Views & Comments

A public notice announcing the availability of this draft report for public review was placed on the USACE New York District website on August 4, 2016. Public and agency comments received will be considered and incorporated into plan optimization. Comments will be included in Appendix E of the final version of this report, and summarized in this chapter.

Chapter 9: 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 Jersey and other non-Federal interests.

I recommend that the selected plan for coastal storm risk management at Sea Bright, New Jersey, as fully detailed in this draft integrated feasibility report and environmental assessment, be authorized for construction as a Federal project, subject to such modifications as may be prescribed by the Chief of Engineers.

David A. Caldwell
Colonel, U.S. Army
District Engineer

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Figure 4: USACE. (2015, October 21.) *Downtown Sea Bright streetscape, Ocean Avenue looking south, 2015* [digital image]. On file.

Figure 5: USACE. (2003, December 29.) *Typical residential streetscape, Center Street looking west to the Shrewsbury River, 2003* [digital image]. On file.

Figure 6: USACE. (2003, December 29.) *Typical street flooding on Beach Street due to a spring tide event, 2003* [digital image]. On file.

Figure 8a: USACE. (2015, October 21.) *Sea Bright's seawall 2015* [digital image]. On file.

Figure 8b: USACE. (2015, October 21.) *Sea Bright's seawall 2015* [digital image]. On file.

Figure 9a: USACE. (2006, April 19.) *Typical bulkheads on the Shrewsbury River, 2006* [digital image]. On file.

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Figure 10: FEMA. (2012, November 25.) *Sea Bright, New Jersey Fire Station Clean Up* [digital image]. Retrieved from https://www.fema.gov/media-library/assets/images/67280.

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Figure 25a: Unknown. (Unknown). *Untitled* [digital image]. Retrieved from http://www.portadam.com.

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Figure 29: Kurdzuk, T. (Photographer). (2014, March 26.) *Home of Desiree Pierce on New St. in Sea Bright. The home was severely damaged during Hurricane Sandy and has been uninhabitable since. Through a partnership of Sea Bright Rising and the St. Bernard Project, residents of Sea Bright and the surrounding area, who own homes but lack the resources to rebuild, will have their homes refurbished through a residential rebuilding program. Sea Bright, NJ 3/26/14.* Retrieved from http://photos.nj.com/star-ledger/2014/03/photos_sea_bright_rising_and_s_3.html

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Shrewsbury River Basin, Sea Bright, New Jersey Coastal Storm Risk Management Feasibility Study

Draft Integrated Feasibility Report & Environmental Assessment

Appendix A: Engineering

Shrewsbury River Basin, Sea Bright, New Jersey
Coastal Storm Risk Management Feasibility Study
Draft Integrated Feasibility Report & Environmental Assessment

Appendix A: Engineering

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Chapter 1: Introduction

1.1 Description of the Study Area

The Borough of Sea Bright is located in northeastern Monmouth County, New Jersey. The Shrewsbury Project area covers about 1.5 square miles, and is bounded by the Shrewsbury River Bridge to the north, the Atlantic Ocean to the east, the Shrewsbury River to the west, and Sandpiper Lane to the south. Figure A1 below shows the location map.

Figure A1: Sea Bright project location; Shrewsbury, New Jersey.

1.2 Characteristics and Problem Identification of Study Area

The Sea Bright area is low-lying, with a shoreline that has been stabilized by a relatively low bulkhead. The majority of the area west of Ocean Avenue is at elevations that are at or below +4 feet North American Vertical Datum of 1988 (NAVD88). There is a slight rise in elevation along Ocean Avenue, with an elevation generally between +4 feet and +5 feet NAVD88. East of Ocean Avenue, the elevations rise. Landward of the beach and dune, elevations generally vary between +6 feet to +12 feet NAVD88, and generally average +10 feet NAVD88. Along the Atlantic Ocean shoreline, the beach conditions vary, but are generally at an elevation of +10 feet NAVD88. The beach is backed by an existing seawall through a portion of the study area, with heights up to elevation +16 feet NAVD88. There are portions of the area where the highest elevation is +10 feet NAVD88.

Most of the community is within the one percent floodplain of the Shrewsbury River. The mean tidal range on the riverside at Sea Bright is 3.15 feet (oceanside range is 5.08 feet). Depending on the tides, runoff and tidal flow from the river can produce significant currents through the narrows at Sea Bright. Flooding in the Shrewsbury River Basin is most severe during nor'easters and hurricanes.

In response to recurrent flooding, some Sea Bright residents and businesses have elevated their buildings. The Borough granted permits for at least 46 structures in the study area to be elevated after Hurricane Sandy in 2012. However, many structures remain at or near grade, and this project seeks to provide flood damage risk reduction from hurricanes for these homes and businesses.

1.3 Other Federal Studies

Prior USACE Reports:

- Optimization Report, "Shrewsbury River, Flood Risk Management Study; Sea Bright, New Jersey, Optimization of Preliminary Nonstructural Plans" (May 2012)
- Draft Preliminary Alternatives Analysis Report, "Shrewsbury River Basin, New Jersey, Flood Risk Management Study Preliminary Alternatives Analysis Report" (January 2011)
- ERDC/CHL Letter Report, "Shrewsbury River Flood Control Modeling" (February 2006)
- "Shrewsbury River Basin, New Jersey, Reconnaissance Study for Flood Control & Ecosystem Restoration, Section 905(b) (WRDA 86) Preliminary Analysis" (July 2000)
    - The Reconnaissance Study recommended further Federal investigation into the feasibility of reducing flood risks along the Shrewsbury River at Sea Bright, and the feasibility of aquatic habitat restoration.
    - Based upon local sponsor preferences, the Feasibility Cost Sharing Agreement that was entered into between USACE and NJDEP focused on the flood risk management aspects of the study.
- General Design Memorandum, "Atlantic Coast of New Jersey from Sandy Hook to Barnegat Inlet Beach Erosion Control Project" (January 1989)

Existing Water Resource Projects:

- Borough of Sea Bright's ocean-facing seawall, , including an extension currently under construction
- Riverfront bulkheads built and maintained by homeowners
- Riverfront bulkheads built and maintained by the Borough of Sea Bright
- Stormwater outfalls
- Atlantic Coast of New Jersey, Sandy Hook to Barnegat Inlet Beach Erosion Control Project (Section 1 – Sea Bright to Ocean Township, New Jersey)

- Shrewsbury & Navesink Rivers Federal navigation projects
- Shrewsbury & Navesink Rivers state navigation projects

Chapter 2: Existing Conditions

2.1 Flooding Sources

Flooding in the Shrewsbury River Basin is the result of complex interactions. The basin receives about 45 inches of precipitation per year. Flooding in the Shrewsbury River Basin is most severe during nor'easters, which typically occur during the late fall, winter, and early spring. These storms can deposit significant amounts of precipitation in the watershed and produce strong onshore winds. When high onshore winds are sustained over several tidal cycles, the resultant storm surge can combine with runoff to produce severe flooding along the coast and in back bay areas, including the Shrewsbury River.

Hurricanes also cause major flooding in the basin. A hurricane surge pushes its way into the Shrewsbury and Navesink Rivers, and into surrounding communities. Hurricane Sandy in 2012 flooded many municipalities in the basin. Relatively low-lying communities such as Sea Bright experience major flooding and associated damages. Communities with higher elevations generally fair better during storms.

2.2 Future Water Surface Elevations Due to Sea Level Change

NACCS Stage Frequency and Wave-Frequency

Stage-frequency curves for the start year for the period of analysis (2020) were acquired from the North Atlantic Coast Comprehensive Study (NACCS) for the project location. The stage-frequency curves for the entire region were developed through surge and wave modeling of a suite of synthetic design storms. The stage frequency data were taken without manipulation, although an adjustment was made to get the stage data into the NAVD88 datum. The stage-frequency curves are referenced to the MSL datum, so a shift to the NAVD88 datum was necessary for this particular project. The datum conversion from the Mean Sea Level (MSL) datum to the NAVD88 datum was calculated to be 0.24ft. This conversion factor was used since the Sandy Hook gauge is located relatively close to the project site. Table A1 contains the datum information for the Sandy Hook Gauge.

Table A1: Datum for the Sandy Hook gauge.

Elevations on Station Datum

Station: 8531680, Sandy Hook, NJ
Status: Accepted (Apr 17 2003)
Units: Feet
T.M.: 75 W
Epoch: 1983-2001
Datum: STND

Datum	Value	Description
MHHW	7.74	Mean Higher-High Water
MHW	7.41	Mean High Water
MTL	5.06	Mean Tide Level
MSL	5.09	Mean Sea Level
DTL	5.13	Mean Diurnal Tide Level
MLW	2.71	Mean Low Water
MLLW	2.51	Mean Lower-Low Water
NAVD88	5.33	North American Vertical Datum of 1988
STND	0.00	Station Datum
GT	5.22	Great Diurnal Range
MN	4.70	Mean Range of Tide
DHQ	0.33	Mean Diurnal High Water Inequality
DLQ	0.19	Mean Diurnal Low Water Inequality
HWI	0.29	Greenwich High Water Interval (in hours)
LWI	6.64	Greenwich Low Water Interval (in hours)
Maximum	12.60	Highest Observed Water Level
Max Date & Time	09/12/1960 13:00	Highest Observed Water Level Date and Time
Minimum	-2.20	Lowest Observed Water Level
Min Date & Time	02/02/1976 16:00	Lowest Observed Water Level Date and Time
HAT	9.11	Highest Astronomical Tide
HAT Date & Time	10/16/1993 12:48	HAT Date and Time
LAT	1.14	Lowest Astronomical Tide
LAT Date & Time	01/21/1996 19:36	LAT Date and Time

Tidal Datum Analysis Periods

01/01/1983 - 12/31/2001

STND: station datum, an arbitrary, vertical reference point at a given location

The raw output, which includes peak surge elevation and associated significant wave heights and mean wave periods, was processed to estimate statistical wave parameters. Figure A2 displays the results of

a regression analysis which determines the flood wave parameters for fifteen events ranging from 0.1 to 99 percent annual exceedance probability. The peak surge elevation for each of the synthetic storms is plotted against the associated significant wave height and peak wave period. From this trend, we can estimate the wave heights for different surge elevations. The results of this regression analysis give the required wave-frequency information at the project site. The location of the project site can be seen on the map in Figure A3. Table A2 contains the resulting stage and wave frequency curves for the project site.

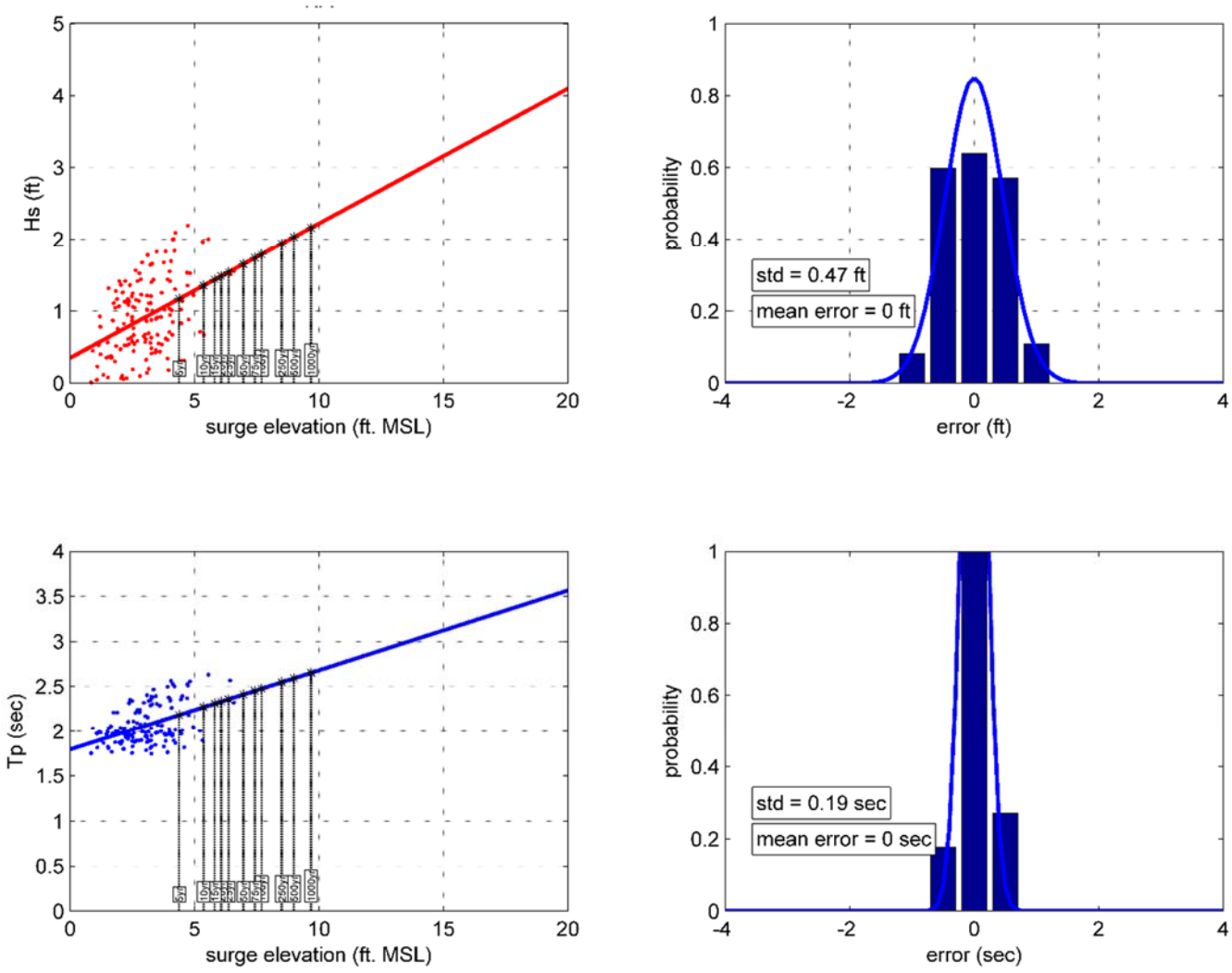


Figure A2: Regression analysis of peak surge and associated significant wave height (Hs) and peak wave period (Tp) for the ADCIRC Node 162137, at Sea Bright.

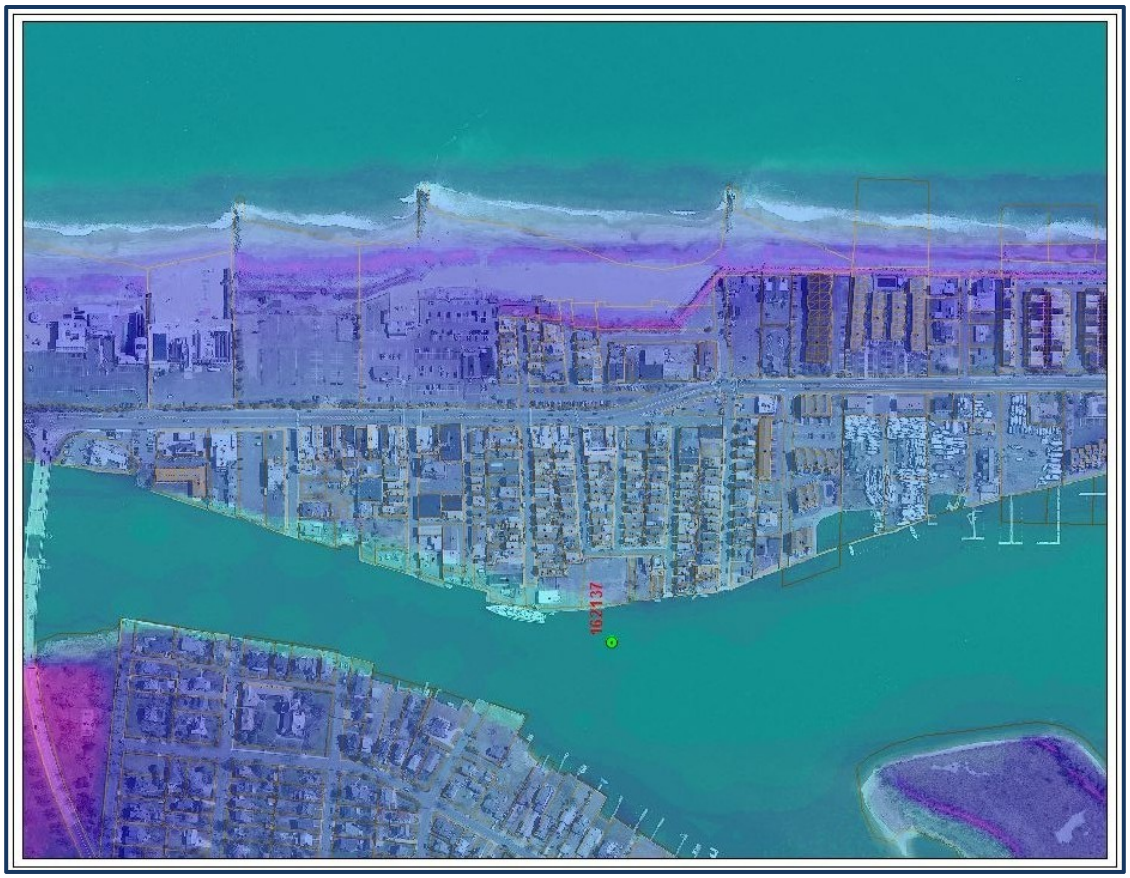


Figure A3: Location of Node 162137 in ADCIRC model in project area.

Table A2: Existing Conditions NACCS stage and wave frequency curves.

Condition	Annual Exceedance Probability, %	Mean Surge Elevation (ft NAVD88)	Significant Wave Height (feet)	Peak Wave Period (Sec)
2020 Existing	99	2.1	0.9	2.0
2020 Existing	50	2.7	1.0	2.0
2020 Existing	33	3.5	1.3	2.0
2020 Existing	25	4.2	1.5	2.1
2020 Existing	20	4.7	1.6	2.1
2020 Existing	10	5.6	1.8	2.1
2020 Existing	6.7	6.1	2.0	2.1
2020 Existing	5	6.4	2.0	2.2
2020 Existing	4	6.6	2.1	2.2
2020 Existing	2	7.2	2.3	2.2
2020 Existing	1.3	7.7	2.4	2.2
2020 Existing	1	8.0	2.5	2.2
2020 Existing	0.4	8.8	2.7	2.3
2020 Existing	0.2	9.2	2.8	2.3
2020 Existing	0.1	9.9	3.0	2.3

USACE Stage Frequency and Wave-Frequency for Future Conditions (2070)

Stage and frequency data for future conditions were not available from the NACCS. To determine future hydraulic boundary conditions, Sea Level Change (SLC) rates were determined using the methodology outlined in the USACE Engineering Circular on SLC. A website tool was used to estimate the SLC rates at the Sandy Hook gauge, which is located near the project site. The website tool can be found at: http://www.corpsclimate.us/ccaceslcurves.cfm.

The three curves displayed in Figure A4 give rates for the low, intermediate and high estimates of SLC. Table A3 contains the tabular SLC data for the Sandy Hook gauge. Assuming construction is complete in 2020 and the period of analysis ends in 2070, the incremental SLC value is +0.7 feet for the low estimate, +1.1 feet for the intermediate estimate, and +2.5 feet for the high estimate. To determine future condition stage-frequency data, the incremental SLC rates are added directly to the base condition curve. For example, if the 25-year 2020 stage is 6.6 feet NAVD88, the future 2070 low-SLC 25-year stage would become 7.3, which is a 0.7-foot increase. Significant wave heights and peak wave periods for future conditions were developed by plugging in the future condition surge values into the same trendlines developed for 2020 conditions. The higher future condition surge elevations produce large waves. **Tables A4** through **A6** contain the stage-frequency and wave-frequency data for the project site for the 2070 condition, for low, intermediate, and high SLC rates.

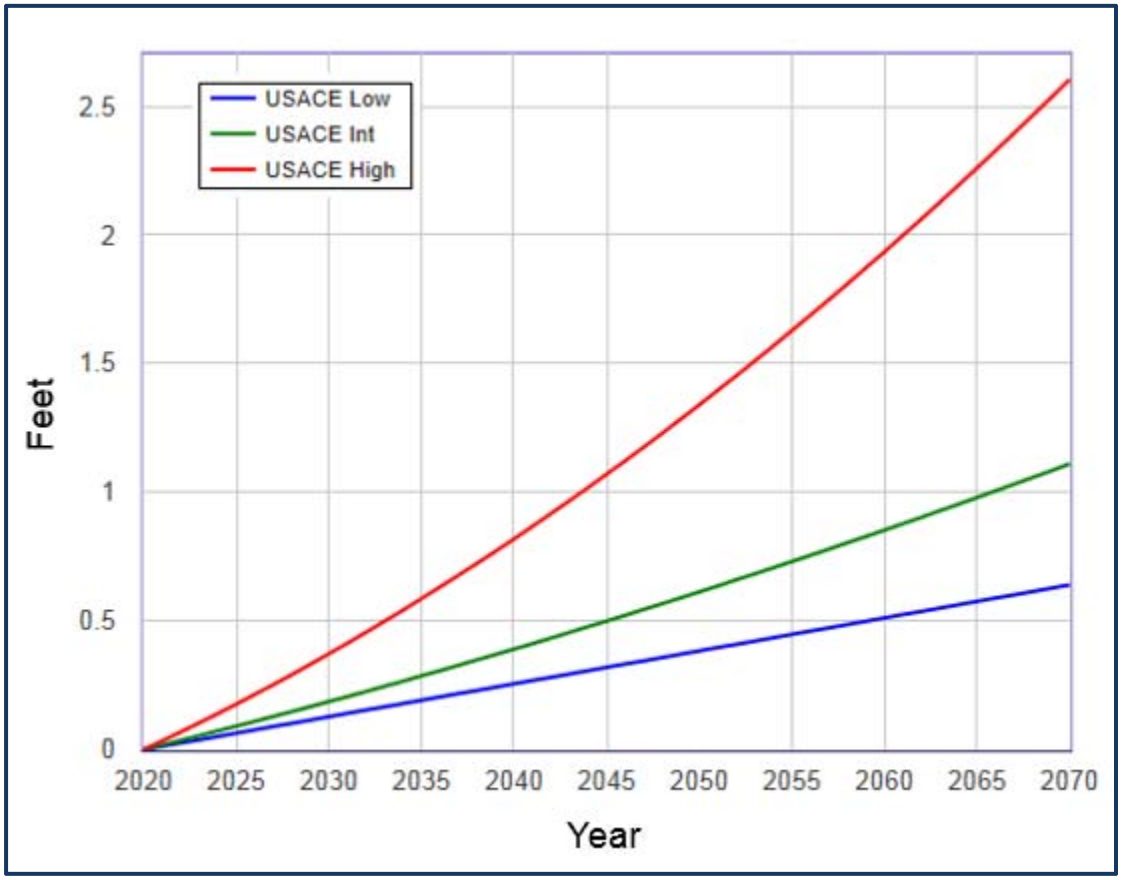


Figure A4: Low, intermediate, and high SLC rates at the Sandy Hook gauge.

Table A3: Low, intermediate, and high SLC data for the Sandy Hook gauge.

Year	USACE Low (feet change since 2020)	USACE Intermediate (feet change since 2020)	USACE High (feet change since 2020)
2020	0.00	0.00	0.00
2025	0.06	0.09	0.18
2030	0.13	0.19	0.37
2035	0.19	0.29	0.59
2040	0.26	0.39	0.82
2045	0.32	0.50	1.07
2050	0.38	0.61	1.34
2055	0.45	0.73	1.63
2060	0.51	0.85	1.94
2065	0.58	0.98	2.26
2070	0.64	1.11	2.61

Table A4: Summary of future condition surge & wave conditions for Low SLC.

Condition	Annual Exceedance Probability, %	Mean Surge Elevation (ft NAVD88)	Significant Wave Height (feet)	Peak Wave Period (Sec)
2070 Low	99	2.8	1.1	2.0
2070 Low	50	3.3	1.2	2.0
2070 Low	33	4.1	1.4	2.1
2070 Low	25	4.9	1.6	2.1
2070 Low	20	5.3	1.8	2.1
2070 Low	10	6.3	2.0	2.2
2070 Low	6.7	6.7	2.1	2.2
2070 Low	5	7.0	2.2	2.2
2070 Low	4	7.3	2.3	2.2
2070 Low	2	7.9	2.5	2.2
2070 Low	1.3	8.3	2.6	2.3
2070 Low	1	8.6	2.7	2.3
2070 Low	0.4	9.4	2.9	2.3
2070 Low	0.2	9.9	3.0	2.3
2070 Low	0.1	10.6	3.2	2.4

Table A5: Summary of future condition surge & wave conditions for intermediate SLC.

Condition	Annual Exceedance Probability, %	Mean Surge Elevation (ft NAVD88)	Significant Wave Height (feet)	Peak Wave Period (Sec)
2070 Intermediate	99	3.2	1.2	2.0
2070 Intermediate	50	3.8	1.3	2.0
2070 Intermediate	33	4.6	1.6	2.1
2070 Intermediate	25	5.3	1.8	2.1
2070 Intermediate	20	5.8	1.9	2.1
2070 Intermediate	10	6.7	2.1	2.2
2070 Intermediate	6.7	7.2	2.3	2.2
2070 Intermediate	5	7.5	2.3	2.2
2070 Intermediate	4	7.7	2.4	2.2
2070 Intermediate	2	9.3	2.6	2.3
2070 Intermediate	1.3	8.8	2.7	2.3
2070 Intermediate	1	9.1	2.8	2.3
2070 Intermediate	0.4	9.9	3.0	2.3
2070 Intermediate	0.2	10.3	3.1	2.3
2070 Intermediate	0.1	11.0	3.3	2.4

Table A6: Summary of future condition surge & wave conditions for high SLC.

Condition	Annual Exceedance Probability, %	Mean Surge Elevation (ft NAVD88)	Significant Wave Height (feet)	Peak Wave Period (Sec)
2070 High	99	4.6	1.6	2.1
2070 High	50	5.2	1.7	2.1
2070 High	33	6.0	1.9	2.1
2070 High	25	6.7	2.1	2.2
2070 High	20	7.2	2.3	2.2
2070 High	10	8.1	2.5	2.2
2070 High	6.7	8.6	2.6	2.3
2070 High	5	8.9	2.7	2.3
2070 High	4	9.1	2.8	2.3
2070 High	2	9.7	3.0	2.3
2070 High	1.3	10.2	3.1	2.3
2070 High	1	10.5	3.2	2.3
2070 High	0.4	11.3	3.4	2.4
2070 High	0.2	11.7	3.5	2.4
2070 High	0.1	12.4	3.7	2.4

2.3 Historical Storm Events

Sea Bright has a history of being impacted by both Hurricanes and Extratropical Storms. This section provides a general description of each storm type and how they affect the project area, followed by a list of specific events and their impacts.

Hurricanes. Hurricanes that develop in tropical latitudes are the most destructive storms affecting the Atlantic Coast. Hurricanes approaching the project area often are reduced in intensity from overland travel and a cooler environment. Even with reduced storm intensity, property damage and loss of life has been caused by hurricanes along the New Jersey coast.

Only two hurricanes have directly hit the New Jersey coast between 1899 and 1977. Both hurricanes hit the coast in September, the first in 1903 and the second the following year in 1904. Although no recent hurricanes have made landfall over the study area, they have physically affected this area by causing high winds, waves, and tides. The closer the path of the storm to the coast, the greater the resulting damages.

Prior to 1933, nine recorded hurricanes impacted the project area: August 1635; August 1788; September 1815; September 1821; September 1869; October 1878; August 1893; September 1930. Although this list is undoubtedly incomplete, the above dates, along with the more recent storms to be described below, serve as an indication of frequency.

Extratropical Storms. Extratropical storms, especially those from the northeast, are second in their destructive force only to hurricanes. If these storms occur during periods of higher astronomical tidal events, they can cause extensive damage to shorelines and coastal structures.

Significant Storms to Affect Sea Bright

The following is a list of some of the most significant coastal storms to affect Sea Bright:

Hurricane of September 1944. The storm center passed 30 miles east of the study area. The storm passed the New Jersey coast at about the time of high tide. The highest tide recorded at Sandy Hook was 7.7 feet above sea level datum. Gusts of up to 99 mph were recorded at New York City, while at Sandy Hook a sustained wind velocity of 68 mph from the northwest was recorded. Damage was severe throughout the study area. Several waves were reported to have reached a height of 15 feet over the top of the seawall in Sea Bright. A portion of the seawall was damaged and a section of railway which traversed the area at that time was destroyed. Boardwalks along almost every municipality in the study area were destroyed or badly damaged.

Storm of November 1950. The storm formed over Eastern North Carolina and moved northerly towards the study area. Wind gust velocities of 72 mph were recorded at New York City, and the average attained hourly wind velocity was 47 mph. Tides at Sandy Hook reached a height of 7.2 feet above sea level datum. The peak tide for this storm was only 0.5 feet below the greatest of previous record (September, 1944). The strong easterly winds resulted in high waves along the study area. Waves of up to 20 feet in height were observed to have swept across the barrier island at Monmouth Beach. Extensive damage to beaches, shore protection structures and homes in the study area resulted from the high tides and waves. Most of Sea Bright and a portion of Monmouth Beach were flooded to depths ranging up to 4 feet.

Storm of November 1953. This storm originated in the Gulf of Mexico and traveled easterly to a position off the Georgia coast where it assumed a more northerly course. The storm intensified when a

high pressure system that was centered over the upper Great Lakes region brought cold air into the southeastern portion of the country. The storm center passed within 60 miles of the New Jersey coast, moving inland in the vicinity of New York City. The maximum sustained wind velocity was 55 mph with gusts up to 74 mph. Wave heights observed by US Coast Guard personnel at Sandy Hook were estimated at 30 feet.

The passage of the storm at the time of the predicted high tide resulted in high tidal levels within the study area. The tide reached a record 7.9 feet above sea level datum at Sandy Hook. The extreme tidal conditions together with the severe wave action, resulted in extensive damage to beaches, as well as public and private properties adjacent to the ocean and to shore protection structures. This storm was the storm of record for the authorizing project.

Storm of March 1962. The storm of March 6-8, 1962 resulted from the joining of two storms, one moving easterly from the Midwest, the other moving northerly up the coast. These storms combined off the mid-Atlantic Coast and remained nearly stationary. For a period of three days, strong onshore winds over a long fetch of ocean influenced the entire Atlantic Coast. The maximum wind of one-minute duration recorded at Long Beach, New Jersey was 68 mph from the northeast. The storm occurred at the time of astronomic high tides. At Sandy Hook five exceptionally high tides occurred above sea level datum that were 7.1 feet and 7.6 feet on the 6th, 7.3 feet and 6.6 feet on the 7th, and 5.7 feet on the 8th of March.

This storm has been described as one of the most destructive extratropical cyclones ever to hit the United States coastline. At Sea Bright, inundation of residential sections required evacuation of the area. Heavy seas and high tides resulted in beach and dune erosion and inflicted structural damage to buildings, the seawall and many groins. At Monmouth Beach the seawall was damaged and the highway protected by the seawall was completely blocked by sand and flooding. The Monmouth Beach pavilion and other buildings were completely destroyed. At Long Branch, the beach and bluffs were eroded, and the seawall and groins were damaged. The boardwalk was extensively damaged with complete destruction at the north and south ends. Throughout the entire study area major damage resulted to the beaches and adjacent structures.

Hurricane Agnes, June 1972. Hurricane Agnes developed off the Yucatan Coast, traveled north across the Gulf of Mexico making landfall near Panama City, Florida. Once ashore, Agnes weakened to a tropical depression as it moved northward across the southeast. The storm rejuvenated as it moved back out to sea off the Virginia Capes then proceeded up the east coast and inland again across western Long Island. The storm center passed within 40 miles of the study area. Wind gusts up to 46 mph were recorded at Sandy Hook. Seas recorded at the Ambrose light tower were less than ten feet. The greatest damage associated with this weather system resulted from rain, which caused flooding. Storm damage within the study area was minimal.

Hurricane Belle, August 1976. This Hurricane moved north at 25 to 35 mph to within 40 miles of the study area. Highest winds near the center were 100 mph. The highest winds recorded at Manasquan Inlet Coast Guard station were 60 mph from the north. Beach erosion was relatively minor.

Extratropical Storm of March 28-29, 1984. This northeaster's near hurricane force winds raised tides 10 feet above normal and deposited nearly three inches of rain in Monmouth County. The storm damaged parts of the seawalls, destroyed two stop logs and caused up to 3 feet of flooding, predominantly from surges in Raritan Bay which flanked the seawalls through the Shrewsbury River. The storm caused more than $200 million in damage to both public and private property throughout the County.

Hurricane Gloria, September 27, 1985. Light damage was reported along most of the New Jersey Coast, due to the offshore path and arrival of this hurricane at low tide. The hurricane passed by the County at more than 40 miles per hour, with winds up to 70 mph and a storm surge of 5-6 feet. Sea Bright and Monmouth Beach experienced up to three feet of flooding due to high tides following rains. The boardwalk at Long Branch was damaged slightly, and a small corner of the amusement pier collapsed. Overall damage was far less than expected and considerably less than damage sustained from the extratropical storm of March, 1984.

The Perfect Storm, October – November, 1991. The nor'easter was absorbed Hurricane Grace and ultimately evolved back into a small unnamed hurricane late in its life cycle. The storm lashed the east coast of the United States with high waves and coastal flooding before turning to the southwest and weakening. In Sea Bright, New Jersey, waves washed over a seawall, forcing 200 people to evacuate. Further inland, the Hudson, Passaic, and Hackensack rivers experienced tidal flooding.

Hurricane Isabel, September 8, 2003. Hurricane Isabel produced slightly above normal tides and rough surf along the Jersey shore, killing one surfer off of Wildwood Crest. The combination of gusty winds and the heavy surf produced moderate beach erosion along much of the coastline, primarily to beaches facing southeastward. Most coastal areas of Monmouth County reported eroded beaches by up to 4 feet (1.2 m), with Union Beach losing about 5,000 sq. feet (465 sq. m) of sand.

Hurricane Irene, August 28, 2011. Hurricane Irene was a long-lived Cape Verde-type Atlantic hurricane during the 2011 Atlantic hurricane season. The storm formed near Cape Verde on August 4 and crossed the Atlantic, turning northward around Bermuda before being absorbed by an extratropical while situated southeast of Newfoundland. The storm caused beach erosion and flooding in Monmouth County, notably in Sea Bright.

Hurricane Sandy, October 30, 2012. Hurricane Sandy was the deadliest and most destructive hurricane of the 2012 Atlantic hurricane season, and the second-costliest hurricane in United States history. While it was a Category 2 storm off the coast of the Northeastern United States, the storm became the largest Atlantic hurricane on record (as measured by diameter, with winds spanning 1,100 miles (1,800 km)). Hurricane Sandy devastated Sea Bright, with storm surge inundating the Borough from both the Shrewsbury River and Atlantic Ocean. As of 2015, the Borough continues its recovery.

2.4 Regional Geology

The study area lies within the Coastal Plain Province, which forms the eastern margin of the State of New Jersey. Its surface has a gentle slope to the southeast, generally not exceeding 5 or 6 ft to the mile. The surface of the plain extends eastward with the same gentle slope beneath the Atlantic Ocean for about 100 miles to the end of the continental shelf, where the depth is approximately 100 fathoms. At this point, the ocean bottom drops abruptly to greater depths. The moderate elevation of the Coastal Plain, which rises to 400 ft in some areas, but is generally lower than 200 ft, has prevented the streams from cutting valleys of any considerable depth. Throughout the greater portion of the plain, the relief is insignificant and the streams flow in open valleys that lie at only slightly lower levels than the broad, flat divides.

The study area, which is contained in Monmouth County, lies in the area that is above the sea level. This sub aerial portion is generally a dissected plain that rises gradually from sea level at the coast to nearly 400 ft in central New Jersey. It then declines to a broad shallow depression less than 100 ft above sea level extending to the Delaware River at Trenton. Some conspicuous features of the sub aerial portion of the plain are the marshes, which border the stream courses and the submerged or drowned valleys, which were formed by erosion when the land was at a higher elevation than at

present. During the geologic history, the sea level fluctuated to a large extent. The rise and fall of the water resulted in wide migration of the shoreline across the Coastal Plain. The sub aerial region was especially influenced by these fluctuations during the Cretaceous Period.

The Cretaceous Period resulted in many successive sedimentary formations, each of which was subject to erosion, deposition, submersion, and emergence. Realizing that weathering and its associated agents determined all of New Jersey's geomorphology; this geological period had great influence on the study area. The resulting Cretaceous formations are composed of unconsolidated sand, clay, and greensand marl (glauconitic), which dip 25 ft to 60 ft per mile to the southeast and having a thickness in places of 500 ft to 1,000 ft. The sediments rest on a sloping formation of deep-seated hard rocks. The present surface features were most recently determined during the glacial Pleistocene Period and by subsequent erosion.

The subsurface geology of the Coastal Plain has been determined by study and correlation of well logs and by interpretation of seismic profiles. The Coastal Plain consists of Cretaceous to Recent sediments lapping on the basement material, which is composed of crystalline rock with locally infolded or infaulted Triassic sediments. The basement surface slopes at about 75 ft per mile, reaching a depth of more than 6,000 ft near the coast. The soils overlying the bedrock are of considerable thickness exceeding several hundred ft., and are of the Upper Cretaceous and Tertiary Period. The oldest and therefore the deepest formation, which rests unconformably on the bedrock is the Raritan (Magothy) formation. It consists of dark lignitic sand and clay containing some glauconite at the top overlying light colored sands and clays.

The Merchantville and Woodbury clay formations overlay the Raritan formation discomformably. Both formations are black, glauconitic, micaceous clay, the former being slightly more plastic and firmer than the latter. To the southeast of Waycake Creek (the western boundary of the Keansburg project area), the upper formation, the Englishtown sand, outcrops at the surface along Creek Road, and extends southeastward to Highlands under the recent swamp deposits at Pews Creek (the eastern boundary of the Keansburg project area). It reaches its maximum thickness at the Highlands where some of the beds have been cemented by iron oxide. This material overlays the Woodbury clay formation and it represents a period of emergence. The Englishtown sand consists of a white and yellow quartz sand, slightly micaceous.

With the final uplift of the land and withdrawal of the Cretaceous sea, streams established themselves across the emerging sea bottom. This ushered in the Cenozoic Era. Periods of submergence and emergence were the dominating geological force, but with the exception of a very shallow deposit of sand referred to as the Cape May formation, no other soil material from this era is found in the project area. The Cape May formation is an interglacial formation deposited by streams and overland deposition at the close of the last glacial period. The sea again invaded the area and created valleys, which have been filling with recent swamp material and sediment.

Considering the age of the Cretaceous materials, estimated by geologists to be 120 to 150 million years old and all the intervals of submergence and deposition, and emergence and erosion, one would expect these soils to be very firm on the basis that they have been subjected to relatively high prestresses. However, the clay materials were found to be nominally consolidated and very soft.

Chapter 3: Development of Alternatives

Structural and nonstructural alternatives were considered for the Shrewsbury River study. Structural measures are those which alter the nature or extent of a hazard, such as flooding. For example, a floodwall is a structure measure, as it alters (prevents the inundation from) the hazard (flooding) in a community. Nonstructural measures are defined as those that reduce human exposure or vulnerability to a flood hazard without altering the nature or extent of that hazard. For example, elevating a structure is a nonstructural measure because it doesn't alter (prevent the inundation from) the hazard (flooding) in a community, but rather removes the structure away from the hazard. Though elevating or modifying a structure involves construction activities, they are inherently nonstructural measure because they reduce human exposure or vulnerability without altering the nature or extent of flooding.

Descriptions and layouts of the alternatives can be found in the main report. The initial development of the alternatives utilized USACE stage-frequency data from 1998. Stage-frequency curves from the NACCS have been adopted as the stage-frequency data for the study.

3.1 Structural Alternatives

The following structural alternatives were considered for flood damage risk reduction:

- Alternative F1 – Floodwall built to 2 percent flood event water surface elevation (WSE)
- Alternative F2 – Floodwall built to 1 percent flood event WSE
- Alternative F3 – Floodwall built to 0.5 percent flood event WSE
- Alternative F4 – Floodwall built to 0.3 percent flood event WSE
- Surge Barrier Alternative – Off-shore breakwater across Sandy Hook Bay at Shrewsbury River

The alternatives were compared to the planning objectives to determine which features should be considered for more detailed analysis. **Table A7** shows the major advantages and disadvantages of each of the structural alternatives.

Table A7: Advantages and disadvantages of structural plans.

Alternative	Description	Major Advantages	Major Disadvantages
Alternative F1	+7.0-foot NAVD88 floodwall	Decreases flood risk Consistent with current waterfront use	Provides limited risk reduction High residual risk
Alternative F2	+8.5-foot NAVD88 floodwall	Decreases flood risk Consistent with current waterfront use	Potential for viewshed impacts Lack of sponsor support Provides limited risk reduction High residual risk
Alternative F3	+9.5-foot NAVD88 floodwall	Decreases flood risk Consistent with current waterfront use	Potential for viewshed impacts Lack of sponsor support Provides limited risk reduction High residual risk
Alternative F4	+11.5-foot NAVD88 floodwall	Decreases flood risk Consistent with current waterfront use	Potential for viewshed impacts Lack of sponsor support
Surge Barrier	Surge barrier at the Shrewsbury River at Highlands, NJ	Provides regional risk management solution Does not impact viewshed	Potential negative environmental impacts

The Surge Barrier Alternative was analyzed as part of a study for Highlands, New Jersey, and it was found that the cost of such a project would not be justified by the benefits gained throughout the Shrewsbury River basin. In addition, all floodwall alternatives were found to be not cost effective. Therefore, all of these structural alternatives were dropped from further consideration.

3.2 Non-Structural Alternatives

Different nonstructural scenarios were developed, each affecting an incrementally greater number of structures. The scenarios were formulated by grouping structures with different main floor elevations (MFE). The groupings that were used were structures with a MFE less than or equal to the 10-year, 25-year, and 1 percent still water surface elevations. The nonstructural alternatives are:

- Nonstructural Alternative 1: structures with a MFE less than or equal to the 10 percent flood water surface elevation (+4.5 feet NAVD88)
- Nonstructural Alternative 2: structures with a MFE less than or equal to the 4 percent flood water surface elevation (+6.0 feet NAVD88)
- Nonstructural Alternative 3: structures with a MFE less than or equal to the 1 percent flood water surface elevation (+8.2 feet NAVD88)

Table A8 shows the major advantages and disadvantages of each of the nonstructural alternatives.

Table A8: Advantages and disadvantages of nonstructural plans.

Alternative	Description	Major Advantages	Major Disadvantages
Alternative NS 1	Elevations only for structures with MFE below 10 percent flood WSE, 4.5 ft NAVD88	Decreases flood risk Consistent with Sea Bright rebuilding strategy No impact to viewshed No O&M requirements Public support of plan	Temporary inconvenience to residents and businesses No risk management provided for evacuation route Limited to 10 percent floodplain
Alternative NS 2	Elevations only for structures with MFE below 4 percent flood WSE, 6.0 ft NAVD88	Decreases flood risk Consistent with Sea Bright rebuilding strategy No impact to viewshed No O&M requirements Public support of plan	Temporary inconvenience to residents and businesses No risk management provided for evacuation route Limited to 4 percent floodplain
Alternative NS 3	Elevations only for, 1 percent flood WSE, 8.2 ft NAVD88	Decreases flood risk Consistent with Sea Bright rebuilding strategy No impact to viewshed No O&M requirements Public support of plan	Temporary inconvenience to residents and businesses No risk management provided for evacuation route Limited to 1 percent floodplain

Chapter 4: Evaluation of Alternatives

After developing and verifying the inventory of structures in the Sea Bright project area, a nonstructural measures engineering tool developed by the USACE National Nonstructural Floodproofing Committee was used to determine the appropriate treatment for each structure. A flow chart was developed for the Fire Island to Montauk Point, NY study, and it was also used for the Leonardo, New Jersey Feasibility Study. The flow charts follow this Appendix in Figures A5 through A8. The tool identified elevations and ringwalls as the most appropriate treatments in the study area, given the amount of inundation and structure types involved. To identify the most efficient and cost effective nonstructural plan, structure elevations and ringwalls were considered separately. For the initial array, nonstructural plans that included only structure elevations were used for comparison and screening of the initial array of alternatives. Ringwalls that were economically justified on their own, or incrementally justified, were added to the plan later in the planning process. Of the alternatives, Alternative NS 2 is the only one with positive net benefits. Using the main floor elevation as the basis for inclusion into each alternative, initially three alternatives were developed, based on the main floor elevations at or below the 10 percent, 4 percent, and 1 percent flood water surface elevations

The plan includes the elevation of 34 structures with a MFE at or below the 4 percent WSEL of +6.0 feet NAVD88. Ringwalls were individually considered in a last-added analysis to reduce residual risk. Many different ringwall designs were considered. Considering current land uses, deployable ringwalls are the most appropriate for the study area. Permanent ringwalls would impede the operation of businesses and potentially impact Ocean Avenue, a major evacuation route. The ringwalls were designed to a height of +11.2 feet NAVD88, which is equal to the height of the elevated structures (the 1 percent flood level of +8.2 plus 3 feet). Detailed ringwall design will be developed prior to construction, in coordination with the NJDEP and Borough of Sea Bright. Costs and benefits were calculated for individual ringwalls identified in Table 6, and were compared. Of the ringwalls in Alternative NS 2, one ringwall had positive annual net benefits of $42,000. Ringwall #10 is located around two attached structures. The ringwall was added to Alternative NS 2.

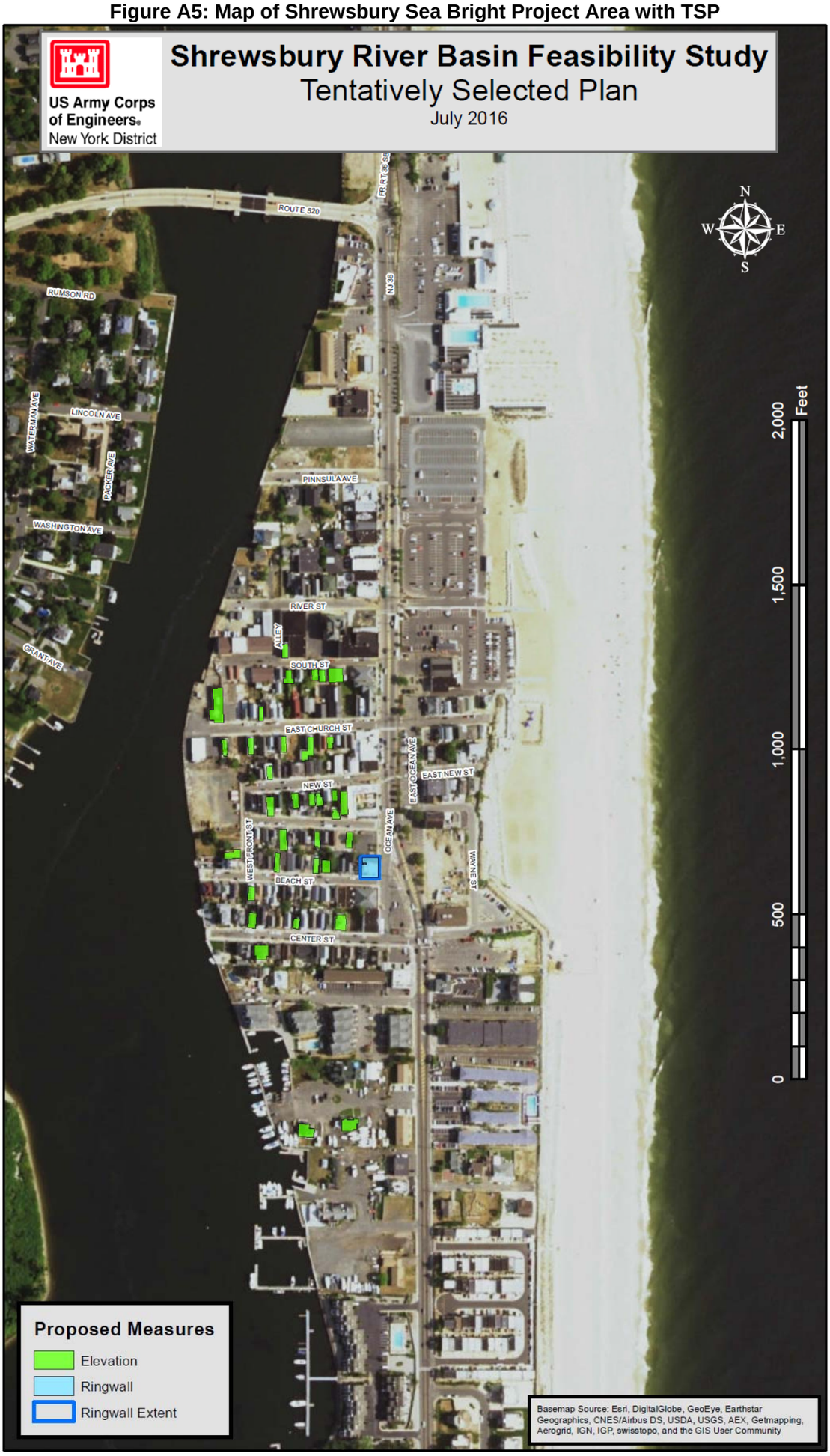
Chapter 5: Tentatively Selected Plan

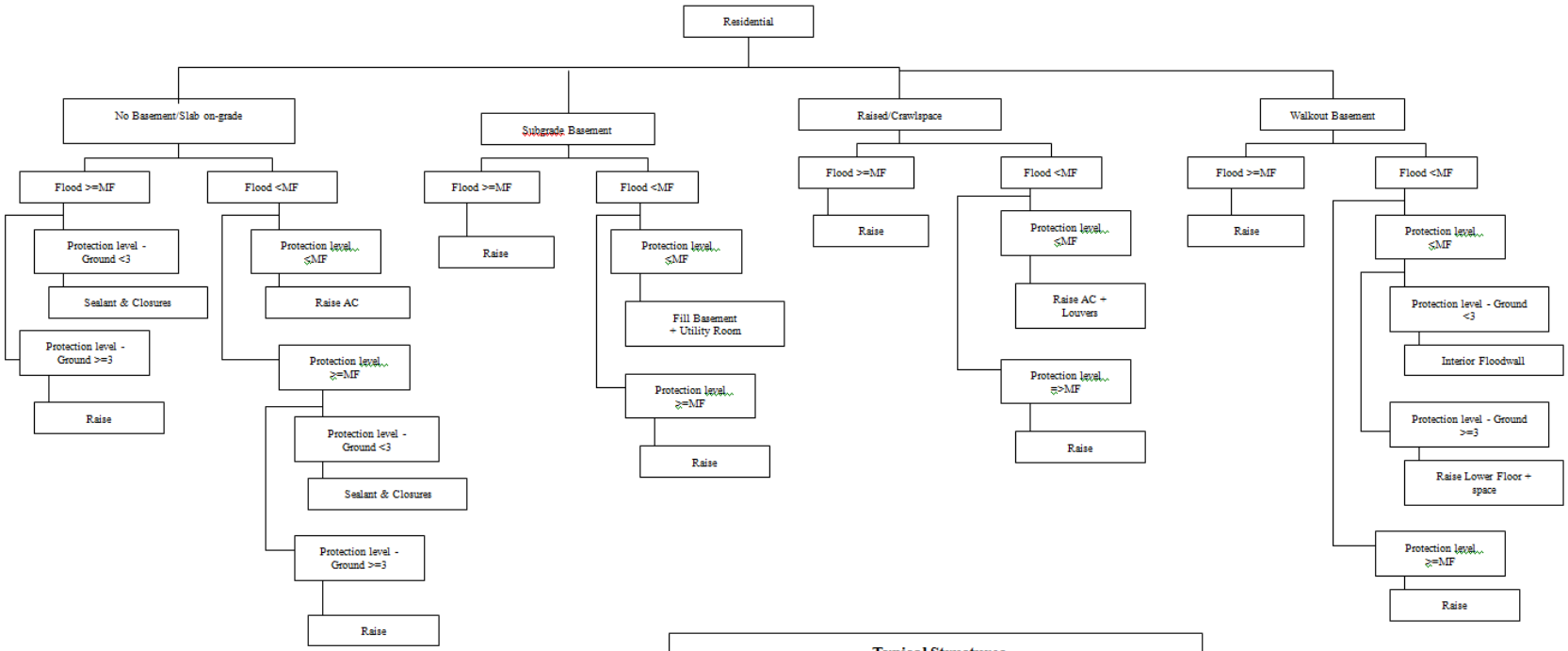
Alternative NS 2 (elevation of structures with a main floor elevation at or below the 4 percent flood water surface elevation of +6.0 feet NAVD88), including the one ringwall with positive annual net benefits has been identified as the TSP. Table A9 shows the selected nonstructural treatment for each structure that is included in the plan. Figure A5 is a map of the project area indicating the location of all proposed structure raises, as well as the location of the structure with the deployable ringwall solution. All mapping products utilize the NAD83 Horizontal Datum and were referenced to the New Jersey State Plane projection.

Table A9: Summary of nonstructural treatments for the tentatively selected plan.

Structure ID#	Structure Type	Main Floor Elevation (ft NAVD 88)	Recommended Plan	Area (sqft)
28.03	Residential	5.77	Elevate	750
30	Residential	5.62	Elevate	660
31	Residential	5.78	Elevate	740
32	Residential	5.50	Elevate	1840
41	Residential	5.63	Elevate	590
44	Residential	5.74	Elevate	3630
46.01	Residential	5.59	Elevate	700
47	Residential	5.85	Elevate	840
51	Residential	4.86	Elevate	800
53	Residential	4.91	Elevate	1170
56	Residential	5.65	Elevate	600
66	Residential	5.62	Elevate	650
70	Residential	4.97	Elevate	1250
72	Residential	5.71	Elevate	930
74	Residential	4.93	Elevate	660
75	Residential	5.34	Elevate	710
77	Residential	5.94	Elevate	550
78	Residential	4.45	Elevate	1560
80	Residential	5.66	Elevate	500
81	Residential	5.32	Elevate	860
84	Residential	5.58	Elevate	740
86	Residential	5.17	Elevate	1350
90	Residential	4.80	Elevate	1110
93	Residential	5.17	Elevate	1490
97	Residential	5.12	Elevate	760
98	Residential	5.28	Elevate	980
101.01	Nonresidential	4.26	Ringwall	1420
101.02	Nonresidential	4.26	Ringwall	1160
106	Residential	5.27	Elevate	810
117	Residential	4.92	Elevate	1510
122	Residential	4.53	Elevate	590
127	Residential	5.11	Elevate	1020
132	Residential	5.13	Elevate	1720
156	Residential	5.75	Elevate	1670
157	Residential	5.48	Elevate	1630

Figure A5: Map of Shrewsbury Sea Bright Project Area with TSP





Assumptions for TYPICAL STRUCTURES

1. (a) Raised(Crawl Space): No utilities are located in the crawl space.
1. (b) Raised(Crawl Space): Wet Flood Proofing includes exterior utilities only.
2. (a) Slab: Wet Flood Proofing is possible when flood depth is below the MF (shallow flooding). Typically exterior utilities only (e.g. AC).
3. Basement: All basements are unfinished.
4. (a) Bi-level/Raised Ranch: The lower floor is a minimum of 4-ft of masonry wall
4. (b) Bi-level/Raised Ranch The lower level is slab on grade; walkout
5. (a) Split-Level: The lower level (LL) is slab on grade; the main floor is raised over a crawl space
5. (b) The Main Floor and the upper level can be separated from the lower level in order to raise the structure.

Typical Structures
(Structures are defined by foundation type)

1. RAISED (crawl space)
2. SLAB-ON-GRADE
3. BASEMENT (Subgrade (Traditional) and Walkout)
4. BI-LEVEL/RAISED Ranch
5. SPLIT-LEVEL

Criteria for flood proofing TYPICAL STRUCTURES

1. Loss of living space due to flood proofing measures will be minimized or replaced.
2. No dry flood proofing for depths>2 feet

Larger Residential
Multi-Family = 12
Garden Apts = 13
High Rise Apts = 14
Townhouses = 15

Figure A6: Residential flowchart.

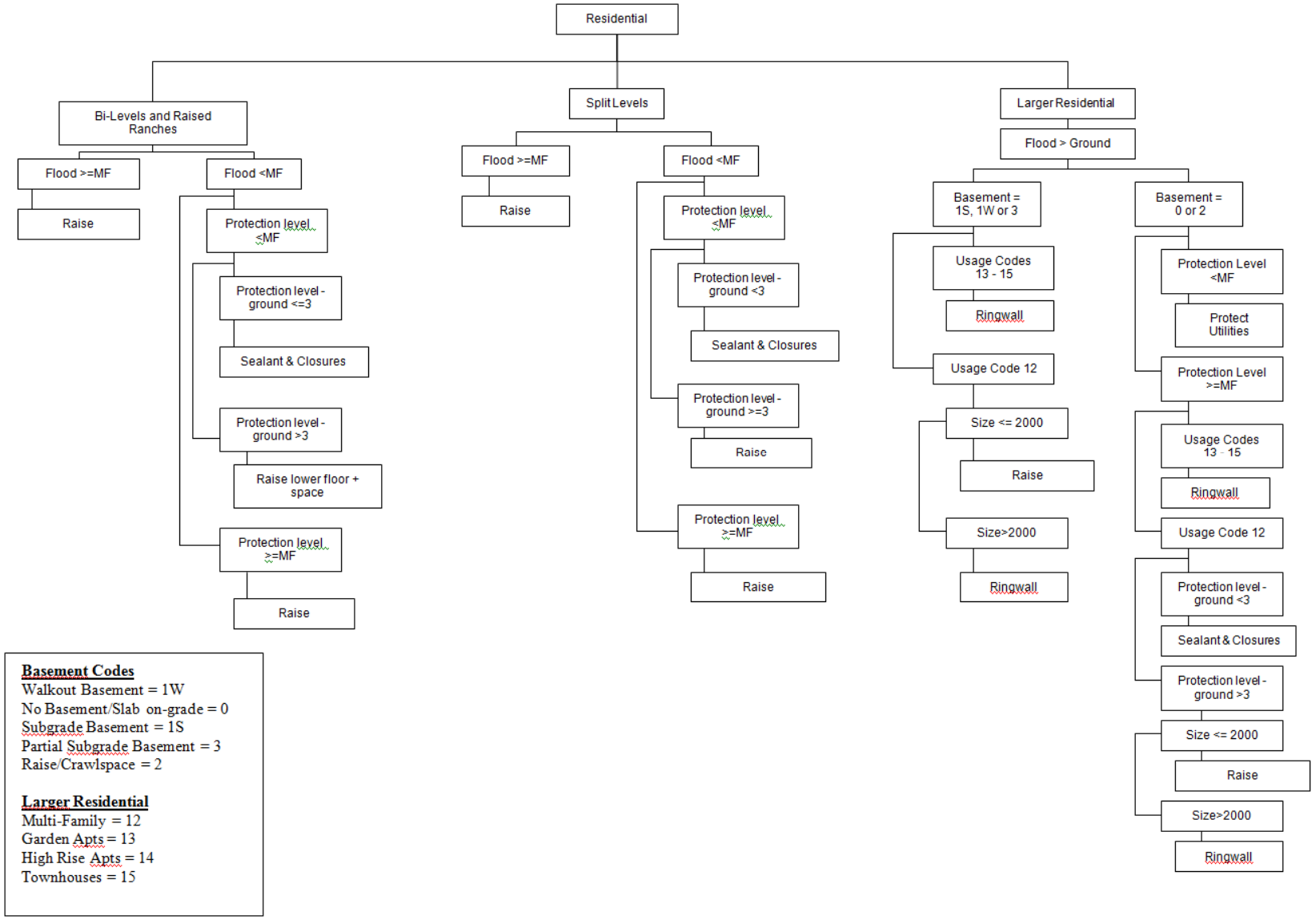


Figure A6: Residential Flowchart (continued).

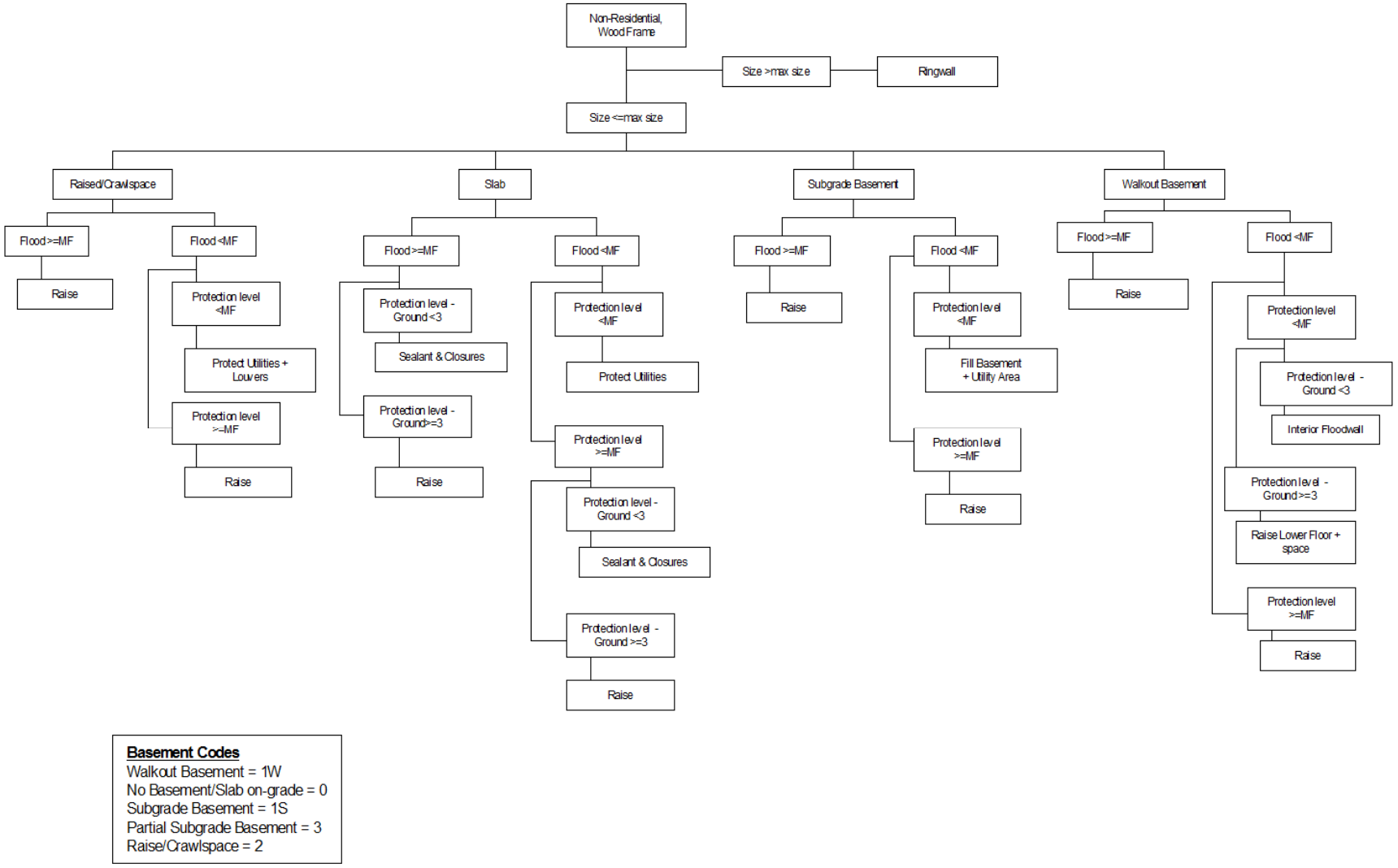


Figure A7: Non-Residential flowchart.

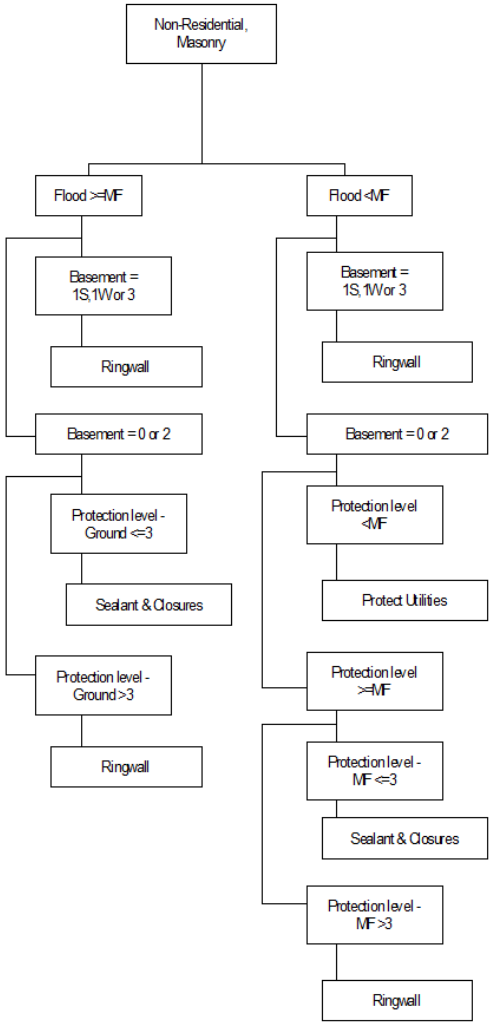


Figure A8: Non-Residential flowchart (continued).

Chapter 6 Proposed Nonstructural Treatments

The following sketches indicate generic elevation plans, and are intended for conceptual purposes only. Actual designs will be based on specific conditions at each site.

Deployable ringwall concepts and designs will be chosen based on appropriateness and feasibility. Pictures of conceptual designs can be found in Chapter 3 of the main report. Coordination with the non-Federal sponsor and Borough of Sea Bright will occur during feasibility-level design.

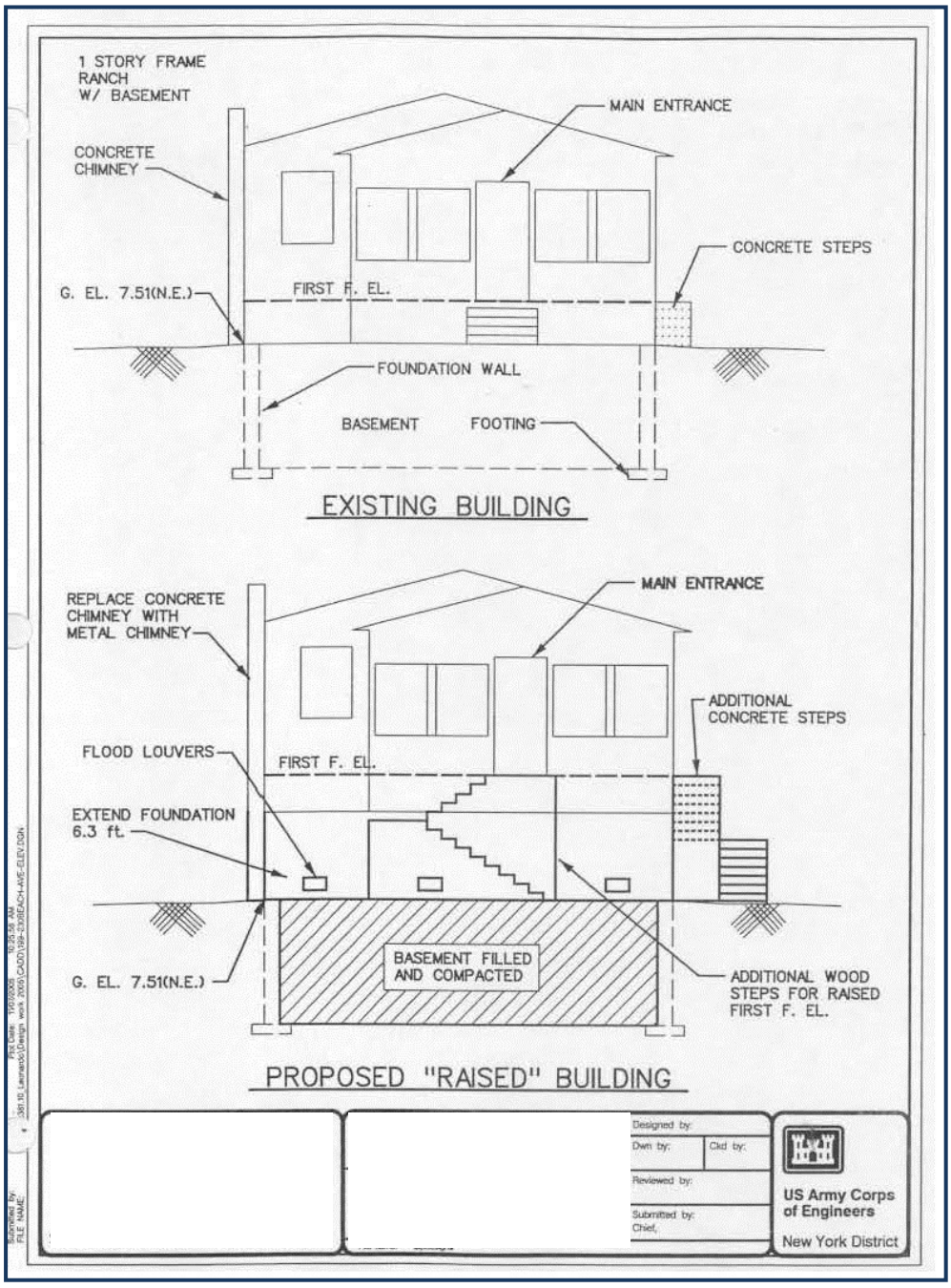


Figure A8: Type A proposed nonstructural treatment.

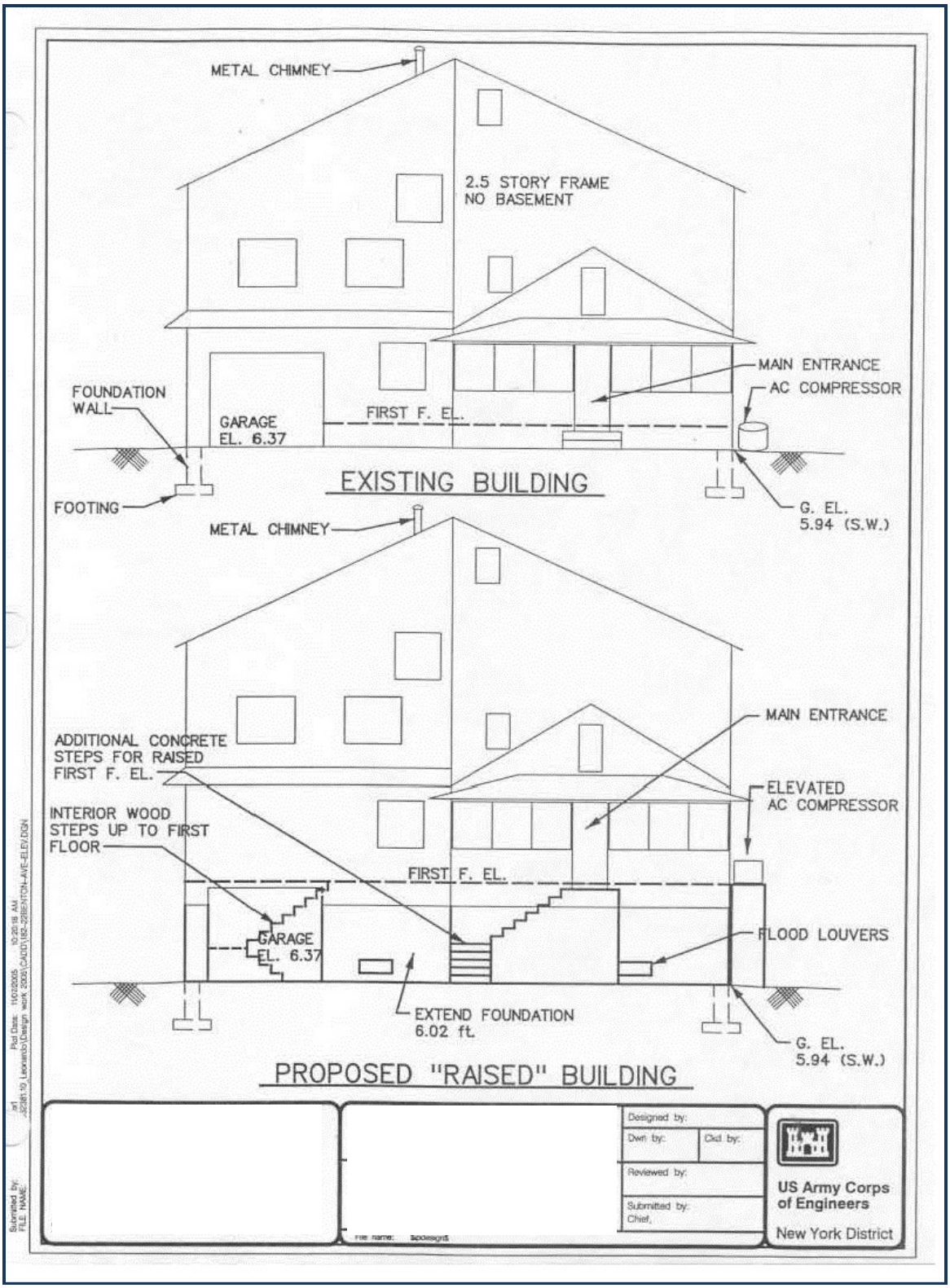


Figure A9: Type B proposed nonstructural treatment.

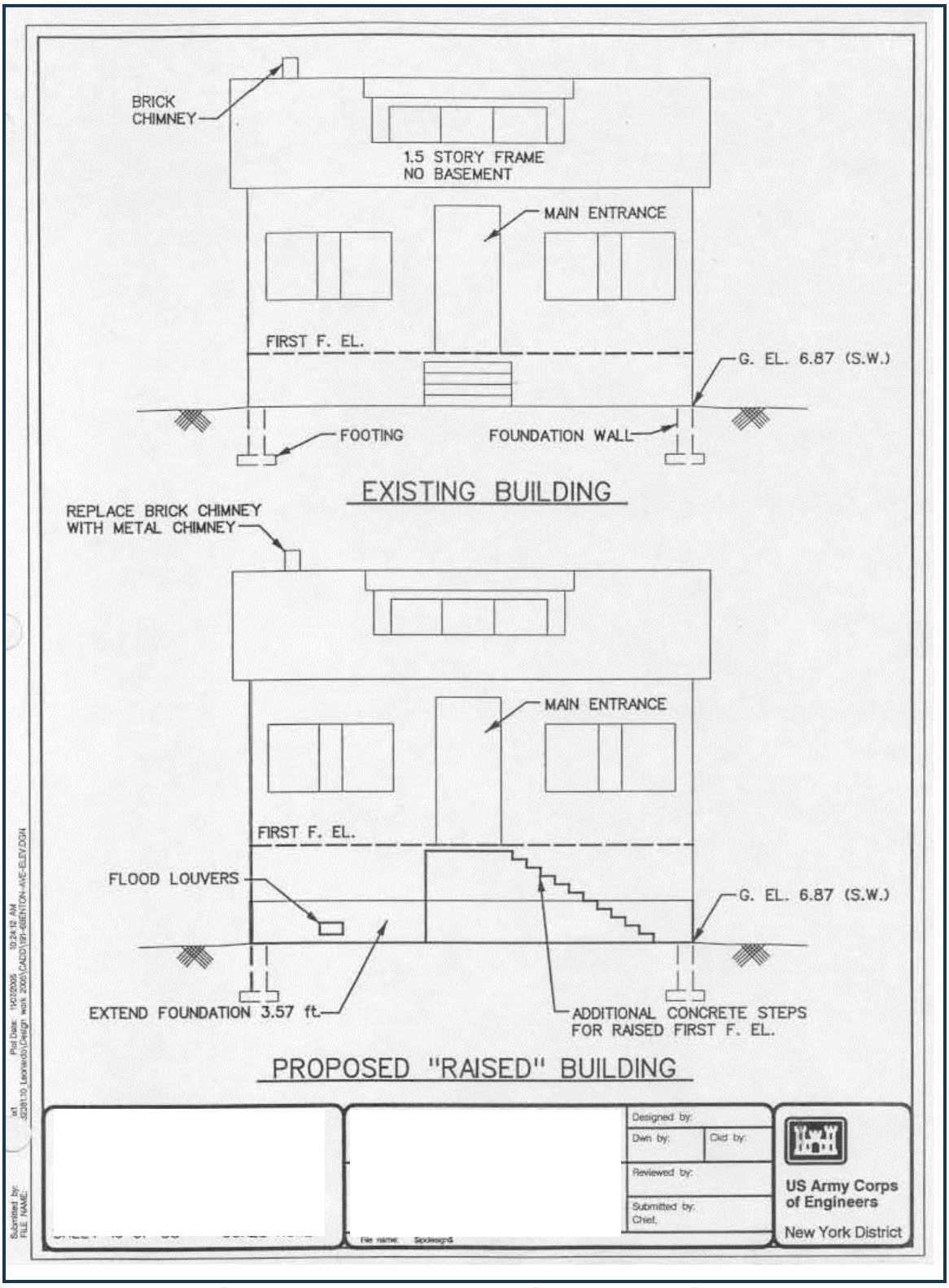


Figure A10: Type C proposed nonstructural treatment.

Shrewsbury River Basin, Sea Bright, New Jersey Coastal Storm Risk Management Feasibility Study

Draft Integrated Feasibility Report & Environmental Assessment

Appendix B: Cost Engineering

Shrewsbury River Basin, Sea Bright, New Jersey
Coastal Storm Risk Management Feasibility Study
Draft Integrated Feasibility Report & Environmental Assessment

Appendix B: Cost Engineering

Table of Contents

Introduction

This appendix presents the detailed cost estimate for the Shrewsbury River, Sea Bright, New Jersey Basin Costal Storm Risk Management Feasibility Study. The project was designed to manage and reduce the risk of flooding of structures in Sea Bright, New Jersey. The study area is generally low elevation and subject to coastal storm-induced flooding from the Shrewsbury River. After the review of several alternatives, as described in the Main Report, the most effective, cost effective solution was determined to be a nonstructural plan that consists of elevating thirty-seven homes and nonresidential structures in downtown Sea Bright. A detailed descripting of the plan is found in the main report and Appendix A (Engineering Appendix).

The material costs were based on a combination of MII database, RSMeans, and quotes, and were compared to historical pricing to ensure reasonableness. Equipment rates were obtained from 2014 Region I price level of the equipment manual, and Davis Bacon Wage Rates for Monmouth County, New Jersey were utilized for labor costs.

The fully funded project cost is $12,109,000 and is cost shared: 65 percent federally funded, 35 percent non-Federal. These costs include the initial first cost $11,140,687 for construction, including lands and damages, design, supervision and associated administration costs (Table B-1). In addition, the escalation to midpoint of construction is included (Table B-2). This midpoint was determined assuming a start date of March 2019 and using the construction schedule shown in Table B-3.

In addition to the start date, the construction schedule was created with other assumptions in mind. It was assumed that five homes would be worked on at once by one contractor with multiple crews working six days a week. A single home will take approximately eight weeks to accomplish with one group of about three to five overlapping with the next group by one month. Assuming work will not be done during the months of December, January, and February because of weather and the potential for existing disconnected plumbing to freeze; the overall duration will be 18 months with a completion date in Nov 2020.

The contingencies were developed using an Abbreviated Risk Analysis program (ARA). The summary of the results of this risk analysis can be viewed in Table B-4.

Table B-1: First Cost

Shrewsbury River Basin Coastal Storm Risk Management Feasibility First Cost
Sea Bright, NJ
OCT 2015 Price Level

Feat. Acct.	Description	Qty	UoM	Contract Cost	Contingency %	Cont $$	Total Cost
	11 FLOODWALLS	1	LS	$ 845,484	44%	$ 368,933	$ 1,214,416
	19 BUILDINGS, GROUNDS, AND UTILITIES	1	LS	$ 5,293,374	44%	$ 2,309,800	$ 7,603,174
	CONSTRUCTION ESTIMATE TOTALS:	1	LS	$ 6,138,858	44%	$ 2,678,732	$ 8,817,590
	01 LANDS AND DAMAGES	1	LS	$ 440,900	20%	$ 88,180	$ 529,080
	30 PLANNING, ENGINEERING, AND DESIGN	1	LS	$ 920,000	29%	$ 264,408	$ 1,184,408
	31 CONSTRUCTION MANAGEMENT	1	LS	$ 490,000	24%	$ 119,609	$ 609,609
	TOTAL FIRST COST			$ 7,989,758		$ 3,150,929	$ 11,140,687

Table B-2: Total Project Cost Summary

PROJECT: Shrewsbury River Basin
PROJECT NO:
LOCATION: Sea Bright, NJ

DISTRICT: New York District **PREPARED: 7/6/2016**
POC: CHIEF, COST ENGINEERING, Mukesh Kumar

This Estimate reflects the scope and schedule in report; Shrewsbury River Basin Draft Feasibility Study 2016

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2016 Effective Price Level Date: 1 OCT 15									
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Spent Thru: 10/1/2015 ($K)	TOTAL FIRST COST ($K) K	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O
19	BUILDINGS, GROUNDS & UTILITIES	$5,293	$2,310	43.6%	$7,603	0.0%	$5,293	$2,310	$7,603	$0	$7,603	8.4%	$5,735	$2,503	$8,238
11	LEVEES & FLOODWALLS Ringwalls	$845	$369	43.6%	$1,214	0.0%	$845	$369	$1,214	$0	$1,214	8.4%	$916	$400	$1,316
	CONSTRUCTION ESTIMATE TOTALS:	$6,139	$2,679	43.6%	$8,818	0.0%	$6,139	$2,679	$8,818	$0	$8,818	8.4%	$6,652	$2,902	$9,554
01	LANDS AND DAMAGES	$441	$88	20.0%	$529	0.0%	$441	$88	$529	$0	$529	6.2%	$468	$94	$562
30	PLANNING, ENGINEERING & DESIGN	$920	$264	28.7%	$1,184	0.0%	$920	$264	$1,184	$0	$1,184	12.4%	$1,034	$297	$1,332
31	CONSTRUCTION MANAGEMENT	$490	$120	24.4%	$610	0.0%	$490	$120	$610	$0	$610	8.5%	$531	$130	$661
	PROJECT COST TOTALS:	$7,990	$3,151	39.4%	$11,141		$7,990	$3,151	**$11,141**	$0	**$11,141**	8.7%	$8,686	$3,423	$12,109

CHIEF, COST ENGINEERING, Mukesh Kumar

PROJECT MANAGER, Jason Shea

CHIEF, REAL ESTATE

CHIEF, PLANNING

CHIEF, ENGINEERING

CHIEF, OPERATIONS

CHIEF, CONSTRUCTION

CHIEF, CONTRACTING

CHIEF, PM-PB, Anthony Ciorra

CHIEF, DPM

ESTIMATED FEDERAL COST: **65%** **$7,871**
ESTIMATED NON-FEDERAL COST: **35%** **$4,238**

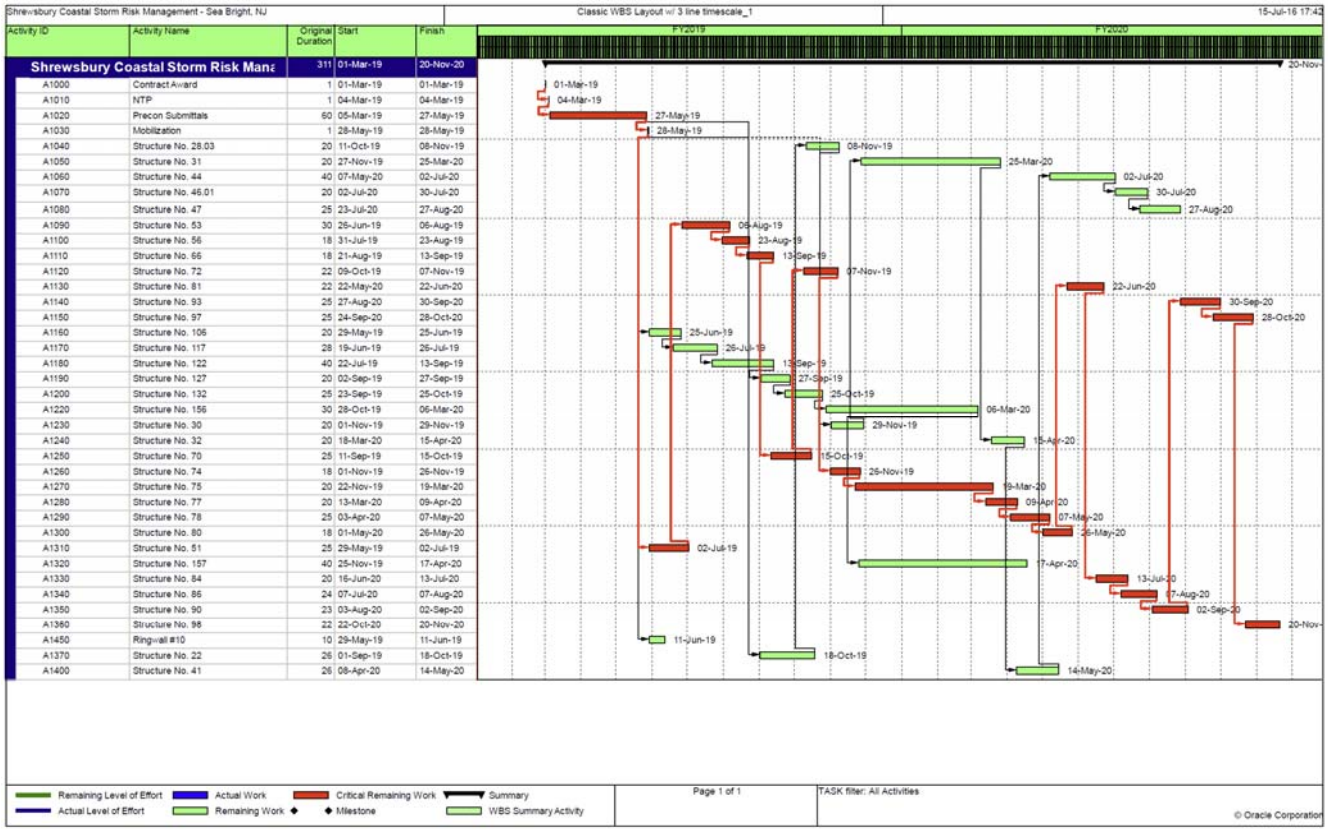
ESTIMATED TOTAL PROJECT COST: **$12,109**

PROJECT: Shrewsbury River Basin
LOCATION: Sea Bright, NJ
This Estimate reflects the scope and schedule in report; Shrewsbury River Basin Draft Feasibility Study 2016

DISTRICT: New York District PREPARED: 7/6/2016
POC: CHIEF, COST ENGINEERING, Mukesh Kumar

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)					
		Estimate Prepared: 6-Jul-16 Effective Price Level: 1-Oct-15				Program Year (Budget EC): 2016 Effective Price Level Date: 1 OCT 15									
				RISK BASED											
WBS NUMBER A	Civil Works Feature & Sub-Feature Description B	COST ($K) C	CNTG ($K) D	CNTG (%) E	TOTAL ($K) F	ESC (%) G	COST ($K) H	CNTG ($K) I	TOTAL ($K) J	Mid-Point Date P	INFLATED (%) L	COST ($K) M	CNTG ($K) N	FULL ($K) O	
	CONTRACT 1														
19	BUILDINGS, GROUNDS & UTILITIES Residential Raise Slab	$1,655	$722	43.6%	$2,377	0.0%	$1,655	$722	$2,377	2020Q2	8.4%	$1,793	$783	$2,576	
19	BUILDINGS, GROUNDS & UTILITIES Residential Raise Crawlspace	$3,193	$1,393	43.6%	$4,587	0.0%	$3,193	$1,393	$4,587	2020Q2	8.4%	$3,460	$1,510	$4,970	
19	BUILDINGS, GROUNDS & UTILITIES Remaining Construction Items	$445	$194	43.6%	$639	0.0%	$445	$194	$639	2020Q2	8.4%	$482	$210	$693	
11	LEVEES & FLOODWALLS Non-Residential Ringwalls	$836	$365	43.6%	$1,201	0.0%	$836	$365	$1,201	2020Q2	8.4%	$906	$395	$1,301	
11	LEVEES & FLOODWALLS Deployment/Redeployment of Ringwalls	$10	$4	43.6%	$14	0.0%	$10	$4	$14	2020Q2	8.4%	$10	$5	$15	
	CONSTRUCTION ESTIMATE TOTALS:	$6,139	$2,679	43.6%	**$8,818**		$6,139	$2,679	$8,818			$6,652	$2,902	$9,554	
01	LANDS AND DAMAGES	$441	$88	20.0%	$529	0.0%	$441	$88	$529	2019Q2	6.2%	$468	$94	$562	
30	PLANNING, ENGINEERING & DESIGN														
1.0%	Project Management	$61	$18	28.7%	$79	0.0%	$61	$18	$79	2019Q1	12.1%	$68	$20	$88	
1.0%	Planning & Environmental Compliance	$61	$18	28.7%	$79	0.0%	$61	$18	$79	2019Q1	12.1%	$68	$20	$88	
10.0%	Engineering & Design	$614	$176	28.7%	$790	0.0%	$614	$176	$790	2019Q1	12.1%	$688	$198	$886	
1.0%	Reviews, ATRs, IEPRs, VE	$61	$18	28.7%	$79	0.0%	$61	$18	$79	2019Q1	12.1%	$68	$20	$88	
0.5%	Life Cycle Updates (cost, schedule, risks)	$31	$9	28.7%	$40	0.0%	$31	$9	$40	2019Q1	12.1%	$35	$10	$45	
0.5%	Contracting & Reprographics	$31	$9	28.7%	$40	0.0%	$31	$9	$40	2019Q1	12.1%	$35	$10	$45	
1.0%	Engineering During Construction	$61	$18	28.7%	$79	0.0%	$61	$18	$79	2020Q2	17.7%	$72	$21	$92	
0.0%	Planning During Construction	$0	$0	28.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
0.0%	Project Operations	$0	$0	28.7%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0	
31	CONSTRUCTION MANAGEMENT														
6.0%	Construction Management	$368	$90	24.4%	$458	0.0%	$368	$90	$458	2020Q2	8.5%	$399	$97	$497	
1.0%	Project Operation:	$61	$15	24.4%	$76	0.0%	$61	$15	$76	2020Q2	8.5%	$66	$16	$82	
1.0%	Project Management	$61	$15	24.4%	$76	0.0%	$61	$15	$76	2020Q2	8.5%	$66	$16	$82	
	CONTRACT COST TOTALS:	$7,990	$3,151	39%	$11,141		$7,990	$3,151	$11,141			$8,686	$3,423	$12,109	

Table B-3: Construction



Schedule Assumptions:
-No winter work possible
-Multiple subcontractors will be available to raise 2 or more homes simultaneously
-Masonry, brick and commercial structures will take longer to construct/protect
Site constraints slow productivity

Abbreviated Risk Analysis

Project (less than $40M): **Shrewsbury River Basin, Sea Bright, NJ, Alternative NS2** — **Alternative: TSP - NS2**

Project Development Stage/Alternative: **Feasibility (Recommended Plan)**

Risk Category: **Moderate Risk: Typical Project Construction Type** — **Meeting Date: 10/4/2015**

Total Estimated Construction Contract Cost = $ 6,138,858

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ 440,900		20.00%	$ 88,180	$ 529,080
1	19 BUILDINGS, GROUNDS, AND UTILITIES	Residential Structures (Raise Slab on Grade)	$ 1,655,116		35.63%	$ 589,714	$ 2,244,830
2	19 BUILDINGS, GROUNDS, AND UTILITIES	Residential Structures (Raise Crawlspace)	$ 3,193,181		39.93%	$ 1,274,900	$ 4,468,082
3	11 02 FLOODWALLS	Non-Residential (Ringwalls)	$ 845,484		84.82%	$ 717,137	$ 1,562,621
4			$ -		0.00%	$ -	$ -
5			$ -		0.00%	$ -	$ -
6			$ -		0.00%	$ -	$ -
7			$ -		0.00%	$ -	$ -
8			$ -		0.00%	$ -	$ -
9			$ -		0.00%	$ -	$ -
10			$ -		0.00%	$ -	$ -
11			$ -		0.00%	$ -	$ -
12	All Other	Remaining Construction Items	$ 445,077	7.8%	21.79%	$ 96,980	$ 542,058
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ 920,829		28.74%	$ 264,673	$ 1,185,502
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ 491,109		24.41%	$ 119,857	$ 610,966
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)					$ -	

Totals				
Real Estate	$ 440,900	20.00%	$ 88,180	$ 529,080.00
Total Construction Estimate	$ 6,138,858	43.64%	$ 2,678,732	$ 8,817,590
Total Planning, Engineering & Design	$ 920,829	28.74%	$ 264,673	$ 1,185,502
Total Construction Management	$ 491,109	24.41%	$ 119,857	$ 610,966
Total	$ 7,991,695	39%	$ 3,151,442	$ 11,143,138
		Base	50%	80%
Range Estimate ($000's)		$7,992k	$9,883k	$11,143k

* 50% based on base is at 5% CL

Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.	

Shrewsbury River Basin, Sea Bright, NJ, Alternative NS2 TS

Feasibility (Recommended Plan)

Abbreviated Risk Analysis

Meeting Date: 4-Oct-15

Risk Register

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Scope Growth				**Maximum Project Growth**		**75%**
PS-1	Residential Structures (Raise Slab on Grade)	• Design confidence? • Investigations sufficient to support design assumptions? • Potential for scope growth, added features and quantities?	Assume corps will do plans & specifications and S&A in house. Design has yet to be done. Investigations are ongoing, but potential for scope growth is low since the main scope is to lift/jack the structure at load bearing members and install piling.	Marginal	Possible	1
PS-2	Residential Structures (Raise Crawlspace)	• Design confidence? • Investigations sufficient to support design assumptions? • Potential for scope growth, added features and quantities?	Assume corps will do plans & specifications and S&A in house. Design has yet to be done. Investigations are ongoing, but potential for scope growth is low since the main scope is to lift/jack the structure at load bearing members and install piling.	Marginal	Possible	1
PS-3	Non-Residential (Ringwalls)	• Design confidence? • Investigations sufficient to support design assumptions? • Potential for scope growth, added features and quantities?	Ringwall design preliminary, type of ringwall likely to change and will affect cost. Due to site constraints, ringwall design may have to be custom and include additional features. Ringwalls may be not the most practical solution to flood proof these buildings, which would change the project scope. Ringwalls of higher height (7-8 ft) have life safety concerns. Walls will need to withstand hydrostatic and wave loads and could require significant foundation - current scope for foundation is unknown.	Moderate	Likely	3
PS-4	0			Negligible	Unlikely	0
PS-12	Remaining Construction Items			Marginal	Possible	1
PS-13	Planning, Engineering, & Design	• Design confidence? • Investigations sufficient to support design assumptions? • Potential for scope growth, added features and quantities?	Increased scope will require additional PED. Additional investigation may be required due to 3-3-3 process.	Moderate	Possible	2
PS-14	Construction Management	• Design confidence? • Investigations sufficient to support design assumptions? • Potential for scope growth, added features and quantities?	Increased scope will require additional S&A - but it is calculated based on percentage of contract cost	Marginal	Possible	1
Acquisition Strategy				**Maximum Project Growth**		**30%**
AS-1	Residential Structures (Raise Slab on Grade)	• Contracting plan firmly established? • Limited bid competition anticipated? • 8a or small business likely?	The contracting plan is not firmly established. In the past it may have been a risk that there were not enough contractors to do the work, but with the recent history, there are more small contractors doing this work. Plenty of 8A and small business that good bid prices can be received.	Marginal	Likely	2
AS-2	Residential Structures (Raise Crawlspace)	• Contracting plan firmly established? • Limited bid competition anticipated? • 8a or small business likely?	The contracting plan is not firmly established. In the past it may have been a risk that there were not enough contractors to do the work, but recently there has been an increase in the number of small contractors doing this work. There are plenty of 8A and small business, so competitive bid prices can be received.	Marginal	Likely	2
AS-3	Non-Residential (Ringwalls)	• Contracting plan firmly established? • Limited bid competition anticipated? • 8a or small business likely?	Contracting plan not firmly established. 8a possible.	Marginal	Likely	2
AS-4	0			Negligible	Unlikely	0
AS-12	Remaining Construction Items			Marginal	Possible	1
AS-13	Planning, Engineering, & Design	• Contracting plan firmly established?	Splitting up into multiple contracts would increase PED costs. Likely to be two contracts - one for residential and one for non-residential.	Moderate	Likely	3
AS-14	Construction Management	• Contracting plan firmly established?	Assume Federal government-managed in the implementation of non-structural measures. Contracting plan is still undetermined.	Moderate	Possible	2
Construction Elements				**Maximum Project Growth**		**25%**
CE-1	Residential Structures (Raise Slab on Grade)	• High risk or complex construction elements, site access, in-water? • Special equipment or subcontractors needed? • Unique construction methods? • Potential for construction modification and claims?	Site-access is a concern with the houses are close together making equipment mobility and staging very difficult. The assumption is made that with the amount of house raises taking place, the equipment and contractors are readily available. The construction is unique but has become more standardized over the last few years. Modification may be made based on foundation condition. More difficult to raise a slab on grade. Claims with settlement and cracking after the house has been raised.	Marginal	Likely	2

CE-2	Residential Structures (Raise Crawlspace)	• High risk or complex construction elements, site access, in water? • Special equipment or subcontractors needed? • Unique construction methods? • Potential for construction modification and claims?	Site-access is a concern with the houses are close together making equipment mobility and staging very difficult. The assumption is made that with the amount of house-raises taking place, the equipment and contractors are readily available. The construction is unique but has become more standardized over the last few years. Modification may be made based on foundation condition. Claims with settlement and cracking after the house has been raised.	Marginal	Likely	2
CE-3	Non-Residential (Ringwalls)	• High risk or complex construction elements, site access, in water? • Special equipment or subcontractors needed? • Unique construction methods? • Potential for construction modification and claims?	Site-access is a significant concern. Businesses are directly at the sidewalk and require access for customers. Installation of ringwall may require non-standard construction techniques.	Moderate	Likely	3
CE-4	0			Negligible	Unlikely	0
CE-12	Remaining Construction Items			Negligible	Unlikely	0
CE-13	Planning, Engineering, & Design			Marginal	Possible	1
CE-14	Construction Management	• Potential for construction modification and claims?	Possible modifications and claims to be managed.	Moderate	Likely	3
Quantities for Current Scope				**Maximum Project Growth**		**20%**
Q-1	Residential Structures (Raise Slab on Grade)	• Level of confidence based on design and assumptions • Appropriate methods applied to calculate quantities? • Sufficient investiagtions to develop quantities?	Unlikely for the quantities to change significantly. Quantities for each house based on known square footage, and the number of houses to be elevated is based on existing elevations, and survey of houses.	Marginal	Possible	1
Q-2	Residential Structures (Raise Crawlspace)	• Level of confidence based on design and assumptions • Appropriate methods applied to calculate quantities? • Sufficient investiagtions to develop quantities?	Unlikely for the quantities to change significantly. Quantities for each house based on known square footage, and the number of houses to be elevated is based on existing elevations and survey of houses.	Marginal	Possible	1
Q-3	Non-Residential (Ringwalls)	• Level of confidence based on design and assumptions • Appropriate methods applied to calculate quantities? • Sufficient investiagtions to develop quantities?	Length of total ringwall and height of ringwall still preliminary. Quantities for the ringwall components based off of assumed design which may change. Only quantity of perimeter (i.e. length of ringwall) provided - but quantities to build the ringwalls are unknown, because the scope is unknown (cost estimate assumes removable structural steel wall)	Moderate	Likely	3
Q-4	0	• Level of confidence based on design and assumptions • Appropriate methods applied to calculate quantities? • Sufficient investiagtions to develop quantities?	Only two non residential structures anticipated to be raised	Marginal	Possible	1
Q-12	Remaining Construction Items	• Level of confidence based on design and assumptions • Appropriate methods applied to calculate quantities? • Sufficient investiagtions to develop quantities?	Additional flood proofing required for raises and ringwalls not based off of any quantities provided. Flood gates or walk overs would be required. AC units for residential units would need to be raised. Utilities would need to be raised as well.	Moderate	Likely	3
Q-13	Planning, Engineering, & Design		Quantities will not have much effect	Negligible	Possible	0
Q-14	Construction Management		Quantities will not have much effect	Negligible	Possible	0
Specialty Fabrication or Equipment				**Maximum Project Growth**		**75%**
FE-1	Residential Structures (Raise Slab on Grade)	• Unusual parts, material or equipment manufactured or installed? Confidence in Contractor's ability to install	Jacking equipment will be used. Elevating homes is fairly standard construction in the area. Helical piles will need to be used where access is limited or piling is not possible/allowed.	Moderate	Possible	2
FE-2	Residential Structures (Raise Crawlspace)	• Unusual parts, material or equipment manufactured or installed? Confidence in Contractor's ability to install	Jacking equipment will be used. Elevating homes is fairly standard construction in the area. Helical piles will need to be used where access is limited or piling is not possible/allowed.	Moderate	Possible	2
FE-3	Non-Residential (Ringwalls)	• Unusual parts, material or equipment manufactured or installed? Confidence in Contractor's ability to install	Construction would be very difficult given the site constraints and proximity to Ocean Ave. Specialty fabrication of the wall is likely - especially for removeable flood walls.	Moderate	Likely	3
FE-4	0			Negligible	Unlikely	0
FE-12	Remaining Construction Items		Standard construction	Negligible	Possible	0
FE-13	Planning, Engineering, & Design	N/A	N/A	Negligible	Possible	0
FE-14	Construction Management	N/A	N/A	Negligible	Possible	0
Cost Estimate Assumptions				**Maximum Project Growth**		**35%**
CT-1	Residential Structures (Raise Slab on Grade)	• Reliability and number of key quotes? • Site accessibility? • Oversue of cost book? • Lack of confidence on critical items?	Preliminary cost estimate was created based on non-structural baseline estimate which takes into consideration only square footage, height of raise, and type of foundation. The baseline estimate was created primarily with cost book items, and may not adequately address site accessibility/congestion and sequencing based on space and labor/equipment resources. However the calculated costs are in line with historical prices. Additional difficulties and costs for masonry structures considered in the cost estimate.	Marginal	Likely	2
CT-2	Residential Structures (Raise Crawlspace)	• Reliability and number of key quotes? • Site accessibility? • Oversue of cost book? • Lack of confidence on critical items?	Preliminary cost estimate was created based on non-structural baseline estimate which takes into consideration only square footage, height of raise, and type of foundation. The baseline estimate was created primarily with cost book items, and may not adequately address site accessibility/congestion and sequencing based on space and labor/equipment resources. However the calculated costs are in line with historical prices. Additional difficulties and costs for masonry structures considered in the cost estimate.	Moderate	Likely	3
CT-3	Non-Residential (Ringwalls)	• Reliability and number of key quotes? • Site accessibility? • Oversue of cost book? • Lack of confidence on critical items?	Minimal scope provided - ringwall design and construction methods assumed based on estimator research. Quote for flood panel obtained from aqua fence	Significant	Likely	4

CT-4	0			Negligible	Unlikely	0
CT-12	Remaining Construction Items			Marginal	Possible	1
CT-13	Planning, Engineering, & Design	• Lack of confidence on critical items?	Values based on percentage of total construction cost	Marginal	Likely	2
CT-14	Construction Management	• Lack of confidence on critical items?	Values based on percentage of total construction cost	Marginal	Likely	2
External Project Risks				**Maximum Project Growth**		**40%**
EX-1	Residential Structures (Raise Slab on Grade)	• Potential for severe adverse weather? • Unanticipated inflations in fuel, key materials? • Political influences, lack of support, obstacles?	Local sponsor and resident input will be significant. Bidding environment. Material cost will fluctuate. Availability of Contractors specializing in elevating houses.	Moderate	Likely	3
EX-2	Residential Structures (Raise Crawlspace)	• Potential for severe adverse weather? • Unanticipated inflations in fuel, key materials? • Political influences, lack of support, obstacles?	Local sponsor and resident input will be significant. Bidding environment. Material cost will fluctuate. Availability of Contractors specializing in elevating houses.	Moderate	Likely	3
EX-3	Non-Residential (Ringwalls)	• Potential for severe adverse weather? • Unanticipated inflations in fuel, key materials? • Political influences, lack of support, obstacles?	Local sponsor and resident input will be significant. Bidding environment. Material cost will fluctuate. Ringwalls over 6 ft may not be allowed by regulation. Potential for life safety concerns with higher ringwalls.	Significant	Likely	4
EX-4	0			Negligible	Unlikely	0
EX-12	Remaining Construction Items	• Potential for severe adverse weather? • Unanticipated inflations in fuel, key materials? • Political influences, lack of support, obstacles?	Input from local sponsor and residents	Marginal	Likely	2
EX-13	Planning, Engineering, & Design	• Potential for severe adverse weather? • Unanticipated inflations in fuel, key materials? • Political influences, lack of support, obstacles?	Input from local sponsor and residents would increase design costs	Marginal	Likely	2
EX-14	Construction Management	• Potential for severe adverse weather? • Unanticipated inflations in fuel, key materials? • Political influences, lack of support, obstacles?		Marginal	Possible	1

Shrewsbury River Basin, Sea Bright, New Jersey Coastal Storm Risk Management Feasibility Study

Draft Integrated Feasibility Report & Environmental Assessment

Appendix C: Economics

Shrewsbury River Basin, Sea Bright, New Jersey
Coastal Storm Risk Management Feasibility Study
Draft Integrated Feasibility Report & Environmental Assessment

Appendix C: Economics

Table of Contents

Chapter 1: Introduction

An economic analysis was conducted to assist in the determination of the economic viability for Federal participation in the Shrewsbury River Basin, Sea Bright, New Jersey Coastal Storm Risk Management Feasibility Study (Shrewsbury Study, or Study). Benefits were calculated for plans that are anticipated to be the most effective with respect to local support, survivability, and flood risk management. Structural and nonstructural alternatives were screened for relative cost-effectiveness based on the level of without- and with-project damages, and preliminary estimates of benefits and costs. The result of the analysis determined that none of the structural alternatives were cost effective and the only economically viable plan is a nonstructural alternative.

1.1 Benefit Types

Many benefits can be realized from implementing flood/storm damage reduction measures, including:

- Reduced inundation damage to structures and contents
- Reduced public emergency and evacuation costs
- Reduced relocation and reoccupation of displace residents
- Reduced Federal Insurance Administration (FIA) administrative costs
- Reduced bulkhead and road damages
- Reduction in lost business revenue
- Reduction in debris cleanup

While there are many benefits, the economic analysis for the Shrewsbury River Basin study focused on evaluating the reduction in inundation damage to structures and contents. Reduction in damages to structures and contents typically produces the greatest benefits during an economic analysis, thus providing a general indication of the economic viability of the evaluated alternative.
In addition, traffic delays and public emergency and evacuation costs were reviewed in previous study efforts of Sea Bright. These damage categories were found to have negligible benefits related to any of the with-project alternatives under consideration. The analyses indicated that traffic delays caused by the closure of Route 36 by storm events in the without-project condition amount to less than $10,000 per year. While the implementation of a structural plan would reduce the risk of future storm-driven closures of Route 36 within the study area, any benefit would consequently be small because of the likelihood of Route 36 being inundated to the north and south of the study area. Similarly, public emergency and evacuation costs are likely to be unaffected because these response actions will be taken regardless.

1.2 Conditions

The methods for the economic analysis were completed in accordance with ER 1105-2-100. The screening of alternatives used an October 2015 price level and 3.125 percent discount rate for cost and benefits calculations. The base year is 2020 and the period of analysis is 50 years.

Chapter 2: Description of Study Area

The study area is located within the Borough of Sea Bright, New Jersey. The study area is the most low-lying and densely-developed area in Sea Bright and encompasses the borough's central business corridor, most residential development, and a majority of the municipal services (i.e., borough hall, police station, fire department).

The following sections delineate the study area and provide basic demographic information about the Borough of Sea Bright, Monmouth County, and the state of New Jersey.

2.1 Delineation of Study Area

The study lies between the Shrewsbury River and the Atlantic Ocean. It spans from the Shrewsbury River Bridge south to Village Road (Figure 1).

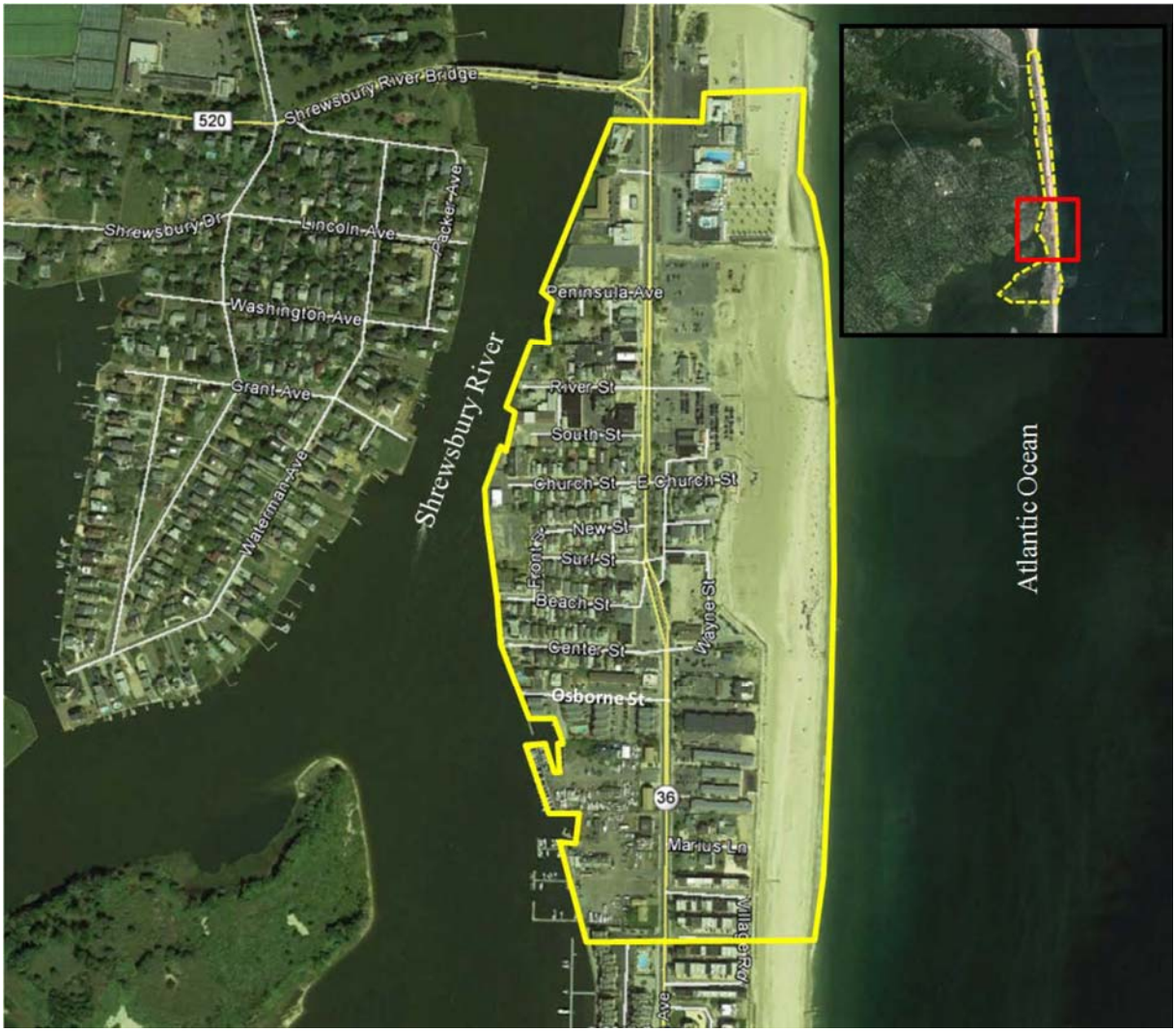


Figure 1: Study area.

2.2 Population

According to the year 2010 U.S. Census, the population of Sea Bright was 1,412 persons. The median age of the population in Sea Bright is 46.7 years. Between 2000 and 2010, the population of Sea Bright decreased by 22.3 percent. Tables C-1 and C-2 summarize the population data.

Table C-1: Population of New Jersey, Monmouth County, and Sea Bright (U.S. Census, 2010).

Area Name	2000 Census	2010 Census	Percentage
New Jersey	8,414,350	8,791,894	4.5%
Monmouth County	615,301	630,380	2.5%
Sea Bright	1,818	1,412	-22.3%

Table C-2: Population and household statistics of New Jersey, Monmouth County, and Sea Bright (U.S. Census, 2010).

Category	Sea Bright		Monmouth County		New Jersey	
	Total	%	Total	%	Total	%
Population	1,412		630,380		8,791,894	
Male	729	51.6%	306,654	48.6%	4,279,600	48.7%
Female	683	48.4%	323,726	51.4%	4,512,294	51.3%
Under 5 years	55	3.9%	34,755	5.5%	541,020	6.2%
18 years and over	1,252	88.7%	480,081	76.2%	6,726,680	76.5%
65 years and over	205	14.5%	86,691	13.8%	1,185,993	13.5%
Median Age	46.7		41.3		37.4	

2.3 Employment and Income

Results from the U.S. Census' American Community Survey (ACS) were used to estimate employment statistics. The ACS 2009-2013 data indicates that there are 1,218 (85.7 percent) residents of Sea Bright who are of working age (16 years or older) and 921 (64.8 percent) are in the civilian labor force. Tables C-3 and 4 provide a breakdown of employment statistics.

Table C-3: Employment data (ACS, 2009-2013).

Category	Sea Bright	Monmouth County	New Jersey
Population	1,424	629,735	8,832,406
16 years or over	1,218	501,783	7,080,181
In Civilian Labor Force	921	335,366	4,688,186
Employed	834	305,222	4,235,089
Unemployed	87	30,144	453,097
Unemployment	9.4%	9.0%	9.7%

Table C-4: Employed civilian population (ACS, 2009-2013).

Industry	Sea Bright		Monmouth County		New Jersey	
	Total	Percent	Total	Percent	Total	Percent
Agriculture, forestry, fishing and hunting, and mining	17	2.0%	1,359	0.4%	14,692	0.4%
Construction	68	8.2%	19,547	6.4%	233,339	5.6%
Manufacturing	58	7.0%	18,786	6.2%	369,927	8.8%
Wholesale trade	8	1.0%	10,412	3.4%	147,576	3.5%
Retail trade	41	4.9%	35,181	11.5%	469,108	11.2%
Transportation and warehousing, and utilities	36	4.3%	15,513	5.1%	236,692	5.6%
Information	21	2.5%	10,936	3.6%	123,121	2.9%
Finance, insurance, real estate, and rental and leasing	141	16.9%	31,717	10.4%	368,865	8.8%
Professional, scientific, management, administrative, and waste management services	143	17.1%	38,703	12.7%	529,294	12.6%
Educational, health and social services	137	16.4%	70,109	23.0%	981,817	23.4%
Arts, entertainment, recreation, accommodation and food services	79	9.5%	26,526	8.7%	344,102	8.2%
Other services (except public administration)	39	4.7%	12,193	4.0%	189,508	4.5%
Public administration	46	5.5%	14,240	5%	189,442	4.5%
Total	834	100%	305,222	100%	4,197,483	100%

According to the ACS 2009-2013 data, the median household income in Sea Bright is $82,821 and a per capita income of $70,174. Approximately 3.7 percent of families and 5.5 percent of the population live below the poverty level (Table C-5). The total number of housing units in Sea Bright is 1,142. According to the Census Bureau, the median value of all owner occupied units is $449,200.

Table C-5: Income data (ACS, 2009-2013).

Category	Sea Bright	Monmouth County	New Jersey
Per Capita Income	$70,174	$42,749	$36,027
Median Household Income	$82,821	$84,526	$71,629
Families Below Poverty Line	3.7%	5.1%	7.9%
Individuals Below Poverty Line	5.5%	7.0%	10.4%
Medium Value of Owner Occupied Housing Unit	$449,200	$389,900	$327,100

Chapter 3: Description of the Problem

Coastal storms such as nor'easters, tropical storms, and hurricanes have long impacted the New Jersey coast. These storms produce wind and wave-driven surges that cause extensive flooding and erosion within the study area. The shoreline composition has been greatly altered with time.

3.1 Storm History

Sea Bright has a history of being impacted by coastal storms. The most recent storms that have impacted the study area include:

The Perfect Storm, October – November, 1991. The nor'easter was absorbed Hurricane Grace and ultimately evolved back into a small unnamed hurricane late in its life cycle. The storm lashed the east coast of the United States with high waves and coastal flooding before turning to the southwest and weakening. In Sea Bright waves washed over a seawall, forcing 200 people to evacuate. Further inland, the Hudson, Passaic, and Hackensack rivers experienced tidal flooding.

Hurricane Isabel, September 8, 2003. Hurricane Isabel produced slightly above normal tides and rough surf along the Jersey shore, killing one surfer off of Wildwood Crest. The combination of gusty winds and the heavy surf produced moderate beach erosion along much of the coastline, primarily to beaches facing southeastward. Most coastal areas of Monmouth County reported eroded beaches by up to 4 feet (1.2 m), with Union Beach losing about 5,000 sq. feet (465 sq. m) of sand.

Hurricane Irene, August 14, 2011. Hurricane Irene was a long-lived Cape Verde-type Atlantic hurricane during the 2011 Atlantic hurricane season. The storm formed near Cape Verde on August 4 and crossed the Atlantic, turning northward around Bermuda before being absorbed by an extratropical storm while situated southeast of Newfoundland. The storm caused beach erosion and flooding in Monmouth County, notably in Sea Bright.

Hurricane Sandy, October 30, 2012. Hurricane Sandy was the deadliest and most destructive hurricane of the 2012 Atlantic hurricane season, and the second-costliest hurricane in United States history. While it was a Category 2 storm off the coast of the Northeastern United States, the storm became the largest Atlantic hurricane on record (as measured by diameter, with winds spanning 1,100 miles (1,800 km)).

3.2 Impacts to Sea Bright

While the risk of flooding in Sea Bright directly from ocean storm surges is reduced by a previously constructed oceanfront sea wall, downtown Sea Bright remains vulnerable to flooding from the Shrewsbury River even during normal weather conditions. A series of low bulkheads, which are irregular in design and maintenance, provide little risk reduction to downtown from the Shrewsbury River. High water from the Shrewsbury River backs up storm sewers during spring tides and floods streets in the center of town. Monthly flooding damages automobiles parked in the street. The study area has been repeatedly flooded by hurricanes and nor'easters. During storms, surge overtops the low-lying bulkheads that line the Shrewsbury shoreline in Sea Bright town center, flooding streets and a significant number of homes that have not been elevated. Residents of this area of Sea Bright experience flood-related reduction in their incomes when they are unable to get to work due to flood waters, the most severe of which occur during winter months. Hurricane Sandy devastated Sea Bright, with storm surge inundating the Borough from both the Shrewsbury River and Atlantic Ocean. Sea Bright was totally inundated, during which storm surge overtopped or breached the Shrewsbury River bulkheads, seawalls fronting the Atlantic Ocean, and beaches.

Chapter 4: Without-Project Conditions

The without-project conditions were evaluated to provide a better understanding of the existing conditions of the study area and what is anticipated through the period of analysis.

4.1 Existing Condition

Sea Bright is comprised primarily of a mix of residences and commercial businesses. The commercial businesses community is based on catering to beach tourism. Because of the reliance on beach tourism, access to the beach and visible and easy access to their businesses is critical. While Sea Bright has been able to capitalize on its proximity to beaches, its location has also made it vulnerable to flooding from both the ocean and the Shrewsbury River.

Within the study area there are 238 structures, of which 234 (approximately 98%) lie within the 1 percent annual chance of exceedance ("100-year") floodplain. Many structures within the study area neighborhoods have been repeatedly flooded, including many of the low-lying roadways. This flooding and associated movement of sand and debris inhibits access to and from most of the community during and after emergencies. Within the study area the typical base flood elevation in the study area is +7 to + 9 feet NAVD88.

4.2 Future Conditions

Sea Bright will continue to be subject to coastal storm flooding from the Shrewsbury River. It will continue to experience road flooding during spring tides and structural damages during storms as water from the Shrewsbury River comes through and over bulkheads. It is expected that storms will continue to occur in the future, causing damage in Sea Bright. Tidal inundation is expected to increase gradually over time, in direct relation to the anticipated rise in relative sea level. Based upon long-term trends measured at Sandy Hook, a 0.014-foot per year increase anticipated, resulting in a 0.7-foot increase over the 50-year period of analysis.

It is anticipated that the existing residential and nonresidential structures will remain, however some changes may occur as structures are rehabilitated and/or elevated. Significant new development is not anticipated within the study area. Any new development that does occur is anticipated to meet or exceed local floodplain ordinances. Therefore, future development is not anticipated to significantly increase flood/storm damages in the study area.

Chapter 5: Extent and Scope of Alternatives

The study area requires an effective storm risk management program that would provide adequate levels of risk management against flooding and storm-driven waves. Coastal storm risk management measures were developed to address problems and to capitalize upon opportunities described in the main report. They were derived from a variety of sources including prior studies, the public scoping process, and the Project delivery Team (PDT). The following measures were considered:

- Nonstructural Alternatives
- Floodwalls (Bulkheads)
- Levees
- Road Raising
- Beach and Dune Fill
- Offshore Breakwaters and Flood Barriers
- Pumps
- Ringwalls

Consideration was given to all feasible structural and nonstructural measures. Sound engineering judgment was utilized in selecting the structural components for each alternative. Existing topography, wetlands, structures, roadways, and drainage patterns were some of the constraints that had to be accommodated in the design process.

The focused array of alternative plans includes the following:

- Nonstructural Alternatives
- No Action Alternative
- Floodwall Alternatives
- Storm Surge Barrier Alternative

5.1 Nonstructural Alternatives

The nonstructural alternatives consist of implementing one or more of the following measures:

- Wet floodproofing
- Dry floodproofing
- Elevation
- Rebuilding
- Acquisition
- Evacuation Plans
- Floodplain development zoning changes/enforcement

Different nonstructural scenarios were developed, each affecting an incrementally greater number of structures. The scenarios were formulated by grouping structures with different main floor elevations (MFE). The groupings were comprised of structures with a MFE less than or equal to the water surface elevations (WSELs) for the 10, 4, and 1 percent annual chance of exceedance flood events (10-year, 25-year, and 100-year flood events, respectively). The nonstructural alternatives are:

- Nonstructural Alternative 1: structures with a MFE less than or equal +4.5 feet NAVD88 (the 10 percent flood water surface elevation)
- Nonstructural Alternative 2: structures with a MFE less than or equal to +6.0 feet NAVD88 (the 4 percent flood water surface elevation)
- Nonstructural Alternative 3: structures with a MFE less than or equal to +8.2 feet NAVD88 (the one percent flood water surface elevation)

An algorithm was used to help the PDT choose the most appropriate treatment for each structure. It has been used for many other USACE feasibility studies with nonstructural components, most recently in the CENAN for the Leonardo, NJ feasibility study. The algorithm identified two nonstructural measures as the most appropriate for the study area: elevations and ringwalls. Table C-6 provides a breakdown by structure type (residential and commercial/nonresidential) for each of the nonstructural alternatives.

Table C-6: Structure types included in nonstructural alternatives.

Alternative	Elevation		Ringwall*		Total # Structures
	Residential	Commercial/ Nonresidential	Residential	Commercial/ Nonresidential	
Structures at/below 10 percent WSEL (+4.5 feet NAVD88)**	1	0	1	7	9
Structures at/below 4 percent WSEL (+6.0 feet NAVD88)	33	0	2	30	66
Structures at/below 1 percent WSEL (+8.2 feet NAVD88)	66	3	5	38	112

* maximum number of structures behind ringwalls, as explained in detail later in this section
** WSEL = water surface elevation

To identify the most efficient and cost effective nonstructural plan, structure elevations and ringwalls were considered separately. For the initial array, nonstructural plans that included only structure elevations were used for comparison and screening of the initial array of alternatives. Ringwalls that were economically justified on their own, or incrementally justified, were added to the plan later in the planning process. Table C-7 shows alternatives were used for initial screening.

Table C-7: Nonstructural alternatives.

Nonstructural Alternatives	Description	Features
Alternative NS 1 Structures at/below 10 percent WSEL** (+4.5 feet NAVD88)	Elevations only for structures with a MFE at or below the 10 percent WSEL of +4.5 feet NAVD88	1 structure elevation
Alternative NS 2 Structures at/below 4 percent WSEL (+6.0 feet NAVD88)	Elevations only for structures with a MFE at or below the 4 percent WSEL of +6.0 feet NAVD88	34 structure elevations*
Alternative NS 3 Structures at/below 1 percent WSEL (+8.2 feet NAVD88)	Elevations only for structures with a MFE at or below the 1 percent WSEL +8.2 feet NAVD88	69 structure elevations

* one structure that was originally included within a ringwall is included in this plan
** WSEL = water surface elevation

5.2 Floodwall Alternatives

The floodwall alternatives would reduce risk to the most vulnerable and frequently flooded parts of the downtown area. The alignment would span from the Shrewsbury River Bridge to just south of Osborne Place, about a half mile. It would tie into relatively high Ocean Avenue to the east. Various floodwall crest elevations were considered (Table C-8). The crest elevations of the tieback components are

controlled by the need to prevent induced flooding and by site conditions at the southern end of the study area, where the raised road dimensions are restricted by the topography, the proximity of existing structures, and drainage issues.

Table C-8: Floodwall dimensions considered.

Alternative	Floodwall Crest Elevation (+ft NAVD88)	Tieback Crest Elevation (+ft NAVD88)	Annual Chance of Exceedance (based on still water level)
Alternative F1	7.0	5.3	2%
Alternative F2	8.5	6.0	1%
Alternative F3	9.5	7.0	0.5%
Alternative F4	11.5	10.0	0.3%

5.3 Storm Surge Barrier Alternative

The storm surge barrier alternative would provide a comprehensive solution to flooding in the Shrewsbury River Basin by reducing the risk of storm surge coming from the Shrewsbury River. It would include an offshore breakwater extending across Sandy Hook Bay at the mouth of the Shrewsbury River. The structure would likely tie into raised ground or a raised road. Closure gates would be constructed to allow for navigation on the Shrewsbury River.

The total breakwater alignment is approximately 4,500 feet, crossing a broad shoal area on the Sandy Hook side. At the location of the existing navigation channel approximately 500 feet from the state bulkhead, a 200-foot wide navigation sector gate would be installed to allow for a 100-foot clear opening for navigation transit when the gate is in the open position. Prior to potential major storm events, the sector gate would be closed during a period of lower tide, sealing the inner basin, providing additional runoff storage leeward of the barrier.

Mean bay-bottom elevation along the breakwater alignment is roughly –4 feet NAVD88 or less, except across the navigation channel where it is approximately –19 to –21 feet NAVD88. The crest of the breakwater would be set at elevation +12.4 feet NAVD88. The crest elevation was selected to limit the effect of storm waves, reduce overtopping damage to the leeward side of the breakwater, and avoid water buildup from overtopping wave effects. There is insufficient storage leeward of the breakwater to store storm water runoff buildup to below elevation +5 feet NAVD88 with the sector gate closed, therefore a pump station would be required. Based on gross approximations, a 4,000 cfs pump station would be necessary to prevent residual damages from the closed gate.

Preliminary cost estimates indicated that because of the high cost of the Storm Surge Barrier Alternative, it would not be economically justified. Therefore, the Storm Surge Barrier Alternative was not evaluated in detail for the economic analysis.

Chapter 6: Economic Analysis Method

The economic analysis evaluated flood/storm related damages to structures and contents. The method and approach for the economic analysis are described in the following sections.

6.1 Structure Inventory

A database of residential and nonresidential structures in the study area was compiled to assist in calculating flood damages. The structure inventory data was generated by a survey of the structures in the study area and was mostly obtained through a "windshield survey" of the area in combination with a full elevation survey of ground and main floor elevations for each vulnerable structure. Various data were gathered and physical characteristics assessed during the structure inventory survey, including:

- Structure ID #
- Map Number
- Type of structure
- Use of structure
- Size
- Number of Stories
- Basement Type
- Number of Garage Openings
- Exterior Construction
- Quality of Construction
- Current Condition
- Ground Elevation
- Main Floor Elevation
- Location of Low Openings
- Assigned Reach
- Notes/Description (as required)

Each structure (or distinct use type where multiple usages occur within a single building) was assigned a unique structure identification number following the identification of all structures for inventory using Geographic Information Systems (GIS) mapping. GIS has also been used to determine the footprint size and hence main floor area for each structure. Sizes have been adjusted as necessary, according to observations in the field, to account for the presence of decks, attached garages, and other ancillary structures adjoined to the main construction.

The original structure inventory was performed in 2006[1], but it has been updated periodically to account for changes in the study area. The most recent update was conducted in the summer of 2015. The 2015 update consisted of field observation of the structures in the study area and additional internet research to verify the occupancy type of nonresidential structures. The 2015 update recorded changes that have occurred since Hurricane Sandy damaged the area in 2012, which include the demolition or elevation of some structures. Photos taken of the structures in 2015 were compared to the information in the structure inventory database and updates where made where appropriate.

6.2 Structure Values

The replacement value for each structure was estimated based on the characteristics of the structure and RSMeans Square Foot Costs data. The characteristics of each structure were compared to similar structure types listed in RSMeans. The estimated dollar-per-square-foot values were multiplied by the structure size to estimate the replacement value. The resulting estimates were reviewed to ensure that the structure values were reasonable.

[1] Refer to the *Shrewsbury River Basin, New Jersey, Flood Control and Ecosystem Restoration Study, Interim Economics Submission for the Borough of Sea Bright* (July 2010) for details of the original structure inventory.

The depreciated replacement value of each structure was estimated based on the replacement value of the structure and the condition of the structure. The depreciation was based on a general factor related to the condition (Table C-9). The replacement value was multiplied by the depreciation factor to estimate the depreciated replacement value of the structure.

Table C-9: Depreciation factor.

Condition	Factor
New	1.00
Excellent	0.94
Good	0.85
Average	0.72
Fair	0.55
Poor	0.36
Dilapidated	0.20

6.3 Water Surface Elevations

Two WSEL models were developed to represent flooding related to the alternatives. An "exterior" conditions model was developed to represent general flooding conditions from the Shrewsbury River. The exterior conditions were used to evaluate damages for the No Action Alternative, the nonstructural alternatives, and when flooding would exceed the design level of the structural alternatives.

An "interior" conditions model was developed to represent flooding inside the line of protection of the floodwall alternatives. The interior conditions accounted for local rainfall runoff and wave action that would overtop a floodwall and result in flooding within the protected area.

Tidal inundation is expected to increase gradually over time in direct relation to the anticipated rise in relative sea level. Based on long-term trends measured at Sandy Hook, a 0.014 foot (ft) per year increase is anticipated, resulting in a 0.7 ft increase in WSEL over the 50-year period of analysis. To account for sea level rise, 0.7 ft was added to the WSELs of the exterior conditions for the future conditions.

Because of recent breach and dune restoration activities, storm surge and wave action from the ocean side of Sea Bright were not evaluated. The beach and dune restoration activities were assumed to provide appropriate storm risk management as to not influence the economic analysis of flooding from the Shrewsbury River.

6.4 Depth-Damage Functions

All structures in the study area were assigned a depth-damage function (DDF) that represents structure and content damage as a percent of the structure's depreciated replacement value and depth of inundation. Residential structures were assigned generic DDFs based on EGM 04-01, Generic Depth-Damage Relationships for Residential Structures with Basements, and EGM 01-03, Generic Depth-Damage Relationships for Residential Structures without Basements. Per the memoranda, content value was set to equal the depreciated replacement value of the structure.

Nonresidential structures in the study area were assigned DDFs based on data developed during the Passaic River Basin Study (PRB). The PRB DDFs were originally developed in 1982 as part of the Passaic River Basin Feasibility Study in northern New Jersey. The functions were later updated in 1995. For the PRB DDFs, content value was set to equal the depreciated replacement value of the

structure. The PRB functions were considered applicable due to the broadly similar nature of the building stock in the study area and the Passaic River Basin, their proximity (the two areas are approximately 25 miles apart), and the relatively small size of the inventory did not warrant the development of project-specific DDFs.

The DDFs also included functions that captured “Other” damages. Other damages generally include landscaping, vehicles, storage sheds, garage, clean up, and extra housing costs. Other damages were also calculated as a percentage of structure value.

6.5 Damage Estimation

The flood damage calculations were performed using the Hydrologic Engineering Center’s Flood Damage Analysis (HEC-FDA) software, version 1.4. The WSELs, DDFs, and structure data were imported into HEC-FDA. HEC-FDA took into consideration the change in WSEL from sea level rise and a discount rate of 3.125 percent to estimate the equivalent annual damages (EAD) for each alternative. For the No Action Alternative and the nonstructural alternatives, the exterior WSEL model was used to estimate the EAD.

For the structural alternatives, two HEC-FDA models were developed – one model estimated the EAD based on the WSELs from the exterior model and the other to account for interior flooding. For the exterior conditions HEC-FDA model, the tie-off elevations for the structural alternatives were set at a stage of 6 ft (NAVD), which is the low point of line of protection. The analysis of exterior and interior stages indicated that they would meet or cross each other above elevation 6 ft. Based on Shrewsbury Project Performance with target stage 6 ft tie-off elevation for interior drainage, residual damage was set to correspond with the median annual exceedance probability of 0.0403 (24.8 years). The respective tie-off stages have been derived for the structural alternatives individually based on data provided in Final Interior WSEL by USACE. The EAD from each model were added together to estimate the total with-project damages for each structural alternative.

HEC-FDA adds Monte Carlo simulation capabilities and incorporates uncertainty associated with key inputs to compute the EAD. The following areas of uncertainty were incorporated into the HEC-FDA model:

- stage-frequency for each flood event
- first floor elevation
- depreciated structure and contents value
- DDFs

Chapter 7: Evaluation of Alternatives

The alternatives were evaluated based on their costs and benefits to determine the economic viability of each alternative. The alternatives were evaluated based on a 3.125 percent discount rate and a period of analysis of 50 years (2020 – 2070).

7.1 Costs of Alternatives

The initial construction costs and the operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) costs of each alternative were estimated using MCASES II and/or engineering judgement. Table C-10 summarizes the initial construction costs and OMRR&R.

Table C-10: Alternative costs.

Alternative	Implementation Cost	Average Annual Implementation Cost	OMRR&R*	Total Average Annual Cost
Alternative F1	$12,596,000	$501,000	$212,000	$713,000
Alternative F2	$13,089,000	$521,000	$219,000	$740,000
Alternative F3	$13,164,000	$524,000	$223,000	$747,000
Alternative F4	$14,669,000	$584,000	$243,000	$827,000
Alternative NS 1A (w/ringwalls)	$9,913,000	$394,000	$14,000	$408,000
Alternative NS 1B (w/o ringwalls)	$283,000	$11,000	$0	$11,000
Alternative NS 2A (w/ringwalls)	$44,162,000	$1,757,000	$45,000	$1,802,000
Alternative NS 2B (w/o ringwalls)	$7,891,000	$314,000	$0	$314,000
Alternative NS 3A (w/ringwalls)	$73,993,000	$2,944,000	$74,000	$3,018,000
Alternative NS 3B (w/o ringwalls)	$14,641,000	$583,000	$0	$583,000
Ringwall 1	$5,660,000	$225,000	$7,000	$232,000
Ringwall 2	$2,840,000	$113,000	$3,000	$116,000
Ringwall 3	$3,856,000	$153,000	$5,000	$158,000
Ringwall 4	$5,981,000	$238,000	$6,000	$244,000
Ringwall 5	$1,843,000	$73,000	$6,000	$79,000
Ringwall 6	$2,026,000	$81,000	$2,000	$83,000
Ringwall 8	$2,927,000	$116,000	$4,000	$120,000
Ringwall 9	$2,880,000	$115,000	$3,000	$118,000
Ringwall 10	$1,958,000	$78,000	$2,000	$80,000
Ringwall 11	$3,702,000	$147,000	$4,000	$152,000
Ringwall 18	$2,599,000	$103,000	$3,000	$106,000

* Note: The removable ringwall alternatives have OMRR&R costs associated with deployment prior to an event and removal following an event.

7.2 Benefits of Alternatives

The benefits of the with-project alternatives are the reduction in damages in relation to the No Action Alternative. The results of the HEC-FDA models were used to estimate the damages for each alternative and the benefits of the with-project alternatives. Table C-11 presents the EAD (i.e., residual flood damages) for each alternative[2].

[2] Damages from interior drainage issues for ringwalls have not been evaluated, but any damage is anticipated to be negligible.

Table C-11: Equivalent annual damages for alternatives.

Alternative	EAD (exterior model)	EAD (interior model)	Total EAD
No Action	$1,533,000		$1,533,000
Alternative F1	$888,000	$166,000	$1,054,000
Alternative F2	$888,000	$137,000	$1,025,000
Alternative F3	$888,000	$83,000	$971,000
Alternative F4	$888,000	$58,000	$946,000
Alternative NS 1A (w/ringwalls)	$1,257,000		$1,257,000
Alternative NS 1B(w/o ringwalls)	$1,526,000		$1,526,000
Alternative NS 2A (w/ringwalls)	$481,000		$481,000
Alternative NS 2B (w/o ringwalls)	$1,138,000		$1,138,000
Alternative NS 3A(w/ringwalls)	$230,000		$230,000
Alternative NS 3B (w/o ringwalls)	$949,000		$949,000
Ringwall 1	$1,360,000		$1,360,000
Ringwall 2	$1,485,000		$1,485,000
Ringwall 3	$1,493,000		$1,493,000
Ringwall 4	$1,460,000		$1,460,000
Ringwall 5	$1,501,000		$1,501,000
Ringwall 6	$1,522,000		$1,522,000
Ringwall 8	$1,474,000		$1,474,000
Ringwall 9	$1,504,000		$1,504,000
Ringwall 10	$1,411,000		$1,411,000
Ringwall 11	$1,473,000		$1,473,000
Ringwall 18	$1,523,000		$1,523,000

Table C-12 presents the benefits for each with-project alternative, which is the reduction in the EAD from the No Action Alternative.

Table C-12: Annual benefits of with-project alternatives.

Alternative	Annual Benefits
Alternative F1	$479,000
Alternative F2	$508,000
Alternative F3	$562,000
Alternative F4	$587,000
Alternative NS 1A (w/ringwalls)	$276,000
Alternative NS 1B (w/o ringwalls)	$7,000
Alternative NS 2A(w/ringwalls)	$1,052,000
Alternative NS 2B (w/o ringwalls)	$395,000
Alternative NS 3A (w/ringwalls)	$1,303,000
Alternative NS 3B (w/o ringwalls)	$583,000
Ringwall 1	$172,000
Ringwall 2	$48,000
Ringwall 3	$40,000
Ringwall 4	$73,000
Ringwall 5	$32,000
Ringwall 6	$11,000
Ringwall 8	$59,000
Ringwall 9	$29,000
Ringwall 10	$122,000
Ringwall 11	$60,000
Ringwall 18	$10,000

7.3 Results of Evaluation

The project costs and benefits were evaluated for each alternative for an initial screening analysis. Costs and benefits were further refined later in the planning process. The net benefits and benefit-to-cost ratio (BCR) were reviewed to determine which alternative are economically justified (Table C-13).

Table C-13: Results of analysis of with-project alternatives.

Alternative	Costs	Benefits	Net Benefits	BCR
Alternative F1	$713,000	$479,000	-$234,000	0.7
Alternative F2	$740,000	$508,000	-$232,000	0.7
Alternative F3	$747,000	$562,000	-$185,000	0.8
Alternative F4	$827,000	$587,000	-$241,000	0.7
Alternative NS 1A (w/ringwalls)	$408,000	$276,000	-$132,000	0.7
Alternative NS 1B(w/o ringwalls)	$11,000	$7,000	-$4,600	0.6
Alternative NS 2A (w/ringwalls)	$1,802,000	$1,052,000	-$751,000	0.6
Alternative NS 2B (w/o ringwalls)	$314,000	$395,000	$81,000	1.3
Alternative NS 3A (w/ringwalls)	$3,018,000	$1,303,000	-$1,715,000	0.4
Alternative NS 3B (w/o ringwalls)	$583,000	$583,000	$1,000	1.0
Ringwall 1	$232,000	$172,000	-$60,000	0.7
Ringwall 2	$116,000	$48,000	-$68,000	0.4
Ringwall 3	$158,000	$40,000	-$118,000	0.3
Ringwall 4	$244,000	$73,000	-$172,000	0.3
Ringwall 5	$79,000	$32,000	-$47,000	0.4
Ringwall 6	$83,000	$11,000	-$72,000	0.1
Ringwall 8	$120,000	$59,000	-$61,000	0.5
Ringwall 9	$118,000	$29,000	-$89,000	0.2
Ringwall 10	$80,000	$122,000	$42,000	1.5
Ringwall 11	$152,000	$60,000	-$92,000	0.4
Ringwall 18	$106,000	$10,000	-$96,000	0.1

Based on the results of the analysis, most large- and small-scale structural and widespread nonstructural alternatives do not appear to warrant Federal interest. This initial screening showed that of the alternatives, Alternative NS 2 is the plan that maximizes net benefits. Ringwalls were individually considered in a last-added analysis to reduce residual risk. Many different ringwall designs were considered. Of the ringwalls in Alternative NS 2, one ringwall had positive annual net benefits of $42,000. Ringwall #10 is located around two attached structures, and would be up to 7 feet tall. The ringwall was added to Alternative NS 2.

When evaluating the alternatives, the analysis only considered reduction in damage to residential and commercial structures and their contents. Damages to structures and contents are generally the largest benefit category of a flood damage reduction study. The other benefit categories identified in Chapter 1 were not evaluated, but as discussed, these damage categories are not anticipated to be significant for the study area. Therefore, it is believed that the majority of the benefits were captured. While additional analysis may help to refine the results, it would most likely not change the outcome of the analysis.

Chapter 8: Tentatively Selected Plan

The benefits of implementing the alternatives represent flood damages avoided by the project. Benefits were calculated as the difference in damages before and after project implementation. Benefits were then amortized over a 50-year period (2020 through 2069) to identify equivalent annual benefits using October 2015 price levels and a discount rate of 3.125 percent.

8.1 Selection of the Tentatively Selected Plan

Based on the evaluation of the structural and nonstructural alternatives (Table C-13), the Alternative NS 2B w/o ringwalls had the greatest net benefits. In addition, the Ringwall 10 alternative also had positive net benefits and the benefits were incremental to Alternative NS 2B. Therefore, the Tentatively Selected Plan (TSP) is comprised of both the Alternative NS 2B and the Ringwall 10 alternatives. Based on additional information, the TSP was revised to remove three structures from consideration. As a result, the TSP includes the elevation of 34 structures and the use of a deployable ringwall around 2 adjacent structures.

8.2 Evaluation of the Tentatively Selected Plan

A more detailed cost estimate of the TSP was completed using MCASES II. The fully funded project cost is $12,109,000 and is cost shared: 65 percent federally funded and 35 percent non-federal. These costs include the initial first cost of $11,140,687 (Table C-14) for construction, including lands and damages, design, supervision and associated administration costs. In addition, the escalation to midpoint of construction is included. This midpoint was determined assuming a start date of March 2019. In addition, annual OMRR&R costs are anticipated to be approximately $2,000.

Table C-14: Construction Cost of the Tentatively Selected Plan

Description	Total Cost
11 Floodwalls	$1,214,416
19 Buildings, Grounds, and Utilities	$7,603,174
Construction Estimate Totals	**$8,817,590**
01 Lands and Damages	$529,080
30 Planning, Engineering, and Design	$1,184,408
31 Construction Management	$609,609
Total First Cost	**$11,140,687**

The economic evaluation of the TSP was refined to account for the construction schedule. The following assumptions were made:

- Half of the implementation costs would be expended in 2019 and half in 2020
- Based on the completion of the ringwall in 2019, OMRR&R would begin in 2020

The benefits for the TSP were estimated in HEC-FDA for the elevations of the individual structures and the deployable ringwall. Table C-15 presents the results of the evaluation of the TSP.

Table C-15: Results of the tentatively selected plan.

Average Annual Cost	Annual OMRR&R	Total Annual Cost	Equivalent Annual Benefits	Net Benefits	Benefit-Cost Ratio	Interest During Construction
$450,000	$2,000	$452,000	$466,000	$14,000	1.0	$174,073

8.3 Risk and Uncertainty

While risk and uncertainty were incorporated in the HEC-FDA model, a more detailed analysis of the risk and uncertainty associated with various confidence intervals of net benefits and BCRs will be completed during optimization.

8.4 Regional Economic Development

Since the scope of this project is small, construction activities will have minimal impacts to regional economic development.

The reduction in flood/storm damages will help the region by assisting to maintain the current residential population and associated tax base. However, the TSP offers little protection to commercial businesses in the study area. These businesses will continue to incur flood/storm related damages as estimated under the No Action Alternative.

Shrewsbury River Basin, Sea Bright, New Jersey Coastal Storm Risk Management Feasibility Study

Draft Integrated Feasibility Report & Environmental Assessment

Appendix D: Real Estate

Shrewsbury River Basin, Sea Bright, New Jersey
Coastal Storm Risk Management Feasibility Study
Draft Integrated Feasibility Report & Environmental Assessment

Appendix D: Real Estate

Table of Contents

1. Preamble

Project Authorization: The current Shrewsbury River Basin, New Jersey Coastal Storm Risk Management feasibility study (Study) was authorized by a resolution of the U.S. House of Representatives Resolution dated May 7, 1997. Prior to Hurricane Sandy, the Study was close to completion, with the next milestone to be the Alternatives Formulation Briefing. The Study was included in Interim Report 2 in response to the Hurricane Sandy Disaster Relief Appropriations Act (P.L. 113-2), as a project under study to receive $1,000,000 for completion. A Federal Cost Sharing Agreement amendment for $1,000,000 to complete the feasibility study was executed on August 5, 2013.

Official Project Designation: Shrewsbury River Basin, New Jersey Coastal Storm Risk Management Feasibility Study

Project Location: The study area is located in downtown Sea Bright, Borough of Sea Bright, Monmouth County, New Jersey.

Non-Federal Sponsor: The non-Federal sponsor for this Project is the New Jersey Department of Environmental Protection (hereinafter referred to as "NJDEP" and/or the "Project Partner"). In accordance with the provisions of the Water Resources Development Act (WRDA) of 1996, the cost of the project will be 65 percent Federal and 35 percent non-Federal.

2. Statement of Purpose

This Real Estate Plan (the "REP") is prepared in support of the Shrewsbury River Basin, New Jersey, Coastal Storm Risk Management Feasibility Study.

3. Project Purpose and Features

a. Project Purpose:

The purpose of the Project is to manage and reduce the risk of flood damages to low-lying residential and commercial structures caused by coastal storm inundation.

b. Plan of Improvement:

The Project would meet this objective through the nonstructural coastal storm risk management of up to 34 structures. The targeted structures are generally one to two story structures, most being residential. The nonstructural coastal storm risk management action would consist of elevating all buildings within the 4 percent floodplain, as determined by ground elevation and all structures with a main floor elevation at or below +6.0 feet North American Vertical Datum of 1988 (NAVD88). The construction of the Project will be implemented on a voluntary basis in a single-construction phase.

The U.S. Army Corps of Engineers (USACE) utilized a community approach in formulating the coastal risk management plan. The community approach is based upon coordination with the USACE's National Floodproofing Committee, and avoids environmental justice issues, single-owner issues, and works well with the topography of the area. Using a community approach, rather than conducting incremental justification of each individual residence, the USACE looked at the community of houses with first floors below selected elevations.

The Project Partner will be responsible for implementing the Project. Nonstructural floodproofing measures will be offered to owners of eligible structures on a voluntary basis. Eligible structures will, in addition, have to meet the following criteria:

- Owner is willing to participate in the nonstructural program and execute a Floodproofing Agreement containing a restrictive covenant limiting development of the property below the determined elevation.
- Structure is safe, decent and sanitary condition
- Owner possesses clear title to the property
- Structure and appurtenant land is not contaminated with hazardous, toxic or radioactive waste or materials
- Owner does not owe taxes or other debts to any state or local government entity or to the Federal Government
- Owner has not previously received any disaster assistance for the elevation of the structure
- Property owner is willing to expend costs that may be necessary in connection with the elevation of the structure which are not eligible costs covered by the program (i.e. temporary housing during construction)

Structures categorized within the voluntary program will be elevated or flood proofed only with the owner's consent. Where owners are willing to participate, but structures do not meet the

program criteria, if cure is possible, owners will be afforded the opportunity to cure any defect in the structure, otherwise applications for ineligible structures will be denied.

Where owners of eligible properties elect to participate in the Project, the following process shall be implemented:

- Property owner deliver a completed application for structure elevation to the Project Partner. The application must be signed by all owners and lien-holders of the property and structure;
- Project Partner shall ensure property meets all eligibility criteria;
- Property owner shall submit to Project Partner proof of ownership and a current Elevation Certificate;
- Project Partner shall conduct a title search to verify clear title;
- Project Partner shall conduct a Phase I HTRW/asbestos investigation. All asbestos must be abated and disposed of properly.
- Floodproofing Agreement is executed by property owner and Project Partner and recorded with the Monmouth County clerk.
- Elevation of structure is completed.

c. Required Lands, Easements, and Rights-of-Way (LER):

Currently, the USACE New York District (CENAN) is awaiting nonstructural flood-proofing implementation guidance from USACE Headquarters. The forthcoming guidance may alter the real estate instruments used to enable construction of the Project. Pending receipt of further guidance, New York District offers the following tentative schedule of required LER. Upon further guidance, CENAN may need to revise this REP accordingly.

The Project will require up to 34 individual Rights of Entry ("ROE") and up to 34 Floodproofing Agreements. The 34 potential properties are identified in Exhibit B, "Required LER," and occupy 0.83 acres of land. ROEs will be required for the entire lot on the up to 34 properties identified for nonstructural flood proofing. The ROEs will serve to allow the Project Partner to enter into the property and investigate to ensure the property meets the eligibility criteria identified in section 3(b) above. This includes verifying the structure is in decent, safe and sanitary condition, and a Phase 1 HTRW investigation. In addition to Rights of Entry, the Project requires Floodproofing Agreements executed between property owner and Project Partner. The Floodproofing Agreement will provide the mechanism for the floodproofing work to occur, as well as a restrictive covenant limiting development on the property below a determined elevation. Lastly, the Project may implement an additional non-structural feature known as a Deployable Ringwall, which if implemented, will require the Project Partner to obtain an access agreement from the Boro that will allow the temporary non-structural ringwalls to be deployed on Boro owned property. The access agreement will need to be included in the Operations and Maintenance Manual and will run with the life of the project.

I. LER Summary:

The following chart summarizes the required LER for the Project:

Required Interest	Required Acres	Number of Parcels	Number of Owners	Acquisition Cost

		Acres Below the MHWM	Private	Public	Private	Public	
• **Right of Entry and Floodproofing Agreement**	0.83	0	34	0	34	0	0
Total:	**0.83**	**0**	**34**	**0**	**34**	**0**	**0**

d. Appraisal Information: This Project contemplates acquisition of up to 34 Rights of Entry and up to 34 Floodproofing Agreements. As the Project is voluntary in nature and no actual permanent interest on the property will be acquired, the ROEs and Floodproofing Agreements have no market value and no appraisal is required.

4. LER Owned by the Non-Federal Partner

The non-Federal Project Partner owns no parcels potentially required for the construction of the Project.

5. Non-Standard Estates

The Project does not require the use of any non-standard estates.

6. Existing Federal Projects

There are no existing Federal projects that lie either fully or partially within the LER required for the Project. However, there are existing Federal projects to the east along the Atlantic Ocean (Sandy Hook to Barnegat shore protection project); and to the west in Laurence Harbor, Keansburg, North Middletown and Port Monmouth. Studies for other potential Federal projects to the east and west of the project area along the coast of Raritan and Sandy Hook Bays and are still ongoing in Leonardo, Highlands, Union Beach, and Keyport.

7. Federally-Owned Land

No Federally-owned land is included within the Project's required LER.

8. Navigational Servitude

None of the LER required for the Project lies below the mean high water line. Therefore, rights in the Federal navigational servitude do not pertain to this Project.

9. Maps

The Project real estate maps are provided in Exhibits "A" herein.

10. Induced Flooding

The Project will not induce flooding.

11. Baseline Cost Estimate for Real Estate

An itemized BCERE is provided in Exhibit "D" in Micro-Computer Aided Cost Estimating System (MCACES) format with estimated real estate costs. The following is a summary of the Project's estimated real estate costs:

SUMMARY OF ESTIMATED REAL ESTATE COSTS:		
01 ACCOUNT LANDS AND DAMAGES (NON FED)	Cost	Total
Non-Federal Admin. ----------	$440,900	
Non-Federal Lands----------	$0	
Subtotal:		**$440,900**
20% Contingency	$96,680	
01 ACCOUNT TOTAL		**$529,080**
30 ACCOUNT – PROJECT MANAGEMENT COSTS (FED)		
Federal Admin ----------	$41,250	
Subtotal:		**$41,250**
20% Contingency	$8,250	
30 ACCOUNT TOTAL		**$49,500**
TOTAL ESTIMATED REAL ESTATE PROJECT COST		**$578,580**

12. Public Law 91-646, Uniform Relocation Assistance

Property owners and occupants of eligible residential structures who willingly participate in the residential elevation program are not considered displaced persons (in accordance with 49 CFR Part 24), and therefore are not entitled to receive relocation assistance benefits. However, displaced tenants of eligible residential structures to be elevated, may be eligible for temporary relocation assistance benefits in accordance with Uniform Relocation Assistance and Real Property Acquisition Policies for Federal and Federally Assisted Programs of 1970 (49 CFR 24.101(a)(2) for additional detail. Eligible tenants that temporarily relocate would be reimbursed for the cost of temporary alternate housing, meals and incidentals (such as laundry services), and the fees for disconnection and connection of utilities at the temporary residence. Alternate housing could be hotels or apartments, depending upon availability in the community. All temporary housing costs would need to be approved in advance by the Non Federal Sponsor. Hotel costs, and meals and incidental expenses would be reimbursed based on the applicable General Services Administration per diem rates. Apartment costs would be based on market rents.

Estimated temporary relocation costs for tenants is based on the following assumptions:

- The U.S. Census Bureau estimates the home ownership rate in Monmouth County at 75.2%. Based on this assumption, 9 of 35 residential structures will be occupied by tenants. The other 2 structures are commercial, and thus have no residential tenants.
- The U.S. Census Bureau estimates the average household size in New Jersey at 2.68 individuals.

- General Services Administration per diem housing rate of $103.00 per day, and long term meals and incidental expenses per diem rate of $42.00 per day
- Total estimated moving expenses of $1,000 per displaced household

The estimated temporary relocation benefits combined with the estimated moving expense payment yields an estimated temporary relocation cost of approximately $21,400 per displaced tenant household. The total estimated relocation assistance benefits paid in support of the Project including 20 percent contingency are approximately **$128,400**.

13. Minerals and Timber Activity

There are no present or anticipated mineral activities or timber harvesting within the LER required for the Project.

14. Land Acquisition Experience and Capability of the Non-Federal Project Partner

The Project Partner maintains the legal and professional capability and experience to acquire the LER in support of the Project. They have condemnation authority and other applicable authorities that may apply if necessary to support acquisition measures. They have successfully acquired the real estate for the Elberon to Loch Arbour reach of the Atlantic Coast of New Jersey, Sandy Hook to Barnegat Inlet, Section I Beach Erosion Control Project.

The Non-Federal Project Partner Capability Assessment Checklist is provided in Exhibit "E." The assessment checklist has been coordinated with the Project Partner: however, the Project Partner has provided no response to the assessment. It has been completed based on the Project Partner's past and current performance on other USACE cost-shared civil works projects.

15. Zoning

No application or enactment of local zoning ordinances is anticipated in lieu of, or to facilitate, the acquisition of LER in connection with the Project.

16. Schedule of Acquisition

Milestone	Date
Project Partnership Agreement Execution	September 2018
Project Partner's Notice to Proceed with Acquisition	September 2018
Authorization for Entry for Construction	January 2019
Certification of Real Estate	February 2019
Ready to Advertise for Construction	February 2019

17. Facility / Utility Relocations

The Project will not require the relocation of any facilities or utilities.

18. Hazardous, Toxic, and Radioactive Waste (HTRW)

There are no known contaminants or HTRW issues associated with the LER required for the Project; however, the Project Partner will conduct Phase 1 environmental assessments all

potential structures to verify the absence of asbestos, lead paint, or other such contaminants posing a health hazard. Presence of such contaminants will render a structure ineligible for floodproofing.

19. Project Support

Local officials and residents appear to be supportive of the Project. No opposition has been expressed by public or private persons or organizations on the implementation of the proposed Project. Implementation of the nonstructural flood proofing contemplated by the Project will be conducted on a voluntary basis and support from affected property owners is critical to the Project's success.

20. Notification to Non-Federal Project Partner

A formal written notification of the risks (as outlined in paragraph 12-31, Chapter 12, ER 405-1-12, Real Estate Handbook, 20 Nov 85) associated with acquiring the LER for this project prior to the full execution of the PPA through letter dated January 14, 2014.

21. Other Issues

There are no known historical sites within and or adjacent to the LER required for the project.

22. Point of Contacts

The points of contact for this real estate plan is Supervisory Realty Specialist Erica Labeste at (917) 790 8461 (email: Erica.A.Labeste@usace.army.mil) or the undersigned at (917)790-8430 (email: Noreen.D.Dresser@usace.army.mil).

23. Recommendations

This Real Estate Plan has been prepared in accordance with Chapter 12, ER 405-1-12, Real Estate Handbook, 20 NOV 85, as amended. It is recommended that this report be approved.

NOREEN DEAN DRESSER
Chief, Real Estate Division
Real Estate Contracting Officer

EXHIBIT “A”
REAL ESTATE MAP

Figure D-1: TSP overview of structures.

Figure D-2: TSP structures - Group 1.

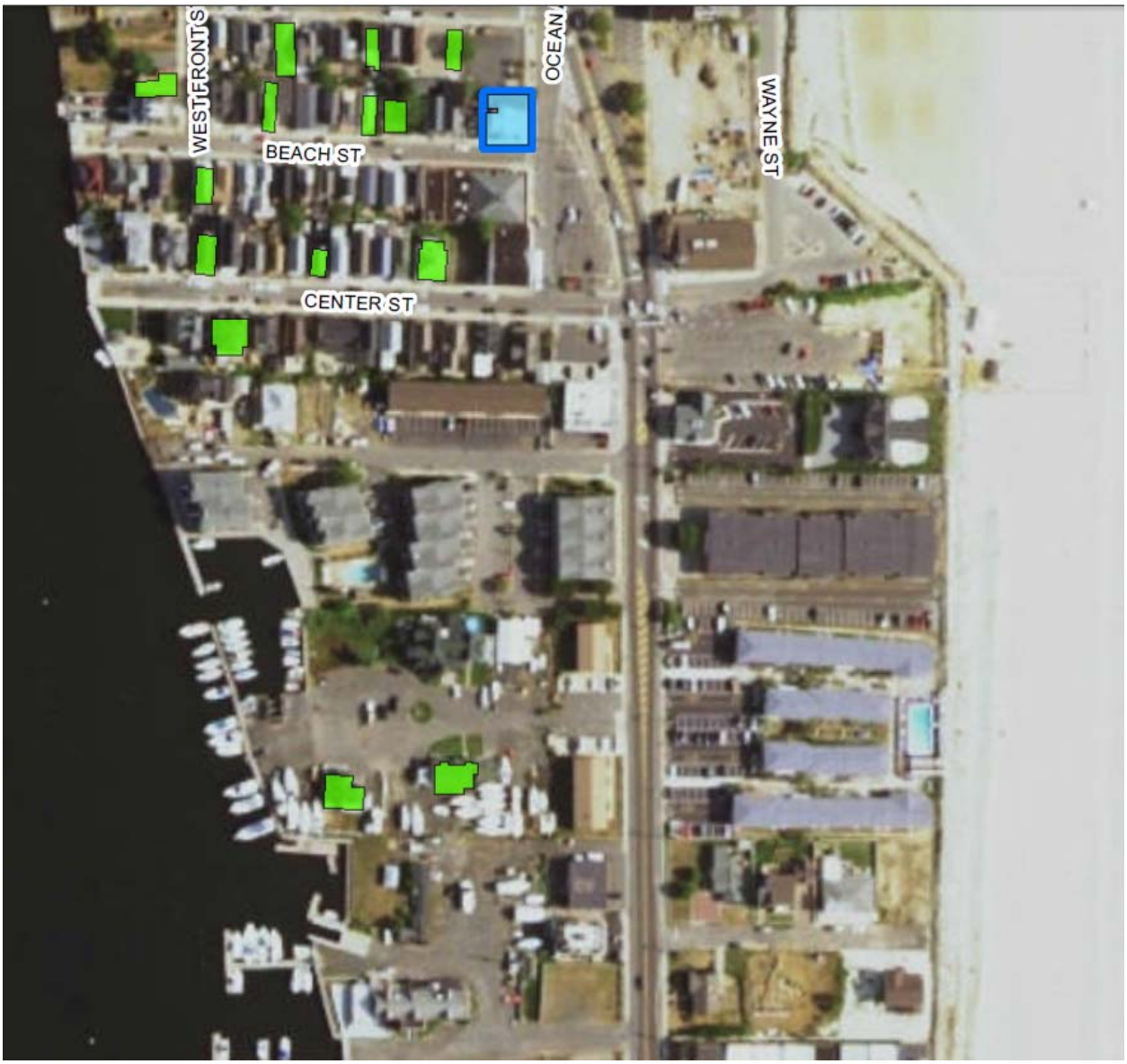


Figure D-3: TSP structures - Group 2.

EXHIBIT “B”
REQUIRED LER

SHREWSBURY RIVER BASIN,SEA BRIGHT, NEW JERSEY
COASTAL STORM RISK MANAGEMENT FEASIBILITY STUDY
REQUIRED LER

24. No.	25. Structure ID	26. Ownership Priv. or Gov .	27. Lot Size (sq. ft.)	28. Lot Size (acres)	29. Estate Required	30. Acreage Required
1	22	Private	763	0.02	ROE and Floodproofing Agreement	0.02
2	28.03	Private	948	0.02	ROE and Floodproofing Agreement	0.02
3	30	Private	661	0.02	ROE and Floodproofing Agreement	0.02
4	31	Private	742	0.02	ROE and Floodproofing Agreement	0.02
5	32	Private	1835	0.04	ROE and Floodproofing Agreement	0.04
6	41	Private	586	0.01	ROE and Floodproofing Agreement	0.01
7	44	Private	3621	0.08	ROE and Floodproofing Agreement	0.08
8	46.01	Private	755	0.02	ROE and Floodproofing Agreement	0.02
9	47	Private	839	0.02	ROE and Floodproofing Agreement	0.02
10	51	Public	796	0.02	ROE and Floodproofing Agreement	0.02
11	53	Private	1620	0.04	ROE and Floodproofing Agreement	0.04
12	56	Private	663	0.02	ROE and Floodproofing Agreement	0.02
13	66	Private	644	0.01	ROE and Floodproofing Agreement	0.01
14	70	Private	1251	0.03	ROE and Floodproofing Agreement	0.03
15	72	Private	930	0.02	ROE and Floodproofing Agreement	0.02
16	74	Private	661	0.02	ROE and Floodproofing Agreement	0.02
17	75	Private	713	0.02	ROE and Floodproofing Agreement	0.02
18	77	Private	549	0.01	ROE and Floodproofing Agreement	0.01
19	78	Private	1556	0.04	ROE and Floodproofing Agreement	0.04
20	80	Private	651	0.01	ROE and Floodproofing Agreement	0.01
21	81	Private	858	0.02	ROE and Floodproofing Agreement	0.02
22	84	Private	740	0.02	ROE and Floodproofing Agreement	0.02
23	86	Private	1443	0.03	ROE and Floodproofing Agreement	0.03
24	90	Private	1109	0.03	ROE and Floodproofing Agreement	0.03
25	93	Private	892	0.02	ROE and Floodproofing Agreement	0.02
26	97	Private	759	0.02	ROE and Floodproofing Agreement	0.02

27	98	Private	976	0.02	ROE and Floodproofing Agreement	0.02
28	106	Private	851	0.02	ROE and Floodproofing Agreement	0.02
29	117	Private	1510	0.03	ROE and Floodproofing Agreement	0.03
30	122	Private	588	0.01	ROE and Floodproofing Agreement	0.01
31	127	Private	1017	0.02	ROE and Floodproofing Agreement	0.02
32	132	Private	1717	0.04	ROE and Floodproofing Agreement	0.04
33	156	Private	1665	0.04	ROE and Floodproofing Agreement	0.04
34	157	Private	1630	0.04	ROE and Floodproofing Agreement	0.04
		TOTAL:	47104	0.83		0.83

EXHIBIT “C”
STANDARD ESTATES
AND
SAMPLE FLOODPROOFING AGREEMENT

RIGHT OF ENTRY FOR SURVEY AND EXPLORATION
(Standard Estate No. 20)

An assignable easement, in, on, over and across the land described in Exhibit "A" for a period of ( ) months beginning with the date possession of the land is granted to the United States, consisting of the right of the United States, its representative, agents, contractors and assigns to enter upon said land to survey, stake out, appraise, make borings; and conduct tests and other exploratory work necessary to the design of a public works project; together with the right to trim, cut, fell, and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles as required in connection with said work; subject to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowner(s), their heirs, executors, administrators, successors and assigns, all such right, title, interest and privilege as may be used and enjoyed without interfering with or abridging the rights and easement hereby acquired.

Sample Floodproofing Agreement

TRACT NO. [TRACT]
SHREWSBURY RIVER BASIN, NEW JERSEY
COASTAL STORM RISK MANAGEMENT PROJECT

WHEREAS, pursuant to Public Law 96-367 (Title II, Section 202, of the Energy and Water Development Appropriation Act, 1981), as amended, and pursuant to the provisions of the Project Partnership Agreement (hereinafter referred to as the "PPA") dated [DATE] between the United States of America (hereinafter sometimes referred to as the "Government") and the New Jersey Department of Environmental Project (hereinafter sometimes referred to as the "NJDEP"), NJDEP has undertaken the implementation of the Shrewsbury River Basin coastal storm risk management project (hereinafter sometimes referred to as the "Project");

WHEREAS, implementation of the Project includes, inter alia, the floodproofing of certain structures so that the habitable floors thereof are raised to levels or protected by other means in such a manner which will protect the structures from certain flooding to the greater extent practicable by allowing the free movement of floodwater beneath and around the structures;

WHEREAS, pursuant to the PPA, the NJDEP has undertaken floodproofing and acquisitions of interests in land for and on behalf of the County;

WHEREAS, [PROPERTY OWNER]; (hereinafter sometimes referred to as the "Owner"), is the Owners of a certain parcel of land identified by the NJDEP as Tract No. [TRACT], and being the same land as that described in a deed from [ACQURIING TRANSACTION DESCRIPTION], which existing structure can and shall be floodproofed in compliance with this agreement and;

WHEREAS, it is the desire of the Owner to participate in and receive the benefits of the Project;

NOW, THEREFORE, THIS AGREEMENT AND GRANT made and entered into by and between [OWNER]; and the NJDEP, as aforesaid;

WITNESSETH, that for and in consideration of the premises and the mutual agreements and covenants hereinafter set forth;

1. The NJDEP, in conjunction with the Government, hereby agrees floodproof the subject structure through elevation of the structure. The Owner shall permit entry upon the property by an authorized Government contractor, and permit said contractor to modify the structure consistent with contractor design to be developed. The Owner shall further permit an inspection or inspections of the floodproofing work by the NJDEP, its contractors, assigns or representatives upon completion of the work, and/or at any time during the work's progress, to ensure that the work is acceptable to the NJDEP and has been satisfactorily performed to meet the Project's criteria as to design, construction, and protection. Provided, further, that the floodproofed structure shall not be located within the regulatory floodway. Provided, further, that, should the Owner incur any cost in excess of said amount, that cost shall be borne by the Owner unless such additional amount is expressly approved in writing by the Government as necessary for the purposes of flood damage reduction.

3. The Owner hereby agrees that the Owner shall not convey to any third party any interest in and to said land and the structures or create any liens thereon prior to completion of said floodproofing work and recordation of this Agreement by the Government in the land records of Monmouth County, New Jersey, without the prior written approval of the Government.

4. The Owner hereby acknowledges that the Government has made no warranties or guarantees whatsoever in connection with the Contractor or with the Contractor's ability to satisfactorily perform the work; and, that, as between the Government and the Owner, the Owner is solely responsible to arrange for the Contractor's satisfactory completion of the work in accordance herewith.

5. Further, that for and in the consideration aforesaid, the receipt and sufficiency of which are hereby acknowledged, the Owner, for herself and her heirs and assigns, do hereby GRANT, unto the NJDEP, and its assigns, the perpetual right, power, and privilege of access to said land and any structures thereon at all reasonable times considered necessary by the NJDEP, its contractors, assigns or representatives to ensure that this Agreement, its covenants and restrictions, and the intents and purposes of the project are being complied with by the Owner, for herself and her heirs and assigns.

6. The Owner, for herself and her heirs and assigns, hereby covenant and warrant to the NJDEP, and to its assigns forever, and agree, that no construction, alteration, or placement of structures of any kind or nature whatsoever on said land shall take place unless the lowest floor thereof to be used for human habitation, commercial or business purposes is elevated above [DETERMINED ELEVATION] feet mean sea level, and this restriction also prohibits the placement of water damageable material of any kind below the stated elevation of [DETERMINED ELEVATION] mean sea level, and any use of materials below this elevation must meet the requirement of “Flood Resistant Material” as defined in the Federal Emergency Management Agency’s (FEMA) FIA-TB-2(4/93)(Technical Bulletin 2-93) this restriction and requirement shall be specifically included in every instrument subsequent hereto conveying title to any interest in said land or structures thereon.

7. The Owner, for herself and her heirs and assigns, hereby covenant, warrant, and agree she will forever hold and save harmless and blameless the Government and the NJDEP, and its assigns, from any damages or injuries resulting either directly or indirectly from any floodproofing work and any flooding of said land or of the floodproofed structure.

8. The Owner, for herself and her heirs and assigns, recognize and agree that the grant hereby made to the NJDEP, and the covenants and restrictions herein, in connection with the Project, are necessary and appropriate to ensure the purposes of said Project, namely, as authorized by Section 202 of the Water Resources and Development Act of 1981, Public Law 96-367, as amended, to afford a level of protection against flooding at least sufficient to prevent any future losses from the likelihood of flooding as [LEVEL OF PROTECTION], whichever is greater; and, that for those purposes the NJDEP, and its assigns, shall forever have the right unchallenged by the Owner, and by the Owner’s heirs and assigns, to seek legal enforcement of all of the provisions contained herein, it being the intentions of the parties that said provisions shall attach to and run with the land forever.

9. It is further provided that the obligations of the Government herein are contingent upon the Owner obtaining, as may be acceptable to the Government, the consent of any lienholder or tenants to the terms of this Agreement and obtaining from any lienholder or tenants waivers,

releases, and/or subordinations of her rights in the premises to the extent necessary to accomplish the work and covenants and restrictions herein, as may be required by the Government.

IN WITNESS WHEREOF, the parties have executed this Agreement and Deed effective as of the date of acceptance hereof by the New Jersey Department of Environmental Protection.

_____
[OWNER NAME] Owner

_____
[OWNER NAME], Owner

ACKNOWLEDGEMENT

STATE OF _____

COUNTY OF _____

The foregoing instrument was acknowledged before me this ____ day of _____, [YEAR], by [OWNER NAME] and [OWNER NAME].

_____
NOTARY PUBLIC

My Commission Expires:

_____

ACCEPTED:

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROJECTION

By: _____ _____
[TITLE] DATE

ACKNOWLEDGEMENT

STATE OF NEW JERSEY

COUNTY OF MONMOUTH

On this _____ day of _____, [YEAR], the undersigned officer, personally appeared _____, [TITLE], New Jersey Department of Environmental Protection, known to me to be the person described in the foregoing Agreement and Deed, and acknowledged that he executed the same in the capacity therein stated and for the purposes therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

(Seal)

_____
NOTARY PUBLIC

My Commission Expires:

_____

THIS INSTRUMENT WAS PREPARED BY:

[NAME], Attorney
[ADDRESS 1]
[ADDRESS 2]

EXHIBIT “D”
BASELINE COST ESTIMATE FOR REAL ESTATE

	TOTAL PROJECT REAL ESTATE COSTS	Non-Federal	Federal	Project Cost
	Lands and Damages Cost Summary:			
	Incidental Costs (01A)	$440,900	$0	$440,900
	Real Estate Acquisition Costs (01B)	$0	$0	$0
	20% Contingency, Less Land Payments (01B1)	$88,180	$0	$88,180
01	**LANDS AND DAMAGES TOTAL**	$529,080	$0	**$529,080**
	Federal Project Management Cost Summary			
	Federal Project Management Costs (30)	$0	$41,250	$41,250
	20% Contingency, Less Land Payments (30)	$0	$8,250	$8,250
30	**PROJECT MANAGEMENT TOTAL**		$49,500	**$49,500**
01A	**INCIDENTAL COSTS**	**$440,900**	**$41,250**	**$482,150**
01A1	**Acquisition (Admin Costs)**	**$220,000**	**$25,000**	**$245,000**
01A1A	By Government (Gov't)		$10,000	
01A1B	By Non-Federal Sponsor (NFS)	$220,000		
01A1C	By Gov't on behalf of NFS			
01A2	**Survey**	**$11,000**	**$1,250**	**$12,250**
01A2A	By Gov't (In-house)			
01A2B	By Gov't (Contract)			
01A2C	By NFS	$11,000		
01A2D	By Gov't on behalf of NFS			
01A2E	Review of NFS		$1,250	
01A3	**Appraisal**	**$0**	**$0**	**$0**
01A3A	By Gov't (In-house)			
01A3B	By Gov't (Contract)			
01A3C	By NFS			
01A3D	By Gov't on behalf of NFS			
01A3E	Review of NFS			
01A4	**Title Services**	**$55,000**	**$2,500**	**$57,500**
01A4A	By Gov't (Contract)			
01A4B	By NFS	$55,000		
01A4C	By Gov't on behalf of NFS			
01A4D	Review of NFS		$2,500	

01A5	**Other Professional Services**	**$26,400**	**$2,500**	**$28,900**
01A5A	By the Gov't			
01A5B	By the NFS	$26,400		
01A5C	By Gov't on behalf of NFS			
01A5D	Review of NFS		$2,500	
01A6	**Closing Cost (4% of Land Payments-01C1)**	**$0**	**$0**	$0
01A6A	By Gov't			
01A6B	By NFS			
01A6C	By Gov't on behalf of NFS			
01A7	**PL 91-646 Assistance**	**$128,500**	**$0**	**$128,500**
01A7A	By Government			
01A7B	By NFS	$128,500		
01A7C	By Gov't on behalf of NFS			
01A7D	Review of NFS			
01A8	**Audit**	**$0**	**$10,000**	**$10,000**
01A8A	By Gov't		$10,000	
01A9B	By NFS			
01B	**REAL ESTATE ACQUISITION COSTS**	**$0**	**$0**	**$0**
01B1	**Land Payments**	**$0**	**$0**	
01B1A	By Government			
01B1B	By NFS			
01B1C	By Gov't on behalf of NFS			
01B2	**Damage Payments**	**$0**	**$0**	
01B2A	By Government			
01C2B	By NFS			
01C2C	By Gov't on behalf of NFS			
01B3	**PL 91-646 Payment**	**$0**	**$0**	
01B3A	By Government			
01B3B	By NFS			
01B3C	By Gov't on behalf of NFS			
01B4	**Condemnation**	**$0**	**$0**	
01B4A	By NFS			
01B5	**Facility / Utility Relocations**	**$0**	**$0**	
01B5A	By NFS			
01B6	**Disposals**	**$0**	**$0**	
01B6A	By Government			

01B6B	By NFS			
01B6C	By Gov't on behalf of NFS			

EXHIBIT “E”
NON-FEDERAL SPONSOR CAPABILITY ASSESSMENT CHECKLIST

ASSESSMENT OF NON-FEDERAL PROJECT PARTNERS'S
REAL ESTATE ACQUISITION CAPABILITY

SHREWSBURY RIVER BASIN, NEW JERSEY
COASTAL STORM RISK MANAGEMENT FEASIBILITY STUDY

I. Legal Authority.

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? Yes.

b. Does the sponsor have the power of eminent domain for this project? Yes.

c. Does the sponsor have "quick-take" authority for this project? Yes.

d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundary? No.

e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? No.

II. Human Resource Requirements.

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended? No.

b. If the answer to II.a is "yes," has a reasonable plan been developed to provide such training?

c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? Yes.

d. Is the sponsor's projected in-house staffing level sufficient considering its other workload, if any, and the project schedule? Yes.

e. Can the sponsor obtain contractor support, if required in a timely fashion? Yes.

f. Will the sponsor likely request USACE assistance in acquiring real estate? No.

III. Other Project Variables.

a. Will the sponsor's staff be located within reasonable proximity to the project site? Yes.

b. Has the sponsor approved the project/real estate schedule/milestones? Yes.

IV. Overall Assessment.

a. Has the sponsor performed satisfactorily on other USACE projects? Yes.

b. With regard to this project, the sponsor is anticipated to be: highly capable/fully capable/moderately capable/marginally capable/insufficiently capable. If sponsor is believed to be "insufficiently capable," provide explanation. Highly Capable.

V. Coordination.

a. Has this assessment been coordinated with the sponsor? Yes.

b. Does the sponsor concur with this assessment? Sponsor has not responded to this form.

Reviewed and approved by:

_____

Noreen Dean Dresser
Chief of Real Estate Division
Real Estate Contracting Officer
New York District Corps of Engineers

Shrewsbury River Basin, Sea Bright, New Jersey Coastal Storm Risk Management Feasibility Study

Draft Integrated Feasibility Report & Environmental Assessment

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Appendix E: Pertinent Correspondence & Environmental Documentation

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS, NEW YORK DISTRICT
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278-0090

March 23, 2016

Environmental Analysis Branch

Mr. Eric Schrading
Field Supervisor
U.S. Fish and Wildlife Service
New Jersey Field Office
4 East Jimmie Leeds Road, Unit 4
Galloway, New Jersey 08205-4465

Subject: Shrewsbury River Basin, NJ Coastal Storm Risk Management Feasibility Study.

Dear Mr. Schrading;

With the passage of the Hurricane Sandy Disaster Relief Appropriations Act of 2013 (Public Law 113-2), the U.S. Army Corps of Engineers has been given the authority and funding to complete ongoing coastal storm damage risk management projects and studies in the Northeast. As part of the planning process for the Shrewsbury River Basin, New Jersey Coastal Storm Risk Management Feasibility Study, the New York District (District) in partnership with the New Jersey Department of Environmental Protection (NJDEP) will be completing an Integrated Feasibility Study/Environmental Assessment. The project is needed to alleviate flood damages along the Shrewsbury River in downtown Sea Bright, New Jersey (Attachment 1). As part of this effort, the District, is contacting the US Fish and Wildlife Service for Endangered Species Act (ESA) and Fish and Wildlife Coordination Act (FWCA) coordination on this project, which will be included with the study's Environmental Assessment.

In 2002, the District coordinated with your office on at the initiation of the original study, which at that time consisted of a range of structural and non-structural alternatives, as well as the potential for ecosystem

restoration within the Shrewsbury River Basin (Attachment 2). In 2006, the Town of Sea Bright was identified as the focus of the study and the structural alternatives and ecosystem restoration were dropped from the study.

The tentatively selected plan is the elevation of 37 existing structures and the deployment of a removable flood wall system around one combined commercial/retail and residential structure. All activities associated with the elevation of structures will be confined to the building footprint (Attachment 3). The removable floodwall system will be deployed immediately surrounding the building. No project activities will involve any modification of areas along the bay or ocean.

The District has determined that no USFWS managed resources will be affected by this project. In 2002, the USFWS determined that the resources within what was then a larger study area included bald eagles, piping plover and sea beach amaranth. More recently, the review of the FWS Information Planning and Confirmation System (IPaC) shows potential impacts on two threatened species: piping plover and sea beach amaranth. As a result of its work on other projects, the District has extensively monitored both of these resources along the beach outside of the proposed project area. The proposed project area does not contain any habitat for these species.

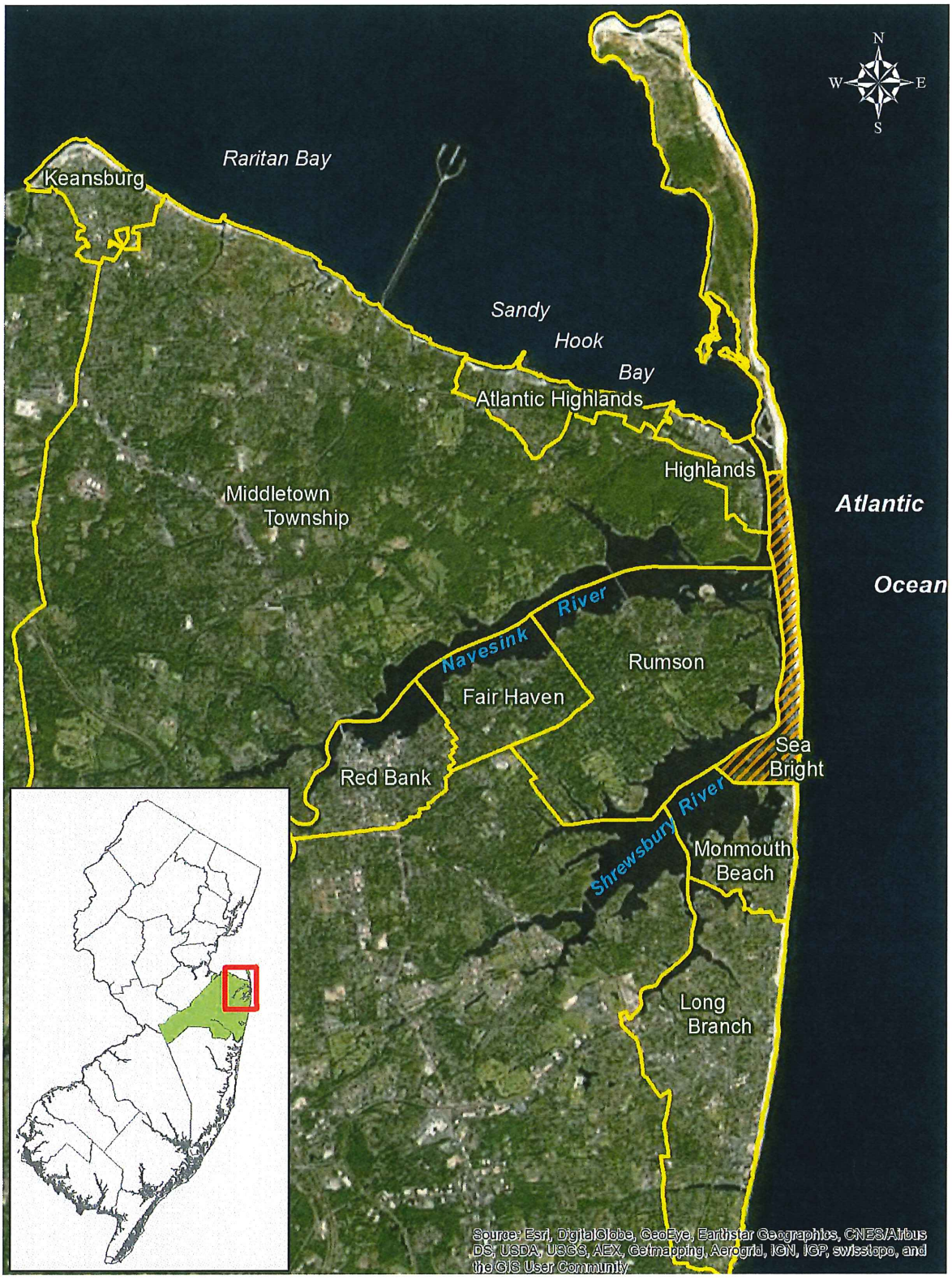
In addition, the National Wetland Inventory shows no wetlands in the proposed project area and there will be no in-water activities. Downtown Sea Bright area is a fully developed, closely spaced, low rise community with few trees and open spaces. The tentatively selected plan effects are further limited in that activities will only take place in the existing footprints of the 37 individual flood prone structures. The District has determined there is no effect on threatened and endangered species.

Pursuant to the Fish and Wildlife Coordination Act (FWCA of 1958, as amended (87 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the Corps is consulting with the Service to ensure that there is equal consideration for fish and wildlife resources during the planning of the Corps proposed project. If you have any questions or require additional information please contact Jeffrey Fry, Project Biologist at (917) 790 8616. Thank you for your consideration.

Sincerely,

Peter Weppler
Chief, Environmental Analysis Branch

Attachments



Attachment 1: Location of the Shrewsbury River Coastal Storm Risk Management Study Area

Attachment 2: USFWS Letter from July 2002

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Jersey Field Office
Ecological Services
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609/646 9310
Fax: 609/646 0352
http://njfieldoffice.fws.gov

In Reply Refer to:

FP-02/27

JUL 2 2002

Melissa Alvarez, Project Biologist
Planning Division
U.S. Army Corps of Engineers, New York District
Jacob Javitz Federal Building
New York, New York 10278-0900

Dear Ms. Alvarez:

This constitutes the comments of the U.S. Fish and Wildlife Service (Service) on the U.S. Army Corps of Engineers, New York District's (Corps) May 3, 2002 Notice of Intent (Federal Register, Vol. 67, No. 86, pp. 22414-22415) to prepare a draft Environmental Impact Statement (DEIS) pursuant to the National Environmental Policy Act (83 Stat. 852; 42 U.S.C. 4321 *et seq.*) (NEPA) for the Shrewsbury River Basin Flood Control and Ecosystem Restoration project, Monmouth County, New Jersey.

AUTHORITY

The following comments are provided under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 *et seq.*) (FWCA) and the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) (ESA), and are consistent with the intent of the Service's Mitigation Policy (Federal Register, Vol. 46, No. 15, Jan. 23, 1981). The Service's Mitigation Policy emphasizes that avoidance and minimization precede compensation, which is to be considered solely for unavoidable adverse impacts on fish and wildlife resources and supporting ecosystems. These comments do not constitute the Service's report pursuant to Section 2(b) of the FWCA, and do not preclude Service comments on forthcoming environmental documents pursuant to NEPA.

BACKGROUND

In our July 3, 2000 correspondence (PL-NY-00/24), the Service provided preliminary comments on the subject project in response to an April 2000 Public Notice announcing initiation of a Reconnaissance Phase Study. On April 4, 2002, the Service and the Corps met to discuss the Service's role in project planning, and satisfaction of FWCA requirements. On May 20, 2002, the Service participated in a preliminary scoping trip to observe potential ecosystem restoration sites in the field. The Service also attended the evening June 14, 2002 public scoping session in

Sea Bright Borough. The Service understands that the Corps will be forwarding a draft Scope of Work (SOW) to this office in the near future for Service assistance in project planning, including Planning Aid Letters and Reports. Through the SOW, the Service can provide information on the fish and wildlife resources within the study area, recommendations for avoiding and minimizing wildlife impacts from the proposed flood control project, assistance in prioritizing ecosystem restoration sites, and recommendations for restoration design.

GENERAL COMMENTS

Based on our May 20, 2002 site visit, this office recognizes the extreme degree of existing "hard" shore protection structures (*i.e.*, bulkheads) along Shrewsbury River within Sea Bright Borough. However, the Service strongly advocates non-structural alternatives as potential solutions for flood control, and encourages the Corps to give full consideration to the complete range of potential flood control alternatives during DEIS formulation. The Service recommends against construction of any new hard structures where none currently exist. Where a comprehensive analysis of alternatives determines that replacement or enhancement of existing hard structures is the preferred flood control solution, such structures should be designed to minimize disturbances to upland, wetland, and aquatic habitats.

The Service strongly supports the proposed ecosystem restoration within the Shrewsbury River Basin study area. Our July 3, 2000 letter emphasized the importance of this area to fish and wildlife resources including wintering waterfowl; migrant shorebirds and landbirds; resident, anadromous, and catadromous fish; and shellfish. To date, restoration alternatives have focused on Shrewsbury River Islands, the Navesink River Delta, and Little Silver Creek. The Service supports further investigation of these potential restoration sites, but also reiterates our July 3, 2000 recommendation to investigate removal of blockages to improve fish passage to upstream portions of the Shrewsbury River. The Service also recommends investigating the creation or enhancement of shallow-water (submerged aquatic vegetation beds) and intertidal (especially *Spartina* marsh and mud flat) habitats. The Service supports integration of the Corps ecosystem restoration planning with the ongoing New Jersey Department of Environmental Protection watershed management planning effort. The Service also recommends careful investigation of potential environmental contaminants concerns during restoration planning.

FEDERALLY LISTED SPECIES

The federally listed (threatened) bald eagle (*Haliaeetus leucocephalus*), piping plover (*Charadrius melodus*), and seabeach amaranth (*Amaranthus pumilus*), and the State-listed (endangered) least tern (*Sterna antillarum*) occur within the study area. In addition, the federally listed (threatened) plants swamp pink (*Helonias bullata*) and Knieskern's beaked-rush (*Rhynchospora knieskernii*) and the State-listed (endangered) plant New Jersey rush (*Juncus caesariensis*) occur further southwest within the Navesink drainage basin. Current information regarding federally listed and candidate species occurring in New Jersey is enclosed, as well as addresses of State agencies that may be contacted for current site-specific information regarding

federal candidate and State-listed species.

Threatened and endangered species and their habitats are afforded protection under Section 7(a)(2) of the ESA, which requires every federal agency, in consultation with the Service, to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. An assessment of potential direct, indirect, and cumulative impacts is required for all federal actions that may affect listed species. In the course of project planning, the Service will conduct informal consultation with the Corps to ensure that the selected flood control and ecosystem restoration alternatives will not adversely affect federally listed species.

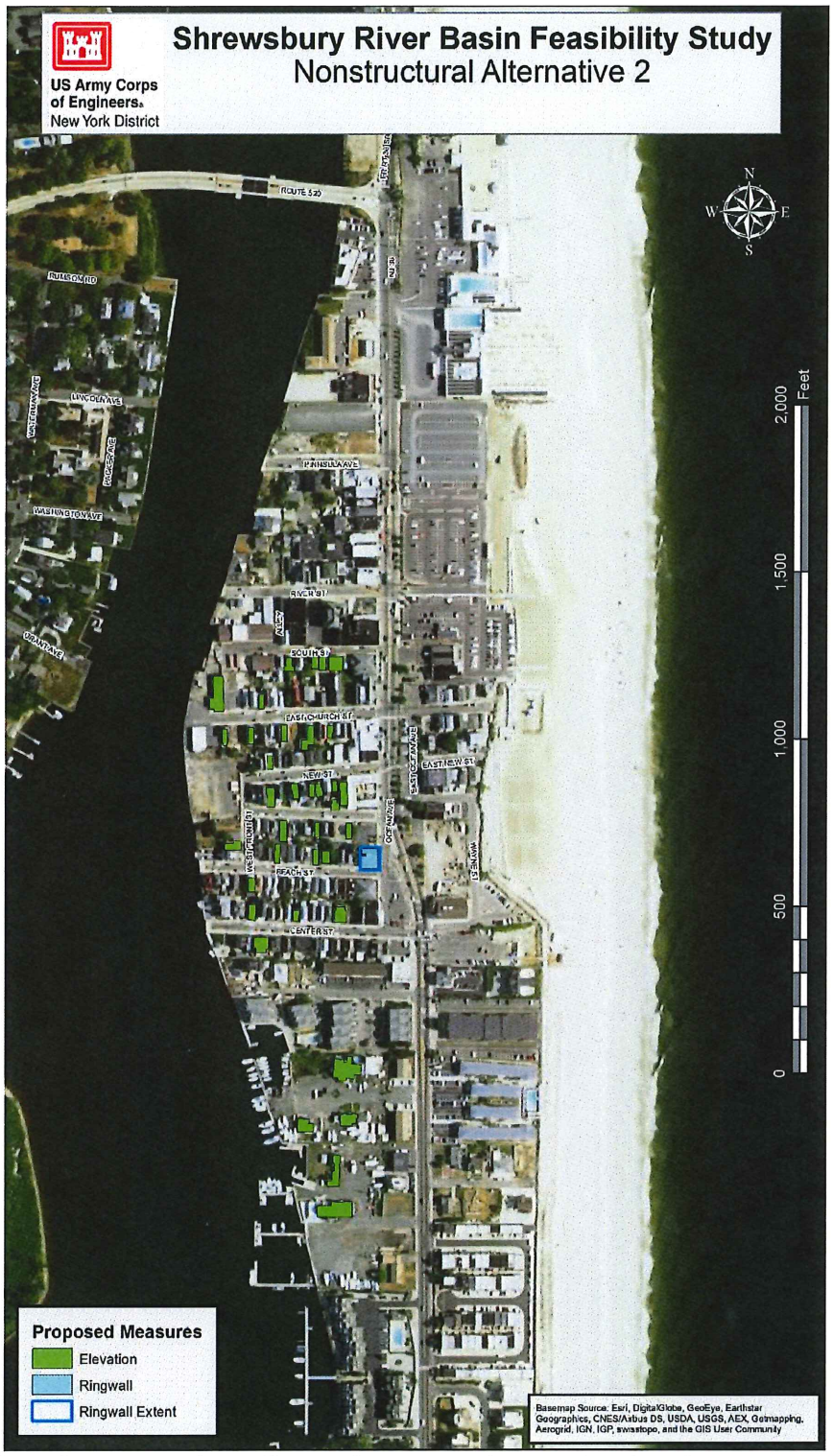
Section 7(a)(1) directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for endangered and threatened species. In furtherance of Corps responsibilities under Section 7(a)(1), the Service encourages the Corps to investigate potential ecosystem restoration opportunities that would benefit federally listed species. We also encourage any opportunities to benefit State-listed species. Through the SOW, the Service is available to assist the Corps in identifying such opportunities.

Please contact Wendy Walsh of my staff at (609) 646-9310, extension 48 to continue agency coordination pursuant to the FWCA, or if you have any questions regarding the above Service comments. We look forward to continued cooperation with the Corps to minimize wildlife resource impacts from the proposed flood control project, and to maximize benefits to wildlife resources from the proposed ecosystem restoration.

Sincerely,

John C. Staples
Assistant Supervisor

Enclosures



Attachment 3: Locations of proposed non-structural measures.

NEW JERSEY COASTAL ZONE MANAGEMENT EVALUATION
SHREWSBURY RIVER BASIN, SEA BRIGHT, NEW JERSEY
COASTAL STORM RISK MANAGEMENT FEASIBILITY STUDY

INTRODUCTION

The Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. §§1451-1466) was enacted by Congress in an effort to balance the often competing demands of growth and development with the protection of coastal resources. Its stated purpose is to "…preserve, protect, develop, where possible, to restore or enhance, the resources of the nation's coastal zone…". The Act established the framework for achieving this balance by encouraging the states to develop coastal zone management programs, consistent with minimum federal standards, designed to regulate land use activities that could impact coastal resources. The Coastal Zone Act Reauthorization Act Amendments of 1990 further strengthened the act by requiring the state programs to focus more on controlling land use activities and the cumulative effects of activities within designated coastal zones.

The State of New Jersey administers its Federally-approved coastal zone program through the Department of Environmental Protection, Land Use Regulation Program (LURP). Pursuant to the Federal CZMA, New Jersey has defined its coastal zone boundaries and developed policies to be utilized to evaluate projects within the designated coastal zone, as set forth in New Jersey's Rules on Coastal Zone Management (CZM) (N.J.A.C. 7:7, 7:7E, dated January 7, 2003). The Waterfront Development Law (N.J.S.A. 12:5-3) and related requirements (N.J.A.C. 7:7-3) provide the authority for issuance of permits for, among other activities the reconstruction (with or without expansion) of single family homes.

New Jersey's rules on Coastal Zone Management are employed by the State's Land Use Regulation Program in the review of permit applications and coastal decision-making; they address issues of location, use, and resources. New Jersey's rules provide for a balance between economic development, and coastal resource protection, recognizing that coastal management involves explicit consideration of a broad range of concerns, in contrast to other resource management programs that have a more limited scope of concern.

The proposed project is for a nonstructural coastal storm risk management project located within the designated coastal zone of New Jersey, in Sea Bright, Monmouth County. The following assessment identified the coastal zone management policies relevant to the proposed coastal storm risk management project.

DISCUSSION OF NEW JERSEY COASTAL ZONE MANAGEMENT POLICIES APPLICABLE TO THE PROPOSED PROJECT

The following section identifies the New Jersey CZM policies, identifies how they are applicable to the proposed project, and discusses the project issues relevant to each.

SUBCHAPTER 3 – SPECIAL AREAS

7:7E-3.2 SHELLFISH HABITAT
This policy generally limits disturbance of shellfish habitat.

The proposed project is not located in shellfish habitat and would not contaminate surface water; therefore this policy would not be applicable to the proposed project.

7:7E-3.3 SURF CLAM AREAS
This policy prohibits development that would destroy or contaminate surf clam areas.

The proposed project is not located in a surf clam area nor would it contaminate surface water, therefore this policy would not be applicable to the proposed project.

7:7E-3.4 PRIME FISHING AREAS
This policy prohibits sand or gravel submarine mining in prime fishing areas.

The proposed project does not involve submarine mining nor is it affecting tidal water areas and water‘s edge areas, which have a demonstrable history of supporting a significant local intensity of recreational or commercial fishing activity; therefore this policy would not be applicable to the proposed project.

7:7E-3.5 FINFISH MIGRATORY PATHWAYS
This policy prohibits development such as dams, dikes, spillways, channelization, tide gates, and intake pipes that would create physical barriers to migratory fish or degrade water quality such that it interferes with fish movement.

The proposed project would not create permanent physical barriers to migratory fish nor would it degrade water quality; therefore this policy would not be applicable to the proposed project.

7:7E-3.6 SUBMERGED VEGETATION HABITAT
This policy prohibits or restricts development at or near submerged vegetation habitats unless compensation efforts establish self-sustaining habitat for the appropriate species.

This policy would not be applicable since the proposed project is not located in water areas supporting or documented as previously supporting rooted, submerged vascular plants.

7:7E-3.7 NAVIGATION CHANNELS
This policy prohibits construction that would extend into a navigation channel or would result in the loss of navigability. This policy discourages the placement of structures within 50 feet of any authorized navigation channel, unless it can be demonstrated that the proposed structure will not hinder navigation. This policy requires appropriate mitigation measures for development which would cause terrestrial soil and shoreline erosion and siltation in navigation channels.

This policy would not be applicable since the project is not located on or near navigation channels.

7:7E-3.8 CANALS
This policy prohibits actions that would interfere with boat traffic in canals used for navigation, defined as navigation channels for boat traffic through land areas which are created by cutting and dredging or other human construction technique sometimes enlarging existing natural surface water channels.

This policy would not be applicable because the proposed project does not involve or affect navigation channels used for boat traffic through land areas.

7:7E-3.9 INLETS
This policy prohibits filling and discourages submerged infrastructure in inlets, which are natural channels through barrier islands allowing movement of fresh and salt water between the ocean and the back-bay system.

This policy would not be applicable because the proposed project is not located in an inlet.

7:7E-3.10 MARINA MOORINGS
This policy prohibits non-water dependent development in marina mooring areas and discourages any use that would detract from existing or proposed recreational boating use in marina mooring areas.

This policy would not be applicable since the proposed project does not involve development in any marina mooring areas nor does it detract from existing or proposed recreational boating use in marina mooring areas.

7:7E-3.11 PORTS
This policy prohibits actions that would preempt or interfere with port uses. Ports are water areas having, or lying immediately adjacent to, concentrations of shoreside marine terminals and transfer facilities for the movement of waterborne cargo (including fluids), and including facilities for loading, unloading and temporary storage.

This policy would not be applicable since the proposed project is not located in a port.

7:7E-3.12 SUBMERGED INFRASTRUCTURE ROUTES
This policy prohibits any activity that would increase the likelihood of submerged infrastructure damage or breakage, or interfere with maintenance operations.

This policy would not be applicable since the proposed project is not in an area with submerged infrastructure routes.

7:7E-3.13 SHIPWRECK AND ARTIFICIAL REEF HABITATS
This policy restricts the use of areas with shipwrecks and artificial reefs that would adversely affect the usefulness of the area as a fisheries resource.

This policy would not be applicable since there are no shipwrecks or artificial reef habitats in the proposed project area.

7:7E-3.14 WET BORROW PITS

This policy restricts the use and filling or wet borrow pits.

This policy would not be applicable since the proposed project does not contain nor will make use of any wet borrow pits.

7:7E-3.15 INTERTIDAL AND SUBTIDAL SHALLOWS
This policy discourages disturbance of shallow water areas (all permanently or temporarily submerged areas from the spring high water line to a depth of four feet below mean low water).

This policy would not be applicable since the proposed project is not located on or near intertidal or sub-tidal shallows.

7:7E-3.16 DUNES
This policy prohibits development on dunes and removal of vegetation from dunes.

This policy would not be applicable since the proposed project is not located on or near dunes.

7:7E-3.17 OVERWASH AREAS
This policy restricts development in over-wash areas, an area subject to accumulation of sediment, usually sand, that is deposited landward of the beach or dune by the rush of water over the crest of the beach berm, a dune or a structure.

This policy would not be applicable since the proposed project is not located on over-wash areas.

7:7E-3.18 COASTAL HIGH HAZARD AREAS
This policy restricts development in coastal high hazard areas, flood prone areas subject to high velocity waters as delineated on FEMA maps. The coastal high hazard area is identified as Zone V on Flood Insurance Rate Maps (FIRMs).

A portion of the proposed project is located in coastal high hazard areas. The proposed project will increase protection to and will meet the standards of the housing use rules (§ 7:7E-7.2) in the Coastal High Hazard Areas, therefore this project would be consistent with this policy.

7:7E-3.19 EROSION HAZARD AREAS
This policy prohibits development in erosion hazard areas under most circumstances, to protect public safety. Erosion hazard areas are shoreline areas that are eroding and/or have a history of erosion, causing them to be highly susceptible to further erosion, and damage from storms.

This policy would not be applicable since the proposed project is not located on shoreline areas.

7:7E-3.20 BARRIER ISLAND CORRIDOR
This policy restricts new development on barrier islands. Barrier island corridors are the interior portions of oceanfront barrier islands, spits and peninsulas.

This policy would not be applicable because the proposed project will not be new development and only occur in the footprint of existing structures.

7:7E-3.21 BAY ISLANDS
This policy restricts development on bay islands, islands or filled areas surrounded by tidal waters, wetlands, beaches or dunes, lying between the mainland and barrier island.

This policy would not be applicable since the proposed project is not located on bay islands.

7:7E-3.22 BEACHES
This policy restricts development on beach areas.

This policy would not be applicable since the proposed project is not located on any beaches.

7:7E-3.23 FILLED WATER'S EDGE
This policy seeks to promote water dependent uses at areas along the waterfront that have been previously filled.

This policy would not be applicable since there are no areas of filled water's edge in the proposed project area.

7:7E-3.24 EXISTING LAGOON EDGES
This policy restricts development at lagoon edges.

This policy would not be applicable since the proposed project is not located along any lagoon edges.

7:7E-3.25 FLOOD HAZARD AREAS
This policy is designed to restrict development in flood hazard areas to ensure that the waterfront is not pre-empted by uses that could function equally at inland locations. The goal of this rule is to reduce losses of life and property resulting from unwise development of flood hazard areas, and allow uses compatible with periodic flooding.

The proposed project would involve elevating residential and commercial buildings in flood hazard areas to reduce flood damage. The proposed project would conform to the applicable design and construction standards; therefore the proposed project would be compatible with this policy.

7:7E-3.26 RIPARIAN ZONES
This policy restricts development in riparian zones around regulated waters.

The proposed project would conform to the requirements of flood hazard area permits and therefore would be compatible with this policy.

7:7E-3.27 WETLANDS
This policy restricts disturbance in wetland areas and requires mitigation if wetlands are destroyed or disturbed.

No wetland are found within the project area. All activities will occur within the structural footprint of existing buildings. The proposed project would be compatible with this policy.

7:7E-3.28 WETLAND BUFFERS
This policy restricts development in wetland buffer areas in order to protect wetlands.

The proposed project would not have any impact on wetland buffers

7:7E-3.29 (RESERVED)

7:7E-3.30 (RESERVED)

7:7E-3.31 COASTAL BLUFFS
This policy restricts development on coastal bluffs.

This policy would not be applicable since the proposed project is not located along any coastal bluffs.

7:7E-3.32 INTERMITTENT STREAM CORRIDORS
This policy restricts actions in intermittent stream corridors.

This policy would not be applicable since the proposed project is not located in intermittent stream corridors.

7:7E-3.33 FARMLAND CONSERVATION AREAS
This policy seeks to maintain and protect large parcels of land used for farming for farming or farm dependent uses.

This policy would not be applicable since the proposed project is not located near or on farmland conservation areas.

7:7E-3.34 STEEP SLOPES
This policy seeks to preserve steep slopes by restricting development in such areas.

This policy would not be applicable since the proposed project is not located on steep slopes.

7:7E-3.35 DRY BORROW PITS
This policy restricts the use and provides maintenance of dry borrow pits within acceptable limits.

This policy would not be applicable since the proposed project is not located near nor would it make use of dry borrow pit areas.

7:7E-3.36 HISTORIC AND ARCHAEOLOGICAL RESOURCES
This policy protects the value of historic and archaeological resources and may require cultural resource surveys and other protective measures.

The project, as proposed, will have no effect on historic resources as no historic resources have been identified in the project's Area of Potential Effect.

7:7E-3.37 SPECIMAN TREES
This policy seeks to protect specimen trees.

This policy would not be applicable since the proposed project does not contain any known specimen trees.

7:7E-3.38 ENDANGERED OR THREATENED WILDLIFE OR PLANT SPECIES HABITATS
This policy restricts development in endangered or threatened wildlife or vegetation species habitat areas.

A known nesting site of the federally listed (threatened) piping plover (*Charadrius melodus*) is located within 3.5 miles of the proposed project area. There is also a known occurrence of the federally listed (threatened) plant seabeach amaranth (*Amaranthus pumilus*) located within 3.5 miles of the proposed project area.

The proposed project activities will be outside of beach habitat and not within areas suitable for threatened and endangered species. USFWS review is on-going and is expected with the conclusion that the proposed project is not likely to have an adverse effect on piping plovers and seabeach amaranth.

The anticipated level of ground disturbance from elevating 34 residential buildings would be centered around the existing foundations and within the same boundaries of prior disturbance and therefore would not adversely impact habitat, either directly or through secondary impacts on the relevant site or in the surrounding area. The deployment of removable flood wall around one commercial building would be contained within the property parcel and would entail minimum disturbance.

The USACE would continue to coordinate with the USFWS, NMFS, and/or the NJDEP to remain consistent with this policy.

7:7E-3.39 CRITICAL WILDLIFE HABITATS
This policy discourages development that would adversely affect critical wildlife habitat.

The proposed project would not affect any critical wildlife habitats.

7:7E-3.40 PUBLIC OPEN SPACE
This policy encourages new public open spaces and discourages development that might adversely affect existing public open space.

This policy would not be applicable since the proposed project does not affect public open space.

7:7E-3.41 SPECIAL HAZARD AREAS
This policy discourages development in hazard areas.

This policy would not be applicable since the proposed project does not affect special hazard areas.

7:7E-3.42 EXCLUDED FEDERAL LANDS
Federal lands are beyond the jurisdiction of the New Jersey Coastal Zone. New Jersey has the authority to review activities on Federal lands if impacts may occur in New Jersey's Coastal Zone.

This policy would not be applicable since the proposed project is not on the list of Excluded Federal Lands.

7:7E-3.43 SPECIAL URBAN AREAS
This policy seeks to encourage development that would help to restore the economic and social viability of certain municipalities that receive state aid.

This policy would not be applicable since the proposed project is not located in special urban areas.

7:7E-3.44 PINELANDS NATIONAL RESERVE AND PINELANDS PROTECTION AREA
This policy allows the Pinelands Commission to serve as the reviewing agency for actions within the Pinelands National Reserve.

This policy would not be applicable since the proposed project is not within the Pinelands National Reserve.

7:7E-3.45 HACKENSACK MEADOWLANDS DISTRICT
This policy allows the Hackensack Meadowlands Development Commission to serve as the reviewing agency for actions within the Hackensack Meadowlands District.

This policy would not be applicable since the proposed project is not within the Hackensack Meadowlands District.

7:7E-3.46 WILD AND SCENIC RIVER CORRIDORS
This policy recognizes the outstanding value of certain rivers in New Jersey by restricting development to compatible uses.

This policy would not be applicable since the proposed project is not located in any Wild and Scenic River Corridor.

7:7E-3.47 GEODETIC CONTROL REFERENCE MARKS
This policy discourages the disturbance of geodetic control reference marks.

This policy would not be applicable since the proposed project area does not contain any known geodetic control reference marks.

7:7E-3.48 HUDSON RIVER WATERFRONT AREA
This policy restricts development along the Hudson River Waterfront and requires development, maintenance, and management of a section of the Hudson Waterfront Walkway coincident with the shoreline of the development property.

This policy would not be applicable since the proposed project is not located in the Hudson River Waterfront Area.

7:7E-3.49 ATLANTIC CITY
This policy restricts development within the municipal boundary of the City of Atlantic City.

This policy would not be applicable since the proposed project is not located in Atlantic City.

7:7E-3.50 LANDS AND WATERS SUBJECT TO PUBLIC TRUST RIGHTS
This policy restricts development that adversely affects lands and waters subject to public trust rights.

This policy would not be applicable since the proposed project is not located on lands and waters subject to public trust rights.

SUBCHAPTER 3A – STANDARDS FOR BEACH AND DUNE ACTIVITIES

7:7E-3A.1 STANDARDS APPLICABLE TO ROUTINE BEACH MAINTENANCE

This policy sets standards for routine beach maintenance to include debris removal and clean-up; mechanical sifting and raking; maintenance of access ways; removal of sand from street ends, boardwalks/promenades and residential properties; the repair or reconstruction of existing boardwalks, gazebos and dune walkover structures; and limited sand transfers from the lower beach to the upper beach or alongshore (shore parallel).

This policy would not be applicable since the proposed project does not involve routine beach maintenance.

7:7E-3A.2 STANDARDS APPLICABLE TO EMERGENCY POST-STORM BEACH RESTORATION

This policy sets standards for beach restoration activities, as part of an emergency post-storm recovery.

This policy would not be applicable since the proposed project would not involve any form of beach restoration.

7:7-3A.3 STANDARDS APPLICABLE TO DUNE CREATION AND MAINTENANCE

This policy sets standards and restrictions for dune creation and maintenance projects.

This policy would not be applicable since the proposed project would not involve dune creation and maintenance.

7:7E-3A.4 STANDARDS APPLICABLE TO THE CONSTRUCTION OF BOARDWALKS

This policy sets standards for boardwalk construction to address engineering concerns.

This policy would not be applicable because boardwalks would not be constructed as part of the proposed project.

SUBCHAPTER 3B – WETLAND MITIGATION PROPOSALS

7-7E-3B.1 MITIGATION PROPOSAL REQUIREMENTS

This section details the requirements of a wetland mitigation proposal.

This policy would not be applicable because the proposed project would not impact wetlands, and therefore does not require any wetland mitigation.

SUBCHAPTER 3C – IMPACT ASSESSMENT FOR ENDANGERED AND THREATENED WILDLIFE

This section details the performance and reporting standards for impact assessments for endangered and threatened wildlife species. If required, based on updated relevant agency correspondence, habitat/impact assessments for endangered and threatened species will conform to the performance and reporting standards listed.

This policy restricts development in endangered or threatened wildlife or vegetation species habitat areas.

A known nesting site of the federally listed (threatened) piping plover (*Charadrius melodus*) is located within 3.5 miles of the proposed project area. There is also a known occurrence of the federally listed (threatened) plant seabeach amaranth (*Amaranthus pumilus*) located within 3.5 miles of the proposed project area.

The proposed project activities will be outside of beach habitat and not within areas suitable for threatened and endangered species. USFWS review is on-going and is expected with the conclusion that the proposed project is not likely to have an adverse effect on piping plovers and seabeach amaranth.

The anticipated level of ground disturbance from elevating 34 residential buildings would be centered around the existing foundations and within the same boundaries of prior disturbance and therefore would not adversely impact habitat, either directly or through secondary impacts on the relevant site or in the surrounding area. The deployment of removable flood wall around one commercial building would be contained within the property parcel and would entail minimum disturbance.

The USACE would continue to coordinate with the USFWS, NMFS, and/or the NJDEP to remain consistent with this policy.

SUBCHAPTER 4 – GENERAL WATER AREAS

7:7E-4.2 to 4.22 ACCEPTABILITY CONDITIONS FOR USES

This section set forth the requirements for specific types of development within General Water Areas, which are located below either the spring high water line or the normal water level of non-tidal water.

This policy does not apply since the proposed project would not involve any of the specific types of development listed.

SUBCHAPTER 5 – GENERAL LAND AREAS

This policy sets forth requirements for impervious cover and vegetative cover on sites in the upland waterfront development area and CAFRA areas.

The proposed project would be located in an area designated as CAFRA Urban Lands. The elevation any selected residential buildings would remain within the existing footprint of the development. Any residential building that would be rebuilt within the same parcel would abide by the applicable impervious cover limits and vegetative cover percentages as determined under N.J.A.C. 7:7E-5B. The proposed project is compatible with this policy.

SUBCHAPTER 6 – GENERAL LOCATION RULES

7:7E-6.1 LOCATION OF LINEAR DEVELOPMENT

This policy sets conditions for acceptability of linear development (e.g., roads, walkways, pipelines).

This policy would not be applicable since there is no linear development associated with the proposed project.

7:7E-6.2 BASIC LOCATION
This policy states that the NJDEP may reject or conditionally approve a project for safety, protection of certain property, or preservation of the environment.

The proposed project would involve protecting private property through a nonstructural engineering alternative.

7:7E-6.3 SECONDARY IMPACTS
This policy sets the requirements for secondary impact analysis from the effects of additional development likely to be constructed as a result of the approval of a particular proposal.

This policy would not be applicable because the proposed project would not involve additional development.

SUBCHAPTER 7- USE RULES

7:7E-7.2 HOUSING USE
This policy sets standards for housing construction in coastal areas.

The proposed project involves the elevation of buildings on the existing footprint. The proposed project would not include new construction or expansion of the existing footprint. The proposed project is compatible with this policy.

7:7E-7.3 RESORT/RECREATIONAL USE
This policy sets standards for resort and recreational uses in the coastal area.

This policy would not be applicable because the proposed project does not involve resort or recreational uses.

7:7E-7.3A MARINA DEVELOPMENT
This policy sets standards for marina development in the coastal area.

This policy would not be applicable since the proposed project does not include marina development.

7:7E-7.4 ENERGY USE
This policy sets standards for energy uses in coastal areas.

This policy would not be applicable because the proposed project does not involve new construction that would require long-term energy use.

7:7E-7.5 TRANSPORTATION USE
This policy sets standards for roads, public transportation, footpaths and parking facilities in coastal areas.

This policy would not be applicable since the proposed project does not involve construction of roads, public transportation, footpaths and/or parking facilities.

7:7E-7.6 PUBLIC FACILITY USE
This policy sets standards for public facilities (e.g., solid waste facilities) in coastal areas.

This policy would not be applicable since the proposed project does not involve construction of a public facility.

7:7E-7.7 INDUSTRY USE
This policy sets standards for industrial uses in coastal areas.

This policy would not be applicable because the proposed project does not involve construction of industrial facilities.

7:7E-7.8 MINING USE
This policy sets standards for mining in coastal areas.

This policy would not be applicable because the proposed project does not involve mining.

7:7E-7.9 PORT USE
This policy sets standards for port uses and port-related development.

This policy would not be applicable because the proposed project does no involve port use or the construction of a port.

7:7E-7.10 COMMERCIAL FACILITY USE
This policy sets standards for commercial facilities such as hotels, and other retail services in the coastal zone.

This policy would not be applicable since the proposed project does not involve construction of commercial facilities.

7:7E-7.11 COASTAL ENGINEERING
This policy sets standards to protect the shoreline, maintain dunes, and provide beach nourishment.

This policy would not be applicable because the proposed project is a nonstructural alternative that involves the elevation of buildings; the proposed project does not involve coastal engineering. This policy would not be applicable to the proposed project.

7:7E-7.12 DREDGED MATERIAL PLACEMENT ON LAND
This policy sets standards for disposal of dredged materials.

This policy would not be applicable since the proposed project does not involve any dredged material placement.

7:7E-7.13 NATIONAL DEFENSE FACILITIES USE
This policy sets standards for the location of defense facilities in the coastal zone.

This policy would not be applicable since the proposed project does not involve national defense facilities.

7:7E-7.14 HIGH RISE STRUCTURES
This policy sets standards for high rise structures in the coastal zone.

This policy would not be applicable because the proposed project does not involve high rise structures.

SUBCHAPTER 8 – RESOURCE RULES

7:7E-8.2 MARINE FISH AND FISHERIES
This policy sets standards of acceptability so as to cause minimal feasible interference with the reproductive and migratory fish patterns of estuarine and marine species of finfish and shellfish.

This policy would not be applicable because the proposed project would be limited to the 19 residential property parcels and therefore would have no adverse impact on the natural functioning of marine fish or any New Jersey based marine fisheries.

7:7E-8.3 (RESERVED)

7:7E-8.4 WATER QUALITY
This policy sets standards for coastal development to limit effects on water quality.

Short-term water quality impacts resulting from construction activities are expected and are anticipated to be localized to the vicinity of the raised buildings. No long-term impacts to the offshore or near-shore water quality are anticipated as a result of the proposed project.

7:7E-8.5 SURFACE WATER USE
This policy sets standards for coastal development so as to limit effects on surface water.

Short-term water quality impacts resulting from construction activities are expected and are anticipated to be localized proximal to the footprints of the residential buildings.

7:7E-8.6 GROUNDWATER USE
This policy sets standards for coastal development so as to limit effects on groundwater supplies.

This policy would not be applicable because the proposed project does not involve or effect future use of groundwater supplies.

7:7E-8.7 STORMWATER MANAGEMENT
This policy sets standards for coastal development so as to limit effects of storm-water runoff.

The proposed project would not involve or effect future storm-water management.

7:7E-8.8 VEGETATION
This policy sets standards for coastal development while protecting native vegetation.

The proposed project would preserve, to the maximum extent practicable, existing vegetation within the proposed project area.

7:7E-8.9 (RESERVED)

7:7E-8.10 AIR QUALITY
This policy sets standards for coastal development with requirements that projects must meet applicable air quality standards.

Emissions to construct the proposed project do not exceed threshold levels for any emission variable. As a result, a Clean Air Act "Record of Non-Applicability" is to be assembled. The proposed project would be consistent with this policy since it is not anticipated to increase air emissions above existing levels.

7:7E-8.11 PUBLIC TRUST RIGHTS
This policy requires that coastal development adjacent to the waterfront provide perpendicular and linear access to the waterfront to the extent practicable, including both visual and physical access.

The proposed project involves the elevation of 34 residential buildings and the deployment of removable flood wall around one commercial building all within the same existing property lines. The proposed project would not impede public access to the waterfront; therefore the proposed project is consistent with this policy.

7:7E-8.12 SCENIC RESOURCES AND DESIGN

This policy sets standards that new coastal development be visually compatible with its surroundings.

The proposed project would not affect views of the natural and/or built landscape; therefore the proposed project is consistent with this policy.

7:7E-8.13 BUFFERS AND COMPATABILITY OF USES

This policy sets standards for adequate buffers between compatible land uses.

The proposed project is compatible with adjacent land uses; therefore, it would be consistent with this policy.

7:7E-8.14 TRAFFIC

This policy sets standards that restrict coastal development that would disturb traffic systems.

The proposed project would make every effort possible to mitigate temporary impacts on traffic during construction. The proposed project would have no permanent effects on traffic and therefore is consistent with this policy.

7:7E-8.15 THROUGH 8.20 (RESERVED)

7:7E-8.21 SUBSURFACE SEWAGE DISPOSAL SYSTEMS

This policy sets standards for subsurface sewage disposal systems in the coastal zone.

This policy is not applicable because the proposed project does not involve sewage disposal.

7:7E-8.22 SOLID AND HAZARDOUS WASTE

This policy sets standards for handling and disposal of solid and hazardous waste.

This policy is not applicable because the proposed project does not involve solid and hazardous waste.