Scituate Harbor Sustainability and Resilience Master Plan

DRAFT FOR REVIEW

Final Report

May 2020

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Town of Scituate
Metropolitan Area Planning Council

Scituate Harbor Sustainability and Resilience Master Plan

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Executive Summary

About the Project

The Town of Scituate had developed this Scituate Harbor Sustainability and Resiliency Master Plan to guide future growth, conservation and infrastructure enhancements over the next 25 years. The overall goal of the project was to create a near-term and long-term village district conceptual master plan with a focus on flood resilience in the Scituate Harbor business district. The district master plan was developed through a public process engaging the community's residents, business owners, property owners, and leadership and is based upon research, analysis, and community involvement. All of these efforts have helped to articulate and define the vision statement to frame the strategies and recommendations of the resilience master plan.

Vision Statement

Create a cohesive vision for Scituate Harbor that will build resilience incrementally, through coordinated and layered measures, to meet flood challenges projected for mid-century (2050) and beyond. Near-term and long-term actions should create more flood resilience while creating additional benefits to the district that will:

- **Enhance economic vitality** by protecting strengthening or expanding the key assets of the district.
- **Improve the public realm** for pedestrian and bicycle safety and more sustainable infrastructure.
- **Strengthen community and civic gathering** to reinforce Scituate Harbor as the heart of the community.
- **Improve district parking** to offer more convenient access and functionality.
- **Maintain cost effectiveness** by strategically weighing the advantages and disadvantages of investments
- **Retain the ability to implement** current and future actions to further protect and improve the district.
- **Reduce the negative impacts** that may result from an approach to resilience investments including environmental, social, economic, or community impacts.

Plan Objectives

The preferred approach of the incremental elevation of the coast and an adaptation of the coastal edge at the perimeter of the district was defined through this process and is documented in the master plan. In addition to increasing the resilience of the district, the improvements identified are also intended to strengthen the district according to the following objectives:

Provide immediate actions to mitigate the impact of climate change - recommendations and an implementation plan for coordinated and immediate actions that can be undertaken by the Town and others to reduce risks and impacts for the district

Encourage economic development - recommendations to enhance economic development, retail activity, and arts and cultural vitality to enhance livability while integrating resiliency

Enhance transportation infrastructure - recommendations for the improvement of the everyday functionality and resilience of multi-modal circulation, walkability, and parking to enhance district access

Beautify the area - recommendations for the beautification and enhanced resilience of coastal parks, streets, streetscape, and other public realm or infrastructure systems

Lay out long-term strategies for the district - strategies for longer term investments in infrastructure and property that will allow the district to thrive in the coming decades

Context and Overview

Scituate Harbor is a vital business district in Scituate that, in many ways, is the most active heart of commerce, services, and community in the Town. As with other coastal locations in Scituate, Scituate Harbor has seen firsthand the impacts of coastal flooding and storm-related damage. The Town's Municipal Vulnerability Plan identified improving resilience in Scituate Harbor as one of the top three priorities for the Town. The coastal business district is centered on Front Street and is focused on the area from First Parish Road to the south and Beaver Dam Road to the north.

Scituate Harbor Coastal Flood Risks

The risk of coastal flooding in Scituate Harbor is not hypothetical or a concern relegated to the future. Recent coastal storms have shown the vulnerability and impact of coastal flood risks in the district. Winter Storm Riley in 2018 brought flooding to the district that reached across Front Street with several feet of water. The current FEMA flood maps show flood risks from a 1% annual chance storm to impact much of the business district. The coastal flood risks even appear more frequently with nuisance tidal flooding that impacts portions of the Cole Parkway parking lot. Projections for sea level rise resulting from climate change will only increase the risk and frequency of coastal flooding in the district.

Resilience Recommendations

The resilience recommendations for Scituate Harbor focus on a incremental elevation and adaptation of the coastal perimeter of the district with an elevated sea wall edge that integrates an elevated Harborwalk, new coastal amenities and open space features. This approach is combined with the protection and improvement of the Kent Street marshes, the banks of the Satuit Brook, and green infrastructure in the district to retain protection from these natural assets and improve water quality of the harbor. All of these investments are focused on reducing the pathways of ocean water into the business district.

Specific Scituate Harbor resilience recommendations include:

- A new elevated waterfront park amenity at Cole Parkway that provides flood protection
- New seating and coastal amenities along an elevated Scituate Harborwalk from Cole Parkway to the Town Pier
- Elevated sea walls and bulkhead edges that exist in the district
- Floodproofing the waterside of buildings along Front Street and adding infrastructure for deployable floodgates between gaps in buildings
- Exploration of roadway infrastructure resilience improvements at the Satuit Brook bridge and Edward Foster Road and bridge

(SUMMARY TO BE EXPANDED)

Introduction

In 2018 the Town of Scituate's Climate Vulnerability and Action Plan (Municipal Vulnerability Plan, MVP) was approved and the Town became MVP certified by the Massachusetts Executive Office of Energy and Environmental Affairs. The MVP plan is titled *Building a Resilient Scituate*. The MVP Plan states that Scituate is proactive and committed to resilience. The top climate action priorities identified by the plan were those receiving the most significant concern and sense of urgency for Scituate's future livability and were recommended to be implemented as soon as possible. The top climate action priority was to "address the vulnerability of coastal business districts." The recommendation was to bring together stakeholders including property owners, residents, businesses and municipal staff and officials for participatory visioning for a future with sea level rise and coastal flooding to assess risks and set a path for the waterfront's current and future resilience. Front Street was called out as a priority for this action.

Shortly thereafter, the Town of Scituate through the Planning Department and Department of Coastal Management and Flood Hazard Mitigation pursued grant funding for this study from the Executive Office of Energy and Environmental Affairs and convened this study with the intent of creating an overall conceptual plan and strategic resiliency action plan for the Scituate Harbor coastal business district. A district master plan is a powerful tool to set the direction for activity and investment by defining a shared vision with the many stakeholders and interests that define Scituate Harbor. The Town convened a Task Force that represents a variety of stakeholders and expert perspectives among members of the Town and hired the Metropolitan Area Planning Council (MAPC) to undertake the planning study.

The overall goal of the project is to create a short-term and long-term village district conceptual master plan for sustainability and resiliency in Scituate Harbor. The project will illustrate desired land use characteristics, building patterns and design, public realm elements (including streetscape and open spaces), and green infrastructure improvements. The district master plan presents recommendations that can be phased over the next 25 years, providing flexibility and balancing the economic and resiliency goals of the community out to about the year 2050.

This report documents the culmination of the efforts of this year-long study focused on the resilience of Scituate Harbor. The document has been designed to follow the study's process and presents information in a sequence similar to the community conversation that occurred through this study. The next section, *Process Overview*, outlines the structure of community engagement that occurred throughout the process and the input and guidance received throughout the study from members of the Scituate community. The *Scituate Harbor Coastal Flood Risks* section outlines the current data for present and future flood risks in Scituate Harbor and provides a

strong foundation of data on which to build the exploration of solutions and recommendations. The *Coastal Resilience Solutions* section offers a summary of the potential solutions that were presented to and explored with the community. These solutions were ultimately narrowed based upon engagement with the community and set the direction for the resilience recommendations for Scituate Harbor. Approaching climate resilience planning from the perspective of the community is critical to ensure the long term success for solving the multiple and complex challenges associated with building a more resilient future. The *Scituate Harbor Resilience Master Plan* section provides the resilience recommendations for Scituate Harbor. The *Implementation Priorities* section provides a listing of next steps organized by the timeframes in which they should be undertaken.

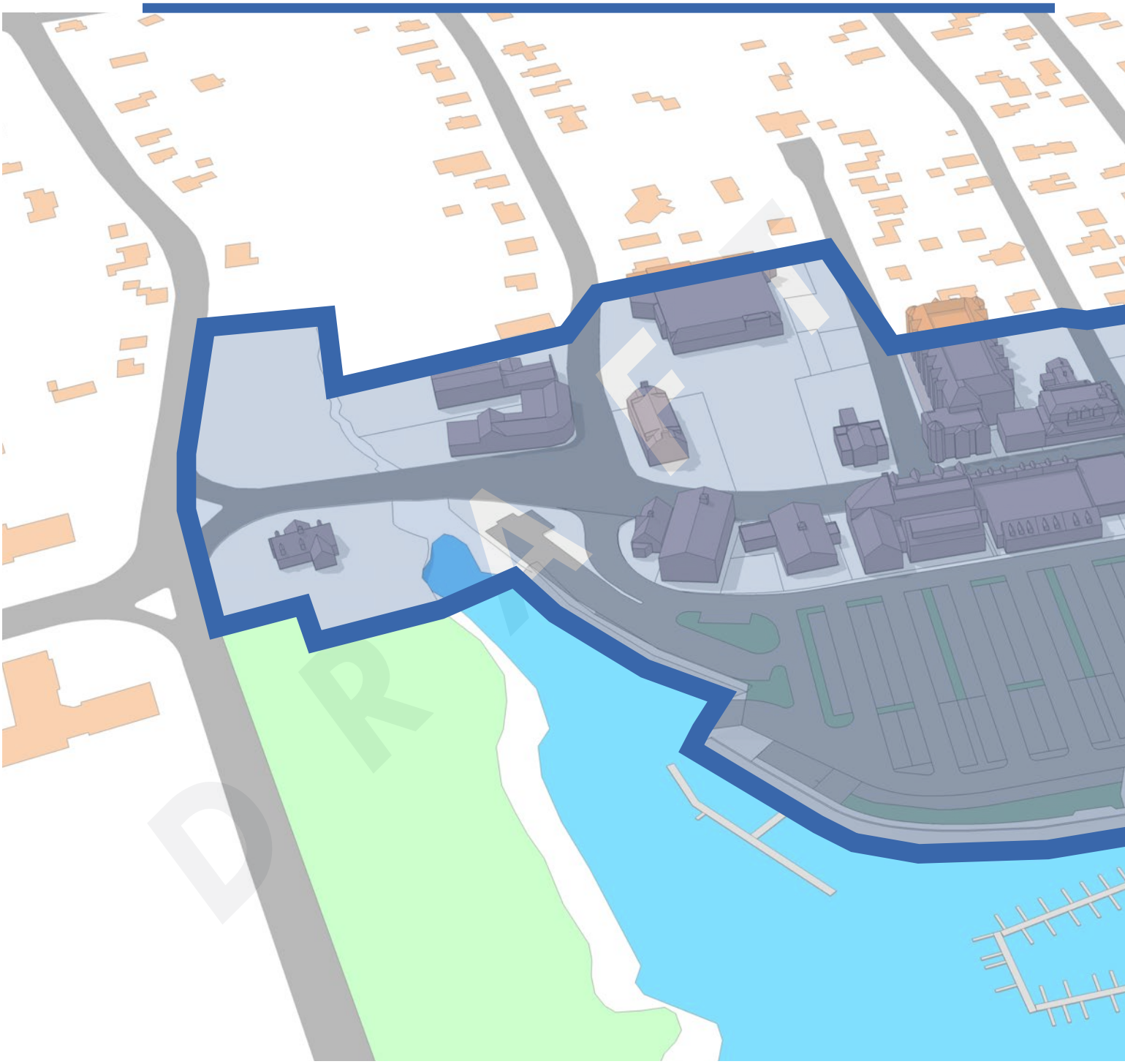
Project Context

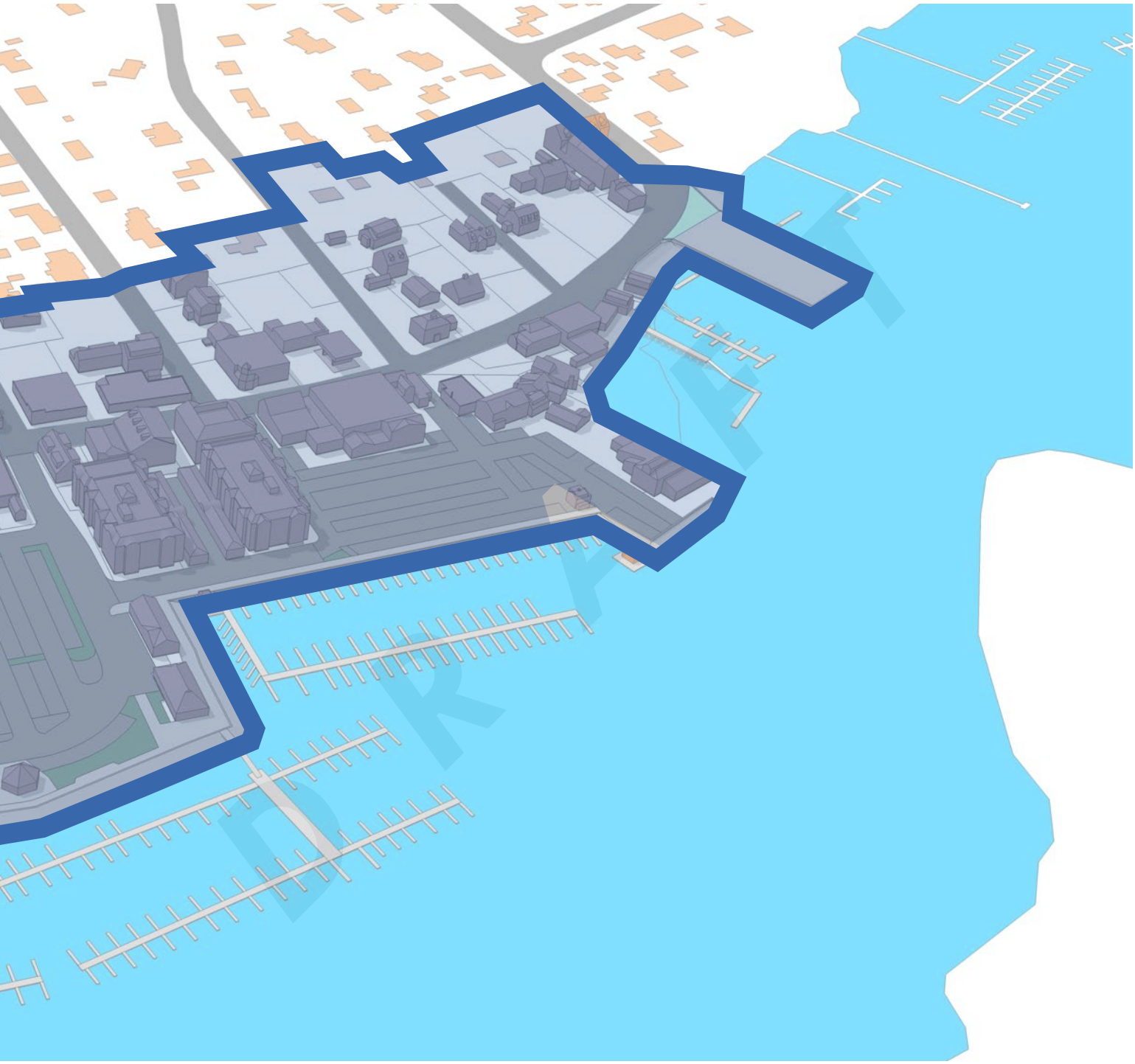
In addition to *Building a Resilient Scituate (2018)*, this study builds on and incorporates other recent efforts related to Scituate Harbor. These include a recent zoning bylaw audit, regional development strategy, parking management plan, cultural district planning, housing production plan, economic development plan, and streetscape plan. Each of these previous efforts, and community discussion through this process, show that Scituate Harbor is one of the most valued areas in the Town of Scituate, both in terms of its place in the community and also its collection of local businesses and combined property value. The Scituate Harbor Business District is a destination that is a source of vitality, tourism, fishing, recreation, and community gathering. It is also a location that is vulnerable to sea level rise and coastal storm surge. It is for all of these reasons that a district master plan with a focus on resiliency and sustainability is critically important for Scituate Harbor.

Study Area

The study area for the Scituate Harbor Resiliency Master Plan is the business district that is centered on Front Street near the harbor's edge. The southern extent of the study area is the intersection of Front Street with Edward Foster Road and First Parish Road. The study area then follows Front Street to the north and includes all of the properties between Front Street and the waterfront. To the west of Front Street the study area includes several parcels along the side streets that are in the current business district zoning boundary. These parcels are along Brook Street, Beal Place, Otis Place, Allen Place, Harbor Heights Road, and Morton Place. The study area's northern extent is the intersection of Front Street with Beaver Dam Road. While coastal flooding is not confined to this district, this district is the focus of the study. The study area is shown graphically on the following pages.

Scituate Harbor Study Area





Existing Conditions of Scituate Harbor

Scituate Harbor lies near the center of the town's 9.5 miles of coastline. The town's northeasterly orientation combined with its ocean exposure make it highly vulnerable to coastal storms and nor'easters. Since 1978, Scituate has submitted the most flood insurance claims of any community in the Commonwealth of Massachusetts. Even without the intensified threat associated with climate change, the Town already experiences frequent and intense coastal storms and significant flooding throughout the coastline, the coastal business district of Scituate Harbor is no exception.

Community

Scituate Harbor is an economic driver for the Town and described as the "heart" of Scituate by many in the community. The business district is a dense, walkable village center with developments that are mixed-use and under three stories in height. The district has a diversity of retail and commercial offerings such as coffee shops, specialty stores, and restaurants with outdoor dining. There businesses and the waterfront environment draw residents and tourists alike. The volume of visitors in the summer is higher with recreation harbor uses expanding the frequency and duration of visits. The volume of visitors expands to the extent that parking demand for waterfront and district uses exceeds the supply, particularly during peak summer weekends. Nearly all Scituate Harbor establishments are independently owned, except for the CVS and Dunkin. There is some commercial vacancy present in the district. Vacant storefronts have been frequently mentioned as one of the biggest concerns by community members. The Scituate Harbor Merchant's Association began in 2005 and is a cooperative of 96 business owners in the harbor area. The association works to improve, inform, beautify, and participate in activities to the benefit of the Harbor. The association helps to organize events, including art and cultural programs, to increase visitation to the business district.

Economy

Prior to the economic disruption still unfolding form the COVID-19 pandemic, the Town of Scituate had a low unemployment rate of 2.8% in July 2019. Scituate has a higher proportion of jobs in education, health care, and social services; arts, entertainment, and recreation; and accommodations and food service than generally found in Plymouth County. The median household income in Scituate is $111,000 and only 4.1% of the population is at poverty level. These were all indicators of a strong local economy and hopefully an indication that a strong recovery is in the future for the district. Through various economic planning efforts, residents have identified tangible and achievable areas of economic growth for Scituate Harbor. These include the maritime industry, tourism, new recreation boating ventures (kayaks, paddle boards, boat rentals, boat tours, etc.), and expanding the scientific marine research and programs with the National

Oceanic and Atmospheric Administration (NOAA) office located there. Residents have also repeatedly mentioned that the waterfront is an asset that could be further leveraged. If planned and designed strategically, the waterfront amenities could grow the Harbor into a year-round tourist destination. Residents and stakeholders agree, Scituate Harbor has untapped potential for tourism, new waterfront recreation activities, community gathering spaces, and beautification. The combination of these economic foundations and identified growth targets hold promise to leverage the waterfront and enliven the local economy.

Infrastructure

In the study area, there is a combination of local, state, and privately-owned roads. The town controls the traffic lights just outside of the Study Area at the intersection of Beaver Dam Road and Tilden Road and at the intersection of Beaver Dam Road and Jericho Road. Scituate Harbor has several large municipal and private surface parking areas that support vehicle access. The parking supply is generally in excess of demand for parking in the district, except for weekends during the peak summer season with busy tourist, waterfront and business visitation. During these peak times, parking areas are estimated to experience an 80-98% utilization rate. The target parking utilization rate to optimize functionality of the parking supply is 85%.

The walkability of the business district is strong with a well-connected system of sidewalks, crosswalks, and alleyways between buildings that connect businesses, the waterfront, parking areas, and surrounding residential areas. The sidewalk network in the Scituate Harbor business district are an important component of the roadway system and essential for business, commercial activity, accessibility, and district events. In 2016, the Town passed a Complete Streets Bylaw and has worked to advance multi-modal improvements throughout the town. One example of these improvements is the Harborwalk in Scituate Harbor that runs along the waterfront from Cole Parkway to the Scituate Harbor Community Building on Jericho Road. A second phase of the Harborwalk has been completed extending the path to Cedar Point at Lighthouse Road. Future phases are under consideration to extend the path out to First Cliff.

The Scituate Harbor business district and the surrounding area also supports water access and marine transportation. There are approximately 2,500 recreational boat users in Scituate Harbor and 250 boat slips at the Town-operated marina. In addition, there are two piers, Pier 44 and the Town Pier and two boat launches, one State-owned and one town-owned at Cole Parkway. There are three private marinas and yacht clubs including the Scituate Harbor Yacht Club, Satuit Boat Club, and Satuit Waterfront Club.

Utilities

Scituate has two sources of drinking water that include wells and surface water. The town maintains a water treatment plant that maintains quality of the drinking water for the town and Scituate Harbor business district. The town wastewater system includes 2,946 total sewer connections. The Scituate Harbor business district is connected to the town's wastewater sewer system. The town's waste water treatment plan is permitted for 1.6 million gallons per day (mgd) and is designed for a peak flow of 4.34 mgd. The town's average wastewater flow is 1.498 mgd. In 2016, the Town approved a stormwater bylaw that requires the first inch of stormwater for development and redevelopment be retained on site. This will protect the water quality and ecological integrity of marine ecosystems adjacent to these sites while assisting the Town in its compliance with MS4 Permit regulations for the Clean Water Act.

Historic Assets

Scituate is rich with historic and cultural assets and Scituate Harbor and the surrounding area are home to several of these assets. The Scituate Harbor business district contains 14 structures recognized by the Massachusetts Historical Inventory. Some of the most notable along the waterfront include the Scituate Lighthouse (1811) nearby at Cedar Point, T.K. O'Malleys (`850), the George Doherty House (1880), the George Welch Coal and Lumber Company (1898), and the Charles Steinbeck Ice Cream and Candy Shop (1890). Scituate has a Historical Commission, a Historical Society, and a Demolition Delay Bylaw to help manage and protect historic assets. The Town has also locally adopted the Community Preservation Act and has completed 70 historic preservation projects with its Community Preservation Committee funds.

Natural Resources and Environment

Scituate Harbor is a robust bay amenity to the Town of Scituate with seasonally active boating, sailing, fishing, educational programs, and tourism. The integrity of the bay ecosystem is critical not only as an economic and recreational asset, but in providing coastal resilience as it supports living shorelines that provide protection for Scituate's coast. The Harbor contains two BioMap 11 Critical Natural Landscape areas totaling approximately 240 acres for Fern Foraging and Coastal Adaptation. Critical Natural Landscape identifies intact landscapes that continue to provide ecological services through disturbances such as climate change. The Harbor also supports salt marshes and eel grass meadows which support water quality and clarity, support fish and shellfish habitat, and dissipate wave energy during coastal storms. Scituate Harbor has approximately 82 acres of salt marshes and about 9 acres of eelgrass meadow. The Scituate Harbor area contains about 4.7 acres of parks including the greenway along Satuit Brook, the Harborwalk, the Jericho Boat Launch, Scituate Marine Park, Scituate Lighthouse, and the Jenkins

School. Other important adjacent areas of protected land include approximately 60 acres of the Kent Street Marshes and the 80-acre Stearn Meadows.

A Resilient Future for Scituate Harbor

A detailed district master plan that responds to this context and existing conditions with a set of strategies drafted and illustrated to show potential locations of property enhancements, redevelopment of property, or repurposing of property in the district is needed to guide investment to enhance the vitality and sustainability of the district into the future. This district master plan outlines enhancements, improvements, and programming recommendations for existing assets such as the Band Stand, Harbormaster's office, charter boat segments, Coast Guard property, parking and circulation, pedestrian connections on Front Street, the Harborwalk, Cole Parkway, Otis Place, new pocket parks, new seating, information kiosks, public art, streetscape, lighting, public restrooms, and boat launches. The recommendations include both short term resilience improvements and a long-term sustainability and resilience vision. One of the benefits of this type of comprehensive district planning is identifying solutions that can address multiple challenges with a single investment. The recommendations that follow look for ways to address climate resiliency, sustainable development, improved walkability, and strengthened economic vitality of the district with solutions bring multiple benefits to an important district.

Process Overview

Planning Approach

For this process, project team adopted a planning approach that relied heavily on thorough analysis, and public input, and community-generated solutions to create a suite of recommendations that reflected the realities, needs, and values of Scituate Harbor's stakeholders.

This approach addressed several important factors unique to this project. First, implementing many of this project's recommendations will require significant buy-in and investment, both emotionally and financially, from all stakeholders in Scituate. For that reason, the recommendations needed to account for what stakeholders were willing to do to address existing and future problems. Second, many of the current problems Scituate Harbor is facing have a level of urgency that is unique to coastal communities like Scituate. Because of this, it was imperative that community members be able to contribute their local knowledge and expertise so that recommendations could most accurately reflect their lived experience.

This approach ensured that stakeholders could understand the trade-offs involved in each potential solution, provide feedback accordingly, and ultimately come to a consensus about a plan of action. To facilitate this approach, the project team worked with Town staff and a Task Force comprised of local experts, hosted two community forums, facilitated six focus groups, and hosted one Planners on the Street engagement event.

Task Force

The Task Force for this project includes members with a wide variety of experiences, knowledge, and expertise. Task Force members include:

Kyle Boyd - *Coastal Management Director*
Charlotte Britton - *Scituate Harbor Condominium Resident*
Kevin Cafferty - *DPW Director*
Tom Clark - *Scituate Harbor Cultural District Committee Member*
Karen Connolly - *Board of Selectmen*
Sue DiPesa - *Chairperson, Economic Development Commission*
Lynda Ferguson - *Scituate Chamber of Commerce Board, Member*
Margaret Loughlin - *Scituate Harbor Condominium Resident*
John Murphy - *Fire Chief*
Rick Murray -*Waterways Commission*
Louise Pfund - *Chairperson Coastal Advisory Commission*
Penny Scott-Pipes - *Conservation Commission*
Michele Wood - *President of Scituate Harbor Business Association*

The Task Force has met four times since the process began in May, 2019. As the process evolved, additional members were added in order to more effectively represent the interests of the study area's stakeholders. Meetings with the Task Force took place during key moments of the process and served to narrow the project team's findings, move the project forward at decision points, and explore the nuances of both the analysis and research findings and the broader community's feedback. For example, after the first community forum the Task Force members gave feedback on and approved the problem statement and guided MAPC staff through the narrowing of solutions preferences.

Community Engagement

MAPC. Town Staff, and the project Task Force worked together to develop and implement a thorough and comprehensive Community Engagement Strategy. The strategy was structured around a set of purposes and goals. The various activities and engagement events were designed to achieve both the three purposes and lead to the three goals listed below. The purpose of the community engagement strategy for this plan was to:

- Exchange information and knowledge between Scituate Harbor's business owners, residents, land owners, and other stakeholders and MAPC and town planning staff about the challenges facing Scituate Harbor and the nature of the relationships stakeholders have with the area.
- Engage stakeholders in crafting a vision for the area's future 25 years from now by exploring common challenges, identifying shared values, and contending with potential trade-offs.
- Empower stakeholders (particularly the Project Champions) with the tools necessary to act on the plan's recommendations.

By successfully implementing the engagement strategy, the project team aimed to achieve the following goals:

- Stakeholders develop a deep understanding of Scituate Harbor's current and future challenges so that they are able to provide meaningful feedback about what interventions/ changes they want to prioritize during the next 25 years.
- Planning staff develop a rich understanding of the nature of the relationship stakeholders have with Scituate Harbor
- Stakeholders and planning staff craft a vision and recommendations for Scituate Harbor that prepares Scituate to implement solutions for future resiliency- and sustainability-related challenges while ensuring it continues to be an economically vibrant area.

Focus Groups

The project team conducted six focus groups with important stakeholder groups in the Scituate Harbor area. These focus groups included:

- Front Street (non-water-based) businesses
- Cultural institutions, committees, and organizations
- Water-based businesses
- Municipal staff
- Property owners
- Residents

The six different stakeholder categories were identified by MAPC staff and the Task Force and selected based on their direct connection to Scituate Harbor (i.e. only residents and businesses in the study area were invited to participate). Participants for these focus groups were identified by the Town, Task Force, and project staff and were recruited via phone calls and emails. Property Owners were identified via the assessor's database and residents were recruited through word of mouth and through the boards of the various condo associations active in Scituate Harbor.

The format for each focus group was designed to inform attendees of MAPC's existing conditions research, discuss and identify existing specific problems and assets for each stakeholder group, and identify which solutions might work best for different stakeholders. At each focus groups, participants received an overview of the project's process to date, an overview of the study area and its existing conditions, and an overview of potential future problems. Participants then played an interactive game exploring sea level rise. MAPC staff then lead participants through a series of exercise to define the current problem(s), identify how urgent they feel those problems are, discuss where those problems occur the most often and explore possible solutions the Town could pursue.

Additional stakeholders who were not able to attend a focus group in person were invited to complete an online survey with the equivalent questions and information. Overall, there were 34 individuals who participated in a focus group.

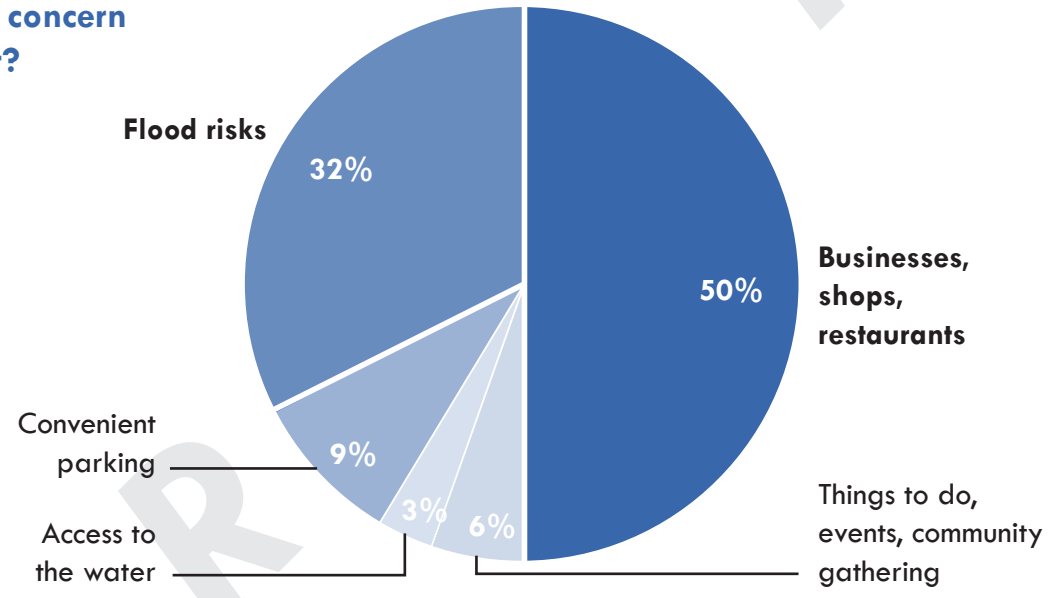
Community Meetings

To date, MAPC has hosted two Community Forums, the first on 10/29/19 and the second on 3/3/20. Both community forums were advertised to the public via email, newspaper, radio, and Town and organizational partner websites and listservs. In addition, the Town communicated with various permit-holders for the second community workshop and the Task Force conducted their own independent outreach for both forums.

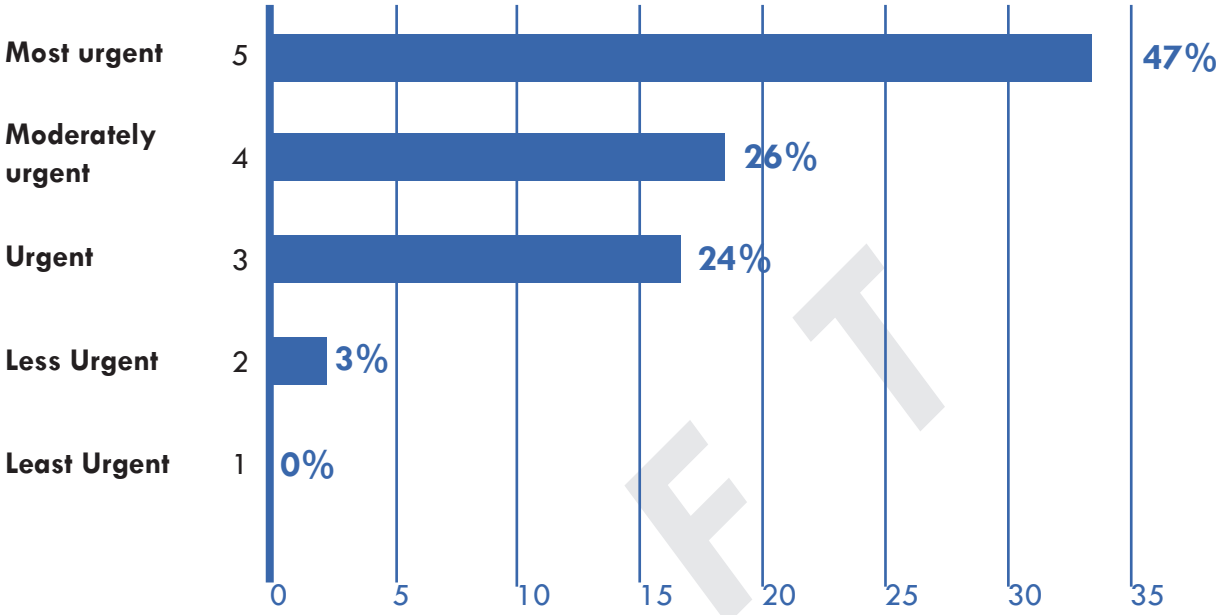
Community Forums

The first community forum served to replicate most of the format of the Focus Groups. MAPC staff provided an overview of Scituate Harbor's existing conditions, discussed possible future projections, and reviewed each category of solution. After the presentation, attendees were invited to vote for their preferred solutions by placing color-coded pins on a map of Scituate Harbor (see below). Additional feedback from attendees was collected via several open response boards. There were about 50 attendees at this forum. The charts below show the responses of these participants to several questions critical to the study.

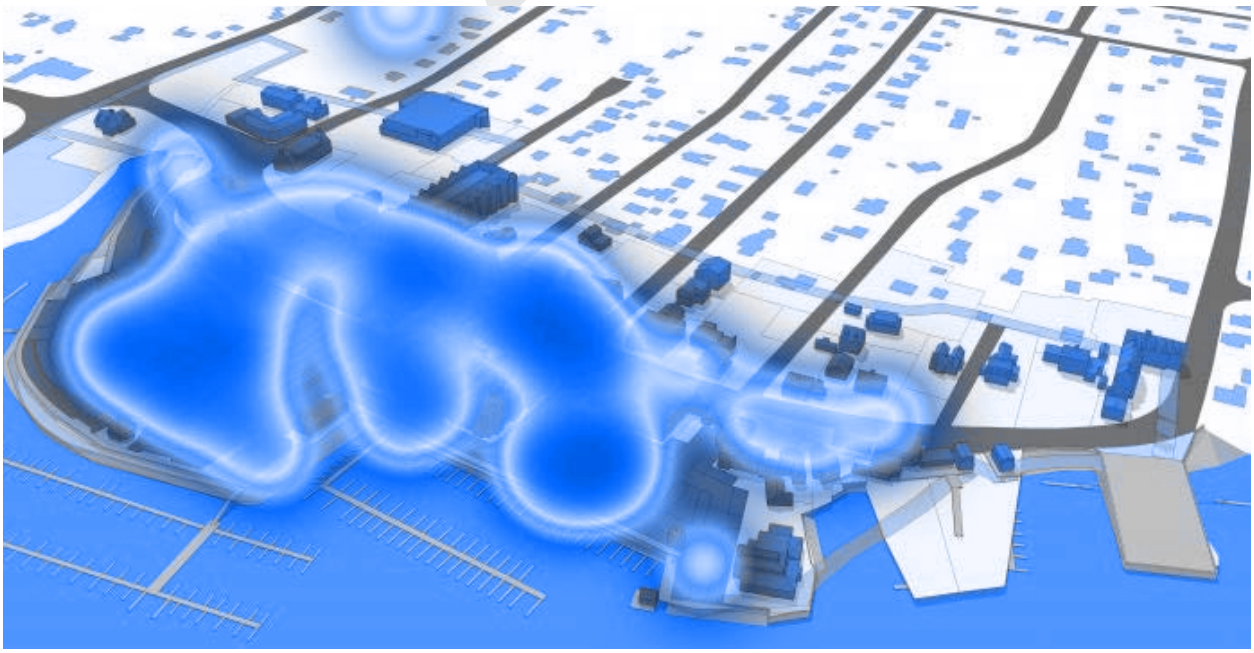
What is your main concern for Scituate Harbor?



How urgent do you feel coastal flooding issues are?



Where have you seen flooding in the district?



At the second community forum, MAPC staff presented an overview of the process to date, reviewed input from the Focus Groups, Task Force, and first Community Forum, and presented a more detailed analysis of the three most preferred solutions. MAPC staff then presented an evaluation of each solution against the goals outlined in the problem statement, assigning each solution a -1, 0 or 1 based on how well they satisfied each goal. The evaluated solutions were then compared against each other so that attendees could more effectively decide which goals and solutions they wanted to prioritize. After the presentation, MAPC staff held a discussion of the content and then asked participants to rank their first, second, and third preferred solution. There were approximately 20 attendees

Community Open House/Planners on the Street

On December 6th, MAPC staff attended the outdoor Holidays in the Harbor event in Scituate Harbor. Originally, MAPC staff had intended to host a table with information and interactive activities, however the weather was not conducive to that. Instead, staff engaged attendees on the street and shared project business cards.

Responsiveness

Throughout the entirety of this project, MAPC staff have committed to making it as responsive to community feedback as possible. Decisions about which solutions to pursue were based almost exclusively on feedback from the Task Force, focus groups, and community forums. Solutions that MAPC staff might have pursued on their own were not analyzed for the second community forum. Doing so enabled staff to better understand what kinds of solutions and interventions are feasible for the Town to pursue and also helped to build buy-in and investment in particular.

In addition, MAPC staff worked to ensure that community members had the high quality and clear information available to them in order to make informed decisions about otherwise technical and complex things. The community engagement process and community forums were designed to both educate attendees about the project and share new information and research. MAPC staff also collected specific concerns and suggestions from community members which helped inform and direct the decision-making process.

Future Engagement

MAPC staff had originally planned to host an open house in April and a final community forum in May. Due to the ongoing COVID-19 crisis, these events have been temporarily postponed and will be hosted at a later day. The open house will explore on other district improvements, not specifically related to one of the preferred solutions. These include pedestrian safety and streetscape improvements, stormwater improvements, a parking management program, and storefront vacancy program, and zoning revisions. The final community forum will focus on presenting the near-complete project back to interested community members in advance of a more formal hearing.

Scituate Harbor Coastal Flood Risks

Over the last century, the earth has warmed by nearly two degrees Fahrenheit and the Northeast United States has seen a similar increase. Historic temperature data indicates that the warming trend is continuing at an accelerated pace. Global warming and greenhouse gas emissions have important implications for climate change and the future of Scituate Harbor. These include sea level rise, increased severity and frequency of coastal storms, ocean warming, and ocean acidification. Since the 1970s, oceans have absorbed more than 93% of excess heat from global warming caused by emissions. Oceans have also absorbed one-third of our carbon dioxide emissions and New England waters have warmed more than 2.5°F since 1901, more than any other coastal area in the United States and 40% faster than anticipated. Ocean acidification could reduce the ability of fish and shellfish to produce skeletons and shells, minimizing their reproductive potential. These broader changes are causing real-time impacts to Scituate Harbor including sea level rise, storm surge, and coastal inundation threatening the economic, environmental, and community vitality of the coastal business district. This section evaluates historic and future coastal flood risks and the potential impact on the assets and resources that define the importance of Scituate Harbor in the community.

Sea Level Rise

In Boston Harbor from 1921 to 2018, sea level rise has occurred at a rate of approximately 2.8 millimeters (mm) per year resulting in a total of 0.94 feet of sea level rise in the last century. Sea level rise in Massachusetts results from the confluence of several factors, the most significant being global warming resulting from accelerated rates of greenhouse gas emissions in the atmosphere. Global warming contributes to sea level rise in two ways. First, the thermal expansion of oceans contributes as water warms and consumes more space. Second, global warming has accelerated the rate of glacial melting that adds more water to the ocean system. Sea level rise is also caused by land subsidence along the east coast that remains as a response to the last glacial period. Pressure from the heavy ice compressed the land causing land areas around the glacier to curl upward and the coastal land to sink. A separate factor contributing to sea level rise in Massachusetts is gravitational pull that is resulting in a disproportionate increase in the level of sea level rise in comparison to other areas around the globe.

Table 1illustrates three models of sea level rise relevant to Scituate. Model results are based upon key assumptions, such as emission scenarios. In 2013, Kleinfelder executed The South Shore model using National Oceanic and Atmospheric Administration (NOAA) Technical Report Global Sea Level Rise Scenarios for the United States National Climate Assessment (December 2012) and storm surge modeled using the hydrodynamic Sea, Lake, and Overland Surge from Hurricanes Model (SLOSH) developed by the National Weather Service. The Boston Harbor Flood Risk Model

(BH_FRM) utilizes the Advanced Circulation (ADCIRC), high-performance and cross platform ocean circulation model. ADCIRC dynamic and probabilistic flood model that simulates flooding from extreme weather and sea level rise. It incorporates variables such as topography, wind, wave action, and storm surge. The Boston Tide Gauge model was derived from a similar process as the BH_FRM. The South Shore model is currently the only geospatial SLR data available for Scituate.

Table showing total relative sea level rise projections in Boston and South Shore for the "highest" emission scenarios from three models

	2030	2050	2070	2100
Boston BH_FRM	0.67 FT (8.00")	1.50 FT	3.10 FT	7.40 FT
South Shore	0.67 FT (8.04")	1.85 FT	3.39 FT	6.52 FT
Boston Tide Gauge	0.4-0.9 FT	2.4 FT	4.2 FT	7.6 FT

Scientists anticipate that the rate of sea level rise will increase and accelerate, anticipating an additional eight inches by 2030. Several local and state-wide sea level rise projection models indicate similar levels where Massachusetts could experience 6.5-7.5 feet of sea level rise by the end of the century. In the near term, sea level rise has exasperated the extent of coastal flooding cause by hurricanes, nor'easters, and blizzards at Scituate Harbor.

Extreme Precipitation

For the last fifty years, precipitation has increased 70% in the Northeast in the amount of rain that falls in the top 1% of storm events. November and fall of 2018 are the wettest November and fall on record since 1891 and part of the third wettest year on record. Due to several stormy periods during the year, annual precipitation was very high and totaled 67.20 inches, which was 18 inches more than the long-term mean and nearly 14 inches more than the 30-year normal.

Projections for future precipitation suggest an increase in total precipitation, changes in precipitation patterns, and increased frequency of extreme storms such as hurricanes and nor'easters. For example, a 100- year storm is defined as a storm that would have a 1% chance of occurring in any given year or consecutive years. Historically this could create 8.9 inches of rain, but that could increase to 10 inches of rain by 2044 and 11.7 inches of rain by 2084. This increased precipitation has the potential to exacerbate existing stormwater runoff issues and pollution of existing impaired waters.

Table showing expected size of a 10-year, 24-hour storm is expected to increase

	1961	2014	2015-2044	2055-2084
	Observed (NOAA) for Eastern MA	Observed (NOAA for Wrentham MA	Projections for Cambridge MA	Projections for Cambridge MA
Rainfall	4.5 inches	5.23 inches	5.6 inches	6.4 inches

Excess stormwater can cause flushing of pollutants into nearby waters diminishing water quality, impairing marine ecosystem and fish habitat and degrading salt marshes. The Town manages compliance with the Clean Water Act for Scituate Harbor, an impaired or threatened water body, which has a Total Maximum Daily Load level five for fecal coliform. The presence of fecal coliform in water bodies is an indicator of pollution from human, mammal, or bird waste. It is an indicator of plant material in run-off or other effluent. Excessive precipitation or extreme precipitation events pose a risk to increase contamination to Scituate Harbor as well as overwhelming the stormwater system capacity. If over-capacity, stormwater infrastructure may be damaged or broken. Overflowing infrastructure may cause flooding into streets and other community areas.

Coastal Flood Risks

Since 1997, Plymouth County has experienced 49 coastal flood events totaling over $15 million in property damage. Scientists have not reached consensus on the extent of increasing frequency or severity of coastal storms, though there is agreement that storms will be more severe and more frequent in the future. Winter Storm Riley in March 2018 was an extreme weather event where storm surge reached near records and caused extensive flooding in Scituate, affecting businesses, residences, and other critical facilities. Furthermore, the storm surge did not retreat for over a week and the impact of long-term flooding in Scituate was significant.

Scituate Harbor's Cole Parkway during Winter Storm Riley from the Weather Channel

This section discusses the impacts of coastal flooding from results generated through a geospatial analysis. Data for the analysis includes:

- South Shore SLR projections
- Current FEMA Flood Data
- Critical Facilities are infrastructure identified by the Town through a FEMA Natural Hazard Mitigation Planning and geo-referenced by MAPC.
- Level 3 Parcel Data
- 2018 Repetitive Loss Data
- Stormwater catch basins, geo-referenced from 2020 imagery CNES/Airbus, Commonwealth of MA, Maxar Technologies, and UDA Farm Service Agency Map as found on Google Maps.

Coastal flood risks for Scituate Harbor are summarized in three categories. First, the extent and depth of flooding to critical facilities, then the financial implications from damage to infrastructure from historic and future storms, and finally the intersection of coastal flooding and stormwater infrastructure.

Scituate Harbor's Front Street during Winter Storm Riley from the Weather Channel

Scituate Harbor and vicinity showing current and projected flood extents

These recent storm events illustrate that while planning for future sea level rise is necessary for coastal districts such as Scituate Harbor, the coastal flood risk is not hypothetical or confined to a far-off future. The current Flood Emergency Management Agency (FEMA) Flood Insurance Risk Maps (FIRM) show that in some locations the current flood risks expand beyond future sea level rise projections. The diagram above maps the extent of floods projected for current FEMA flood zones (yellow), future sea level rise to 2050 (red), and future sea level rise to 2070 (purple).

Critical Facilities

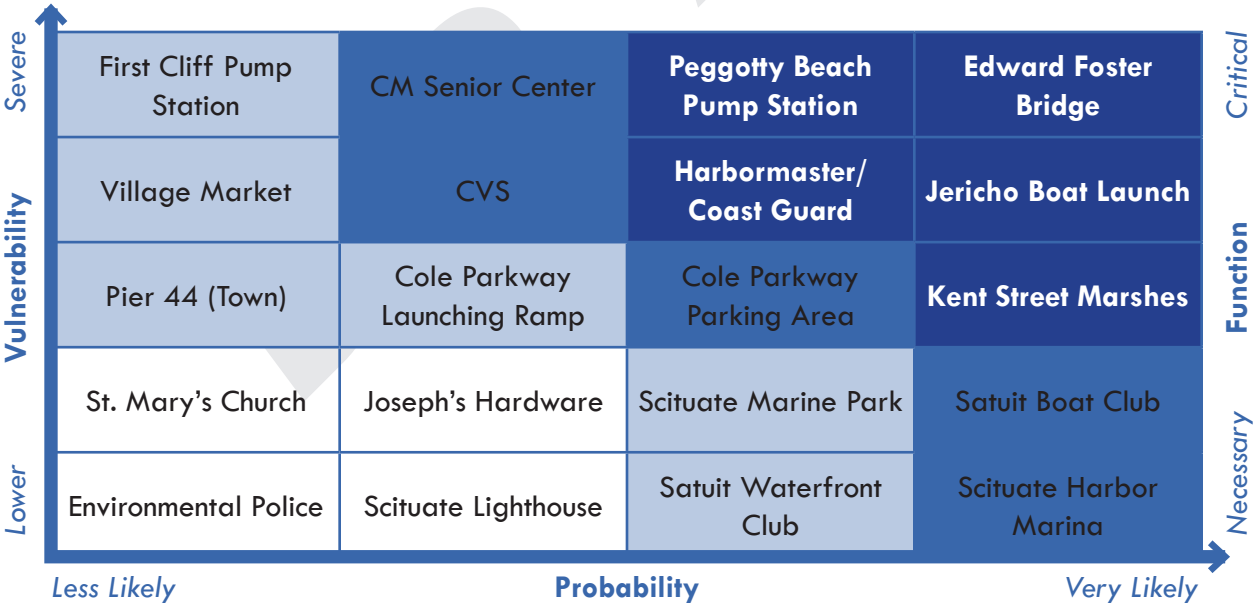
Critical facilities are infrastructure that are defined as being critically important to the functionality of the Town. These include utility and transportation infrastructure, municipally-owned buildings, buildings used for community gathering or sheltering during extreme weather events, or resources that are critically important for resident health and survival such as grocery stores and pharmacies. The risk of critical facilities to coastal flooding was evaluated for current and future flood zones within and adjacent to the Scituate Harbor Business District. Future sea level rise projections were isolated to 0.5-foot intervals to spatially analyze the risk to critical facilities, and the ranges of depths that are projected to affect the critical facility are indicated at the building level.

Since most of Scituate Harbor has already and will continue to experience coastal flooding, the analysis further assesses the coastal flood risk by severity (depth), probability (current or future flood zone), and function (level of importance for servicing municipal and community needs).

These qualitative categories were used to create a risk matrix to define which buildings are most important to address to minimize damage and loss to Scituate Harbor, not only for the building itself but also for the overall protection of the business district. A risk matrix provides a visualization of risk and asset decision making. Facilities that are very likely to flood, have a high severity or depth of flood risk, and have a critical function to serving the community are the facilities most important to address for resilience strategies for Scituate Harbor.

The critical facilities at greatest risk include Edward Foster Bridge, Peggotty Beach Pump Station, Harbormaster/ Coast Guard building, Jericho Boat Launch, and Kent Street marshes. The Edward Foster Bridge overtops during a 1% Annual Chance Flood and has significant flood depths at SLR 2038. Its flooding effectively disconnects an emergency response root from the First Cliff neighborhood to the rest of the Town. The Jericho Boat Launch, though less important in function during an extreme weather event, has significant flood depths and is a water entry point for this portion of Scituate Harbor. The Harbormaster and Coast Guard buildings have less flood depths but are of greater importance serving the community, particularly during extreme weather events and coastal storms. The Kent Street Marshes provide a protective natural system to Scituate Harbor and surrounding neighborhoods. Located in a FEMA VE High Risk zone, the flooding of these marshes dissipate intense wave energy that might otherwise impair residences, businesses, and other important infrastructure. The marshes flood during storms events today. Future projections indicate that the marshes become submerged by 2038. If this occurs, the marshes transform into open water and no longer provide the critical shoreline protection and could increase the extent of flooding in the future. Finally, though outside of the Scituate Harbor business district, the Peggotty Beach Pump Station is a high-risk facility because its impairment from flooding could cause extensive pollution into Scituate Harbor and surrounding waters.

Risk Matrix of Scituate Harbor critical facilities based on vulnerability, probability, and function



Economic Risk of Coastal Flooding

One of the most significant threats to Scituate Harbor's economy is its vulnerability of its businesses to coastal storms and sea level rise. There are currently 15 business repetitive loss sites in Scituate Harbor proper. Repetitive Loss sites are properties with more than two claims of over $1,000 within a 10-year period since 1978. Since 1978, the National Flood Insurance Program (NFIP) has paid over $880,000 in claims to these businesses. Planning studies also indicated that the increasing cost of flood insurance could preclude business and property owner success and viability, particularly if businesses are limited to income only in the tourist season. Finally, there are 35 Scituate Harbor business district parcels worth $58 million that are in a flood zone. In this flood zone, as projected in 2088 from Sea Level Rise alone, depths of 2.5-5 feet of water may be a frequent occurrence. The number of business district parcels located in a 1% Annual Chance Flood (such as Winter Storm Riley in 2018) is 46 parcels worth over $68 million (Table 4). Sea level rise and coastal storms threaten the Scituate Harbor economy and its generation of tax revenue for the town. Though implementing resilience strategies is costly, the cost of inaction is as significant.

Summary of building and property at risk for coastal flooding and sea level rise in the Scituate Harbor Business District

Flood Zone	Buildings	Parcels	Parcel Value	Repetitive Loss	National Flood Insurance Program (NFIP) Claim Amount
Floodplain and Water-shed District	3	4	-	2	$3 million
FEMA VE Zone	3	5	$7.4 million	3	$45,755
FEMA 1% An-nual Chance Flood	57	46	$68 million	8	$266,830
SLR 2038	2	4	$3.6 million	1	$45,755
SLR 2038 Category 1	3	9	$12 million	1	$45,755
SLR 2088	50	35	$58 million	8	$266,830
SLR 2088 Category 1	36	34	$48 million	8	$266,830

Stormwater Infrastructure Flooding

Scituate Harbor business districts is approximately nine feet above sea level and the landward slope quickly rises from 0-3% to 8 and 15%. Most business district parcels are covered with impervious surface indicating the landward topography is an important contributor to the stormwater infrastructure in the low-lying business district. This study identified 41 stormwater catch basins in and around the business district, managing both the business district proper and the adjacent upland neighborhood stormwater. Catch basins are vulnerable to sea level rise, storm surge, and coastal flooding. All identified catch basins are within a 1% Annual Chance Flood zone but none in a VE: High Risk Flood zone.

One catch basin at 139 Front Street is within a SLR 2038 zone flooding with approximately 0.5 feet of water. Sixty-eight percent of the stormwater catch basins are within a SLR 2038 flood zone with a category 1 hurricane storm surge. The flooding of catch basins at 105 and 164 Front Street at SLR 2038 Cat1 appears to occur from an overflow of the system from stormwater runoff and sea water entering the system through an outfall. Spatially, the flooding at these catch basins is isolated and disconnected from the coastal flooding. Catch basins 9-13 have the greatest depths of flooding, 2.5-3.0 feet) during SLR 2038 Cat 1 vulnerable with the greatest depths of flooding are ones known to flood the parking lot of Cole Parkway during lunar high tides. Overall, sea level rise will affect the stormwater system with sea water entering the system during extreme weather events. That is happening today with a 1% Annual Chance flood and similarly in 2038 with a Category 1 hurricane storm surge.

Sea water entering the stormwater system repeatedly can cause corrosion. Additionally, the mix of sea water with stormwater during extreme weather enables stormwater pollutants to flow more easily into Scituate Harbor. It also can create conditions of overcapacity and additional flooding from the catch basins. More comprehensive sea level rise modeling may indicate greater probability or increased depths affecting the stormwater infrastructure with sea level rise.

Coastal Resilience Solutions

Scituate

Inventory of Potential Solutions

In order to better understand the community's preferences relative to coastal resilience solutions for Scituate Harbor, an inventory of potential solutions was prepared. This inventory was based on resilience solutions that have been employed with examples from around the region, the country, or internationally. The solutions inventoried were categorized by the location of the intervention and the type of intervention.

Inventory of Potential Solutions

Category	Strategy	Description
Open Ocean Adaptations		
O1	**Fortification** Fortification structures in the open ocean at the outer edge of the harbor, mouth of the harbor, or inner harbor.	A major man-made structure that places a fortification or barrier at a location in the water that would reduce wave action and storm surge.
O2	**Attenuation** Floating structures in the open ocean at the outer edge of the harbor, mouth of the harbor, or inner harbor.	A system of objects or structures that reduce or weaken wave action and storm surge by disrupting the wave energy.
Coastal/Harbor Adaptations		
C1	**Fortification** Fortification structures at the coastal edge between the harbor and the land.	A variety of coastal edge structures including rip-rap, boulders, armor stone walls, revetments, sea walls, sheet piling that protect against rising sea levels.
C2	**Attenuation** Artificial or natural systems at or near the shoreline.	A variety of man-made systems or support for natural systems that reduce or weaken wave action and storm surge by disrupting the wave energy.
C3	**Elevation** Raising the elevation of the coastal edge, typically on the immediate land side of that edge.	A variety of approaches to raise the elevation where water enters the district that protect against rising sea levels and waves.
Land Adaptations		
L1	**Fortification** Fortification structures on land within the district that provide a barrier to flood waters.	Permanent or temporary barriers at buildings, streets, walkways, or other potential pathways for floods that can protect against rising sea levels.
L2	**Elevation** Raising the elevation of the building to increase the height of occupied space above projected flood levels.	Increasing the height of the building with piles or columns to allow water to flow beneath the building during a flood event.
L3	**Accommodation** Design parks, streets, buildings, and other infrastructure to flood without extensive damage.	Make permanent changes to locations and design of infrastructure, utilities, and equipment to allow flood waters to enter or divert flooding.
L4	**Migration** The strategic and managed relocation of high risk or high sensitivity functions away from flood risk.	Defining where uses could be intentionally relocated and creating opportunities for long term migration of those uses.

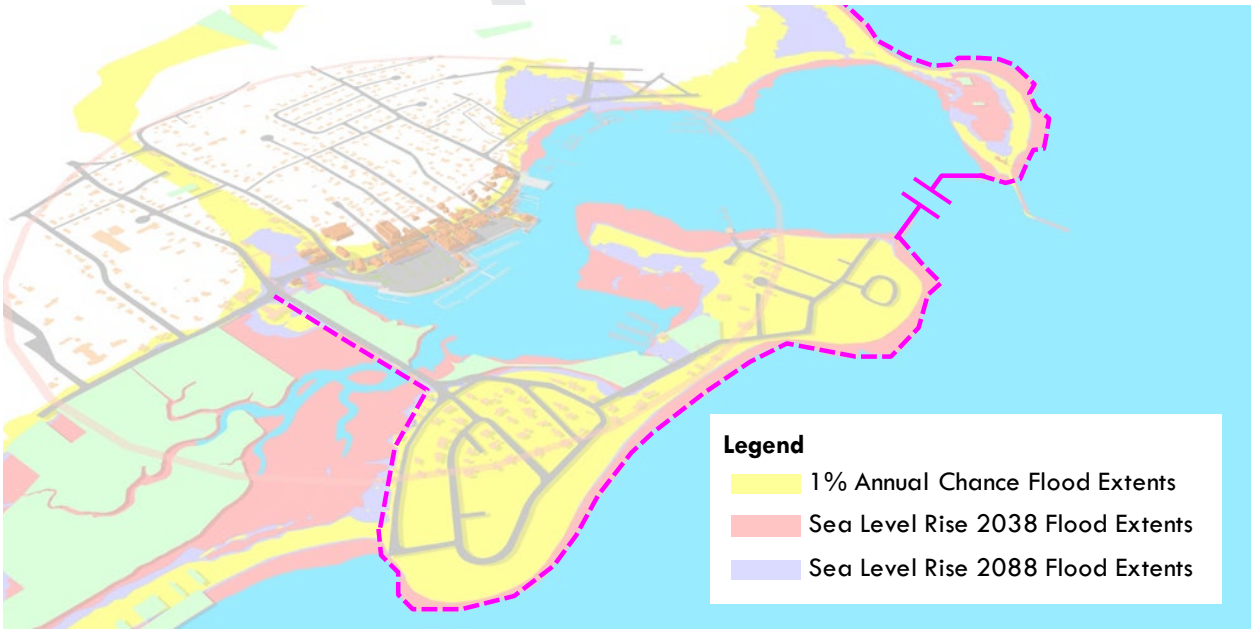
Example		Community Preferences *(Focus Groups, Task Force, Community Forum)*	
	A stone jetty, hurricane barrier or hurricane gate such as in New Bedford (shown in image) or the Fox Point Barrier in Providence.	(30)	19%
	Floating breakwaters are buoyant objects typically consisting of box, pontoon, mat, tethered float, or other shape (shown in image).	(11)	7%
	A variety of coastal fortifications are employed including boulders, sea walls, sheet piling, or a sculptural seawall (shown in image).	(16)	10%
	Man-made or natural systems may include living shorelines, break waters, beach nourishment, or oyster reefs.	(15)	9%
	Elevated stone walls, earthen berms, topographical features, increased elevations integrated with new parks, playgrounds, or harborwalk.	(22)	14%
	Removable, deployable, or retractable flood barriers that are connected to other permanent barriers or buildings.	(21)	13%
	Elevating occupied building levels, moving critical building infrastructure to the roof, elevating other infrastructure and utilities.	(19)	12%
	Buildings and infrastructure that are designed and occupied strategically to be floodable, flood diversions that give flood waters room.	(15)	9%
	Incentives for relocation, zoning changes that allow migration of the business zone, property voluntary buyout program.	(11)	7%

Three Most Preferred Approaches

From the inventory of all potential resilience approaches the community expressed preferences resulting in three approaches that were most preferred. These three most preferred approaches included "ocean fortification" which may include an outer or inner harbor barrier combined with a hurricane/nor'easter gate, "coastal/harbor elevation" which may include earthen berms, an elevated coastal edge, or elevated harborwalk, and "land fortification" which may include floodproofing buildings, infrastructure, and utilities and elevating land forms through waterfront parks or infrastructure. Each of these three most preferred approaches are outlined in more detail below and defined further through a case study example for each. A comparative evaluation of these approaches follows this general description.

Conceptual Alternative A
"Close the mouth" - Harbor barrier infrastructure

The community's most preferred approach from the inventory was **"ocean fortification."** This approach was preferred by 19% of the community participants. This approach increases resilience through investment in major water-based infrastructure that create the ability to keep the water out of the inner harbor area. This type of approach would involve constructing a perimeter of flood defenses that would stretch from Cedar Point to Edward Foster Road and build up defenses at the mouth of the harbor. At the mouth of the harbor the height and length

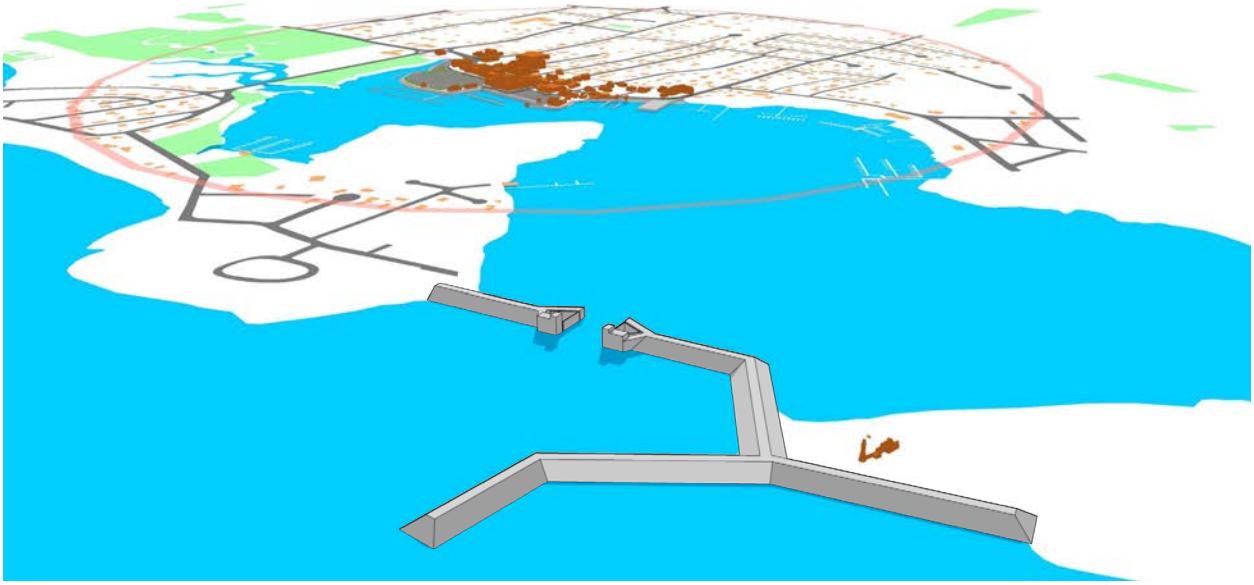


of stone jetties approximately where they are currently located would be increased. They would expand to nearly meet at the center of the harbor's mouth and an operable flood gate would be constructed at the gap between expanded jetties. The diagrams below illustrate this type of approach and concept.

An example of this type of approach is New Bedford's Hurricane Protection Barrier. New Bedford's Hurricane Protection Barrier was constructed in the 1950's to protect the New Bedford and Fairhaven Harbors. The flood protection system includes a coastal system of elevated walls and operable gates with a water-based stone jetty that includes an operable flood gate near its center.

Image credit: US Army Corps of Engineers

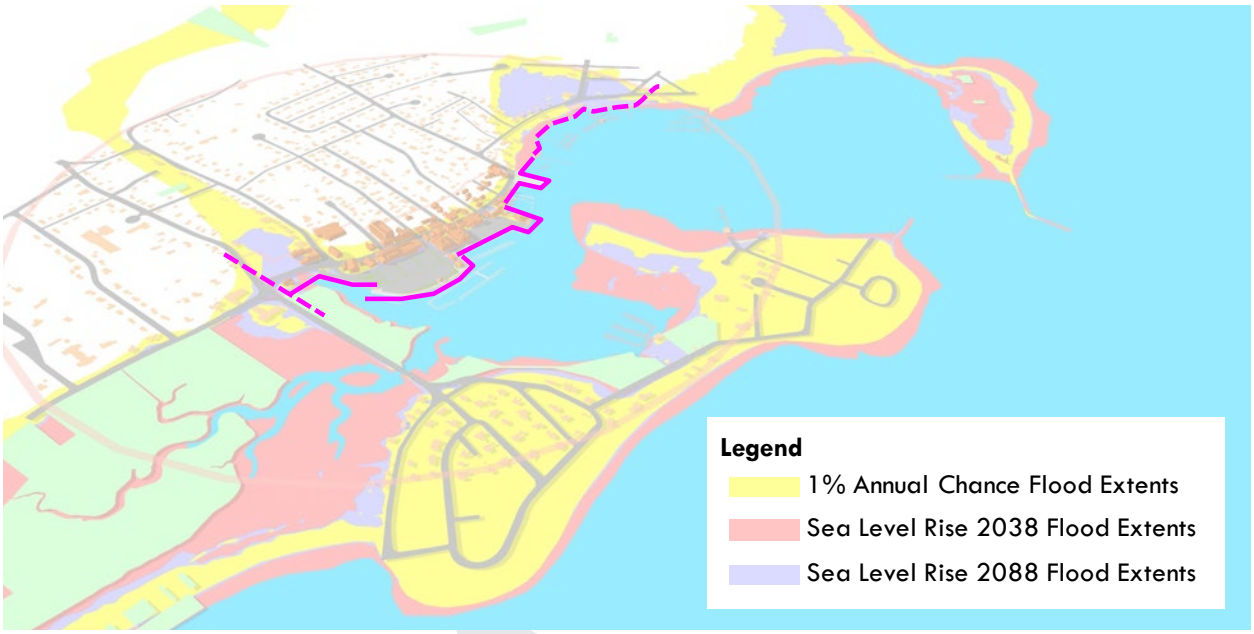
Image credit: Jesse Costa/WBUR



Conceptual Alternative B

"Lift the edge" - Incremental elevation of coast

The community's second most preferred approach from the inventory was **"coastal/harbor elevation."** This approach was preferred by 14% of the community participants. This approach increases resilience through investments that elevate the land edge where it meets the water to keep the water from entering specific districts or areas. This type of approach would be focused on the water edges of the business district from the vicinity of First Parish Road to the vicinity of Beaver Dam Road. This may entail elevating an existing sea wall or revetment, adding height to an existing pier, or integrating additional elevation into a waterfront sidewalk that is part of the harborwalk. The diagrams below illustrate this type of approach and concept.



An example of this type of approach is Hingham's approach to improving resilience in Hingham Harbor. There continuous stone walls, stone revetments, armor stone barriers built into restored beaches, and elevated wharves combine to provide a protection barrier to water moving inland beyond these coastal protection measures. The resilience improvements have been made incrementally and will combine over time to provide a comprehensive barrier.

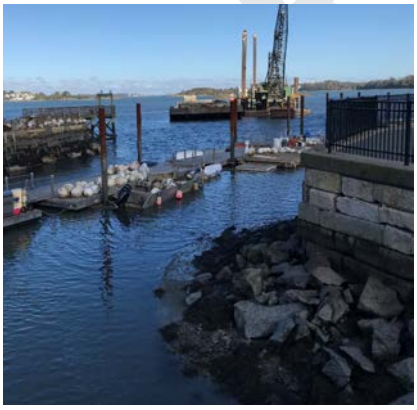


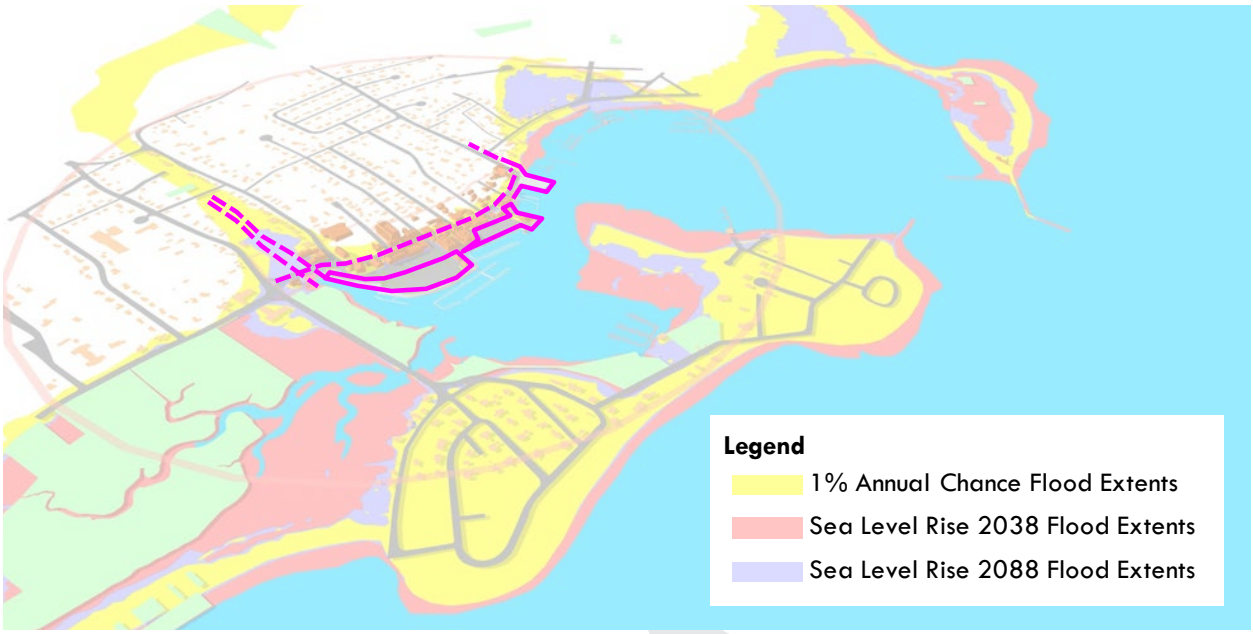
Image credit: MAPC

Image credit: MAPC

Image credit: MAPC

Conceptual Alternative C
"Floodproofing with infrastructure" - Land fortification

The community's third most preferred approach from the inventory was **"land fortification."** This approach was preferred by 13% of the community participants. This approach increases resilience through investments that elevate the land through new waterfront parks, infrastructure, or other features that would increase land elevation and reduce the risk of district flooding. This type of approach would be focused on the water edges of the business district from the vicinity of First Parish Road to the vicinity of Beaver Dam Road. This may entail developing a new waterfront park with an increased elevation, adding height to an existing pier, or integrating additional elevation into a waterfront sidewalk that is part of the harborwalk. The diagrams below illustrate this type of approach and concept.



An example of this type of approach is Boston's approach to improving resilience in the Fort Point Channel with the Martin Richard Park. Martin's Park developed a new playground and amenity for the district while elevating land forms and plugging a critical gap in a flood pathway that would allow waters to enter into the Seaport Innovation District.

Image credit: Boston Globe

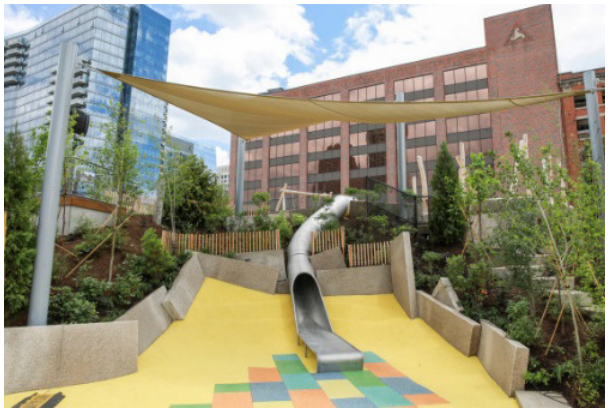


Image credit: Boston Herald

Resilience Case Studies

The three detailed resilience case studies provide real world examples of regional efforts that have been constructed in response to flood risks. These examples respond to the preferences that were initially expressed by the community and provide a way to compare the end results of a variety of proposes to district resilience. The three case studies represent the most preferred approaches of "ocean fortification" with the New Bedford Hurricane Barrier, "coastal/harbor elevation" with the Hingham Harbor resilience investments, and "land fortification" with the Martin Richard Park in Boston.

New Bedford Hurricane Barrier

The New Bedford Fairhaven Hurricane Protection Barrier is a major flood infrastructure solution that was built by the United States Army Corps of Engineers (USACE) in the 1960s after about 20 years of intense coastal storms and finally Hurricanes Carol and Edna. During this time period the USACE constructed seven hurricane protection projects in New England and New Jersey.

Description

The hurricane barrier lies across the New Bedford and Fairhaven Harbor. It protects about 1,400 acres of land from tidal flooding from hurricanes and coastal storms. New Bedford's fishing port is among the highest revenue earning in the country due to scallops. Construction was completed in 1966 at a total cost of about $18.7M. The Federal government paid $11.7M, the State paid $3.5M, New Bedford paid $3.15M, Fairhaven paid $315,000 and Acushnet paid $35,000. Adjusting the total cost for inflation puts the amount at about $149M in 2019 dollars. The damage estimated from Hurricane Carol alone was approximately $9 billion in 1995 dollars. The total system is 3.5 miles in length. The main features of the systems is the 4,500 feet earthfill dike with stone slope protection barrier across the harbor. The barrier structures are 20 feet above median sea level and the operable flood gate is 150 feet wide.

Challenges and Opportunities

The system is inspected semi-annually by the USACE. Long term operating costs are between $400,000 to $600,000 per year, not including major maintenance projects. These costs are paid by the municipalities. The barrier is closed during storms that occur at high tide.

Resilience Features

The flood gates are closed about once or twice a month on average when a high tide coincides with a south or southwesterly wind. It has become a regular part of the water-level control for New Bedford Harbor. The future sea level rise resilience of the system is being reanalyzed based on current projections.

Hingham Harbor

Hingham's Harbor Development Committee completed a district master plan for Hingham Harbor in 2007 and a climate change vulnerability assessment and adaptation study in 2015.

Description

Based upon these two plans, the Town and its stakeholders have pursued an incremental investment approach to improve and elevate coastal edges. This includes a pedestrian harborwalk with resilient stone wall, an elevated and engineered dune planted with sea grass that covers a buried sea wall, armor stone barriers at the coastal edge, and plans to lift wharves with fill and reconstructed sea walls.

Challenges and Opportunities

The engineered dune is managed with sand relocation twice per year to move it back up the coast. The town and stakeholders have been successfully pursuing funding for the incremental construction of resilience components with funding received from the Seaport Economic Council headed by Lieutenant Governor Karyn Polito, Coastal Resilience Grants from Coastal Zone Management (CZM), and local funding from the Community Preservation Committee and Trustees of the Bathing Beach at Hingham.

Boston Martin Richard Park

The City of Boston has undertaken resilience studies with a city-wide Climate Ready Boston Plan that was followed by neighborhood specific resilience plans. One issue in the South Boston/Fort Point Channel Neighborhood Plan was a flood entry point into the neighborhood next to the Boston Children's Museum.

Description

The City created a climate resilient park to address the flood entry point. The park cost $7M and was built on city and state assembled land. The park is city-owned. Most of the costs were paid by private donors, nonprofit foundations, and city funds.

Challenges and Opportunities

In order to close a flood pathway the elevation of the park needed to be raised while still providing an active and accessible recreation space.

Resilience Features

The new park raised the elevation of the property substantially and narrowed the potential flood pathway to be controlled by a deployable flood gate. The stone features of the park prevent tidal erosion when the park does provide flood protection. Mini-piles were used throughout the park to create vegetation beds with salt tolerant plantings.

Comparative Analysis

Comparison of Most Preferred Approaches

In order to inform the pursuit of one of the approaches most preferred by the community, a comparative analysis was performed to evaluate the relative benefits and costs of each. The metrics used in this evaluation are the components of the vision statement of the Scituate Harbor Resilience Master Plan. These metrics include the ability of the approach to: enhance economic vitality, improve the public realm, strengthen community and civic gathering, improve district parking, maintain cost effectiveness, retain the ability to implement, and reduce negative impacts. This evaluation is set organized by each of these metrics and compares across three columns on the following pages, the left column for the ocean fortification approach, center column for coastal elevation approach, and right column for land fortification approach.

Ocean fortification

Conceptual Alternative A

"Close the mouth"
Harbor barrier infrastructure

About **10,000** linear feet of adaptations, including a harbor gate

Coastal elevation

Conceptual Alternative B

"Lift the edge"
Incremental elevation of coast

About **5,000** linear feet of adaptations

Land fortification

Conceptual Alternative C

"Floodproofing with infrastructure"
Adapt coast and land configuration

About **5,000** linear feet of adaptations

Ocean fortification
Conceptual Alternative A

"Close the mouth"
Harbor barrier infrastructure

Coastal elevation
Conceptual Alternative B

"Lift the edge"
Incremental elevation of coast

Land fortification
Conceptual Alternative C

"Floodproofing with infrastructure"
Adapt coast and land configuration

Enhance economic vitality

-1

- ⊖ Protection from storm surge, does not protect against more frequent tidal flooding
- ⊕ Protects about 450 acres of total land
- ⊖ May impact recreational and commercial boating with impacts to local economy

0

- ⊕ Protection from storm surge and more frequent tidal flooding
- ○ Protects about 35 acres of total land
- ○ No substantial positive or negative impact foreseen for economy

+1

- ⊕ Protection from storm surge and more frequent tidal flooding
- ○ Protects about 35 acres of total land
- ⊕ May create new destinations and attractions for the business district

Improve the public realm

0

- ⊕ Opportunity to create extensive expanded harborwalk
- ⊖ No investments directly in Scituate Harbor business district that could be used for improvements

0

- ○ Opportunity to create improved harborwalk in business district only
- ○ Investments directly in business district, but focused on the coastal edge

+1

- ○ Opportunity to create expanded harborwalk in business district only
- ⊕ Investments directly in business district that may create new destinations and attractions

Ocean fortification
Conceptual Alternative A

"Close the mouth"
Harbor barrier infrastructure

Coastal elevation
Conceptual Alternative B

"Lift the edge"
Incremental elevation of coast

Land fortification
Conceptual Alternative C

"Floodproofing infrastructure"
Adapt coast/land configuration

Strengthen community and civic gathering

0

- ○ May create new community landmark or feature of civic pride
- \+ Creates opportunity for extensive harborwalk
- − Does not create new civic gathering place

-1

- − Does not create new community landmark or feature of civic pride
- ○ Creates opportunity for improved harborwalk
- − Does not create new civic gathering place

+1

- \+ Opportunity to create new community landmarks and features of civic pride
- ○ Creates opportunity for improved harborwalk
- \+ Opportunity to expand civic gathering space at Cole Parkway or other locations

Improve district parking

0

- \+ May create more opportunity for walking with a desirable pathway connecting nearby neighborhoods
- ○ Parking is not reduced in the district
- ○ Parking is not impacted by the infrastructure
- − Parking is not protected from tidal flooding

+1

- ○ Does not add walking connections beyond what exists today
- \+ Parking is not reduced in the district
- \+ Edges of district parking areas may be improved
- \+ Parking is protected from tidal flooding

-1

- ○ Does not add walking connections beyond what exists today
- − Number of district spaces would be reduced
- − District parking would be reconfigured to accommodate new infrastructure
- \+ Parking is protected from tidal flooding

Ocean fortification
Conceptual Alternative A

"Close the mouth"
Harbor barrier infrastructure

Coastal elevation
Conceptual Alternative B

"Lift the edge"
Incremental elevation of coast

Land fortification
Conceptual Alternative C

"Floodproofing infrastructure"
Adapt coast/land configuration

Maintain cost effectiveness

-1

- About 10,000 linear feet of improvements
- About $8,000 per linear foot based on escalations of costs from the New Bedford Hurricane Barrier
- Minimum of $80M order of magnitude cost
- About $500,000 order of magnitude annual operational cost to the Town, based on New Bedford operations
- Protects about $444M in assessed value

+1

- About 5,000 linear feet of improvements
- About $3,000 per linear foot based on price estimates for Hingham resilience improvements
- Minimum of $16.5M order of magnitude cost
- Annual maintenance cost would be minimal except for wall replacements in the future
- Protects about $86M in assessed value

0

- About 5,000 linear feet of improvements
- About $3,000 per linear foot based on price estimates for Hingham resilience improvements; $7M destination park cost based on Martin's Park in Boston
- Minimum of $19.9M order of magnitude cost
- Annual maintenance cost would include additional park features
- Protects about $86M in assessed value

Ocean fortification
Conceptual Alternative A

"Close the mouth"
Harbor barrier infrastructure

Coastal elevation
Conceptual Alternative B

"Lift the edge"
Incremental elevation of coast

Land fortification
Conceptual Alternative C

"Floodproofing infrastructure"
Adapt coast/land configuration

Retain the ability to implement

-1

- One large capital investment could impact ability to invest in other projects
- Approvals at Federal, State and Local levels will be extensive, costly, and time consuming

+1

- Investments can be made incrementally and phased to respond to sea levels and risk
- Less extensive approvals at Federal, State and Local levels - in many locations, shoreline is already hardened

0

- Investments can be made incrementally and phased to respond to sea levels and risk. More extensive interventions may impact future investments

Less extensive approvals at Federal, State and Local levels - in many locations, shoreline is already hardened, land-based improvements may be less difficult to permit, but could be disruptive

Reduce negative impacts

-1

Water

- Potential environmental disruption to salinity, pollution, tidal circulation, sedimentation, water exchange rate
- Potential impacts to recreational and commercial boating navigation and safety
- Potential impacts to abundance, distribution and behavior of fish populations

+1

Water

- Potential impacts to tidal circulation, sedimentation, and coastal erosion
- Potential expansion of marina docks and adjacent shoreline edge

0

Water

- Potential impacts to tidal circulation, sedimentation, and coastal erosion
- Potential expansion of marina docks and adjacent shoreline edge

Ocean fortification
Conceptual Alternative A

"Close the mouth"
Harbor barrier infrastructure

Coastal elevation
Conceptual Alternative B

"Lift the edge"
Incremental elevation of coast

Land fortification
Conceptual Alternative C

"Floodproofing infrastructure"
Adapt coast/land configuration

Reduce negative impacts

-1

Land

- Potential impacts to landowners at locations requiring elevated or improved flood resilience measures

+1

Land

- Potential impacts to landowners at locations requiring elevated or improved flood resilience measures

0

Land

- Potential impacts to landowners at locations requiring elevated or improved flood resilience measures
- Potential impacts to current patterns of circulation and parking near shoreline

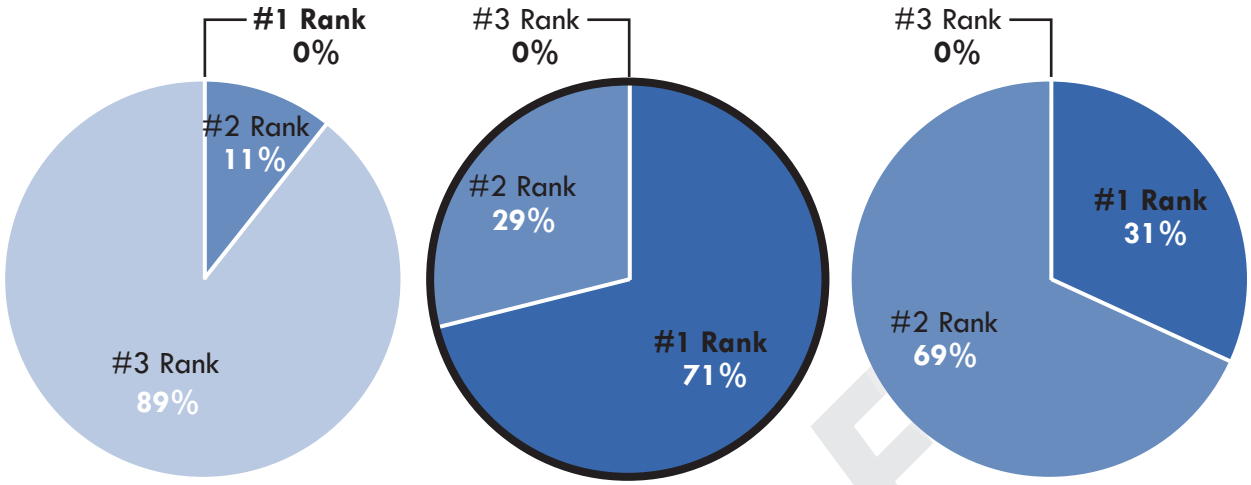
The following page compiles all of these more detailed evaluations in a summary table that shows the results of this comparison.

	Ocean fortification **Conceptual Alternative A** "Close the mouth" Harbor barrier infrastructure	**Coastal elevation** **Conceptual Alternative B** "Lift the edge" Incremental elevation of coast	**Land fortification** **Conceptual Alternative C** "Floodproofing infrastructure" Adapt coast/land configuration
Enhance economic vitality	-1	0	+1
Improve the public realm	0	0	+1
Strengthen community and civic gathering	0	-1	+1
Improve district parking	0	+1	-1
Maintain cost effectiveness	-1	+1	0
Retain the ability to implement	-1	+1	0
Reduce negative impacts	-1	+1	0
Overall Performance	-4	+3	+2

Final Community Preferences

The following pie charts show the results of asking the community for ranking of their preferences upon review of the information presented in this comparative analysis. Participants were asked to rank the (3) alternatives, 1 as the most preferred, 2 as the second most preferred, and 3 as the least preferred. The pie charts so that Conceptual Alternative B was the most preferred.

Rank your preferences for the alternatives:



Ocean fortification

Conceptual Alternative A

"Close the mouth"
Harbor barrier infrastructure

Coastal elevation

Conceptual Alternative B

"Lift the edge"
Incremental elevation of coast

Land fortification

Conceptual Alternative C

"Floodproofing infrastructure"
Adapt coast/land configuration

All of this information, including this comparative analysis and its results were presented to the Task Force in February and to the community at a Community Forum in March. On both occasions the participants responded with preferences for Conceptual Alternatives B and C. While Conceptual Alternative A was expressed as a preference by the community at the beginning of the process, the comparative evaluation of the three most preferred approaches left the other two as the leading preferences.

The Scituate Harbor Resiliency Master Plan is focused on these two approaches to resilience solutions, the elevating of the coastal edge and the creation of land-based amenities that would also serve to increase the height of a barrier to flooding. This community-based process and discussion has determined the final preferred approach that the Scituate Harbor Resilience Master Plan is based upon.

Additional Case Studies

Examining several climate resilience planning case studies is useful in addition to the case studies outlined as examples of completed resilience investments from New Bedford, Hingham and Boston. Designing and planning for climate-resilient working harbors is relatively new to the field of planning, where economic prosperity, tourism attractions, beautification, and harbor-based industries must align with the prospect of extreme flooding and sea level rise. The following section highlights recent planning efforts that aim to build resilience to flooding in communities vulnerable to coastal and/or riverine flooding. These plans capture a vision that combines community values, economic growth, and water-based industry prosperity with the environmental conditions that currently impair these values and goals.

These additional case studies include ***Resilient Boston Harbor***, ***Estes Park Downtown Plan: A Vision for a Resilient Future***, and the ***Lower Manhattan Climate Resilient Study***. Each of these plans are unique to the geography and community in which they serve, however all three share several common characteristics found in Scituate Harbor- a strong community spirit and sense of place for the planning area, threats to that vitality of the area from flooding, and the need to balance growth, economic stability, beautification opportunities, and resilience. Each case study is organized by *Site Description*, *Community Vision*, *Challenges and Opportunities*, and *Recommended Actions*. All have some component that is comparable to Scituate Harbor's challenges and opportunities.

Resilient Boston Harbor (2019)

After its climate vulnerability assessment and action plan, Climate-Ready Boston, Boston pursued a resilient harbor planning effort neighborhood by neighborhood, to create a vision of increased access and open space and flood-resilience of its infrastructure along the 47-mile Boston Harbor shoreline.

Site Description

Boston Harbor is a natural harbor and estuary of Massachusetts Bay and home of the Port of Boston, one of the major shipping facilities in the Northeastern United States. It contains an inner harbor and an outer harbor. The inner harbor is the site of most port facilities as well as other coastal uses, including residential and recreational uses, such as recreational and commercial boating. The inner harbor is the location of the mouths of two major rivers, the Charles River and the Mystic River. Inner Boston Harbor has been the subject of major pollution remediation efforts including the development of Deer Island as a wastewater treatment plant and recent lawsuits on violations to the Clean Water Act. Today, the inner harbor is safe for fishing and swimming on most days, except those with rainstorms. The outer harbor has numerous harbor islands, 34

of which are part of the Boston Harbor Islands National Recreation Area. These islands provide significant shoreline protection to the mainland Boston waterfront and inner harbor by dissipating intense wave energy during coastal storms and nor'easters. However, the islands do not protect Boston Harbor from inundation, nuisance flooding at lunar high tides, or sea level rise.

Challenges and Opportunities

Boston proper is largely comprised of filled wetlands. Beginning nearly 4 centuries ago and until the late 1800s, Boston slowly grew the city boundaries by altering the natural hydrological systems to create more land. Today, the filled tidelands are only one to two feet above the high tide mark and this low-lying city is highly vulnerable to widespread exposure to sea level rise. This includes nearly two feet and potentially up to four feet by mid to late century at a regular high tide. Storm surge and lunar high tides would have even more dramatic impact in the extent and severity of flooding.

Boston's current and future flooding affects many critical facilities, businesses, the Harborwalk, parks and other civic spaces that threaten the vitality, economic prosperity, and community gathering of Boston, its residents, visitors, and businesses. In South Boston, this includes a manufacturing waterfront, art district, marinas, parks, piers for commercial fishing, industrial uses, beaches, parks and more. By mid to late century, without intervention, 7,300 people and 920 buildings will be exposed creating the potential for an estimated $2.8 billion in damages and relocation. In East Boston, flooding impairs critical transportation corridors not only for vehicles and public transit, but also for emergency response. This effectively transforms the neighborhood into an island disconnected from services that mainland Boston provides.

Vision for Resilient Boston Harbor

In all of the harbor neighborhoods- East Boston/Charlestown, South Boston, Downtown/North End, and Dorchester, the vision for a Resilient Boston Harbor is a redesigned system of waterfront parks that create improved access to parks, open space, and water as well as buildings and infrastructure prepared for flood events and sea level rise. The vision was determined by four distinct neighborhood planning efforts that contained significant public outreach and engagement. The overall vision reflects resident's preference for the waterfront that maximizes flood protection from a 1% Annual Chance Storm.

Resilience Recommendations

All resilience recommendations utilize a combination of ecological, natural, and hard infrastructure to prevent water pathways from entering the City. The approach is largely a land adaptation approach of building up the waterfront with earthen berms and civic spaces, climate-smart parks, and seawalls combined with restoration and development of salt marshes which minimize the wave energy entering the harbor areas.

South Boston/Dorchester harbor resilience recommendations include:

- Elevated waterfront parks such as Martin's Park the deflect water pathways,
- Natural wetland buffers in low-energy coastal areas,

- New civic parks along an elevated Harborwalk,
- New seawalls,
- Deployable floodgates, and
- Proposed boardwalk along the Fort Point Channel.
- New design standards for transportation corridors and civic spaces at 15 feet NAVD 88.
- Elevated sidewalks that create stepped, interactive seating, and
- Earthen berms that connects to a park for a mid-term sea level rise strategy.
- Dorchester harbor resilience includes a large-scale redevelopment of Moakley Park that protects the neighborhood from climate change, improves health, vitality, and well-being of the diverse communities the park connects.
- The plan also creates recommendations for expanding the beaches and tidal marshes at Tenean and Victory Beaches.

East Boston/Charlestown harbor resilience recommendations include:

- Restoration of Belle Isle Marsh for additional shoreline protection.
- Installation of a deployable flood wall at Eat Boston Greenway and Lewis Street.
- Creation of elevated open spaces at the East Boston Greenway entrance and at Piers Park II.
- Regulations for flood proofing and flood-resilient new and redevelopment.

Downtown/North End harbor resilience recommendations include:

- Redesign of three coastal parks, Christopher Columbus Park, Langone/Puopolo Park and Sargent's Wharf. These are important tourist and community gathering spaces that connect to the East Boston Greenway and create a continuous shoreline protection strategy.
- Park redevelopment will protect the neighborhood from flooding.
- Additional resilience strategies include enhanced water transportation at Long Wharf.

Lower Manhattan Coastal Resiliency (2019)

Post Hurricane Sandy, the New York Metropolitan area began an era of resiliency planning with overall city-wide strategies and neighborhood level planning efforts. This case study focuses on planning efforts for Lower Manhattan.

Site Description

Surrounded by the Hudson River, East River and New York Harbor, the waters surrounding Lower Manhattan have been an important part of the origins and historic evolution of New York City. Lower Manhattan itself has been the feature of many major milestones beginning with the Lenape people and Dutch colonization, the first stop for immigration from Ellis Island and Castle Clinton, the site of the attack on the World Trade Center on September 11, 2001, and its continued evolution as the center of United States and global economic activity. Lower Manhattan represents 10% of all NYC jobs, was host to 15 million visitors in 2016, and is home to a thriving 24-hour live-work district. The neighborhood contains a densely developed mix of tall new towers and large proportion of old, historic buildings. It also contains world-class parks including Battery Park,

the 9/11 Memorial Park, and the Esplanade. Lower Manhattan is also low-lying whose coastline is dipping below the aging bulkhead on the coastal edge. It was one of the hardest-hit areas during Hurricane Sandy.

Challenges and Opportunities

In 2012, Hurricane Sandy flooded 17% of New York City's land with a record 14 feet high storm surge. The flooding and subsequent storm damage claimed 44 lives, created power outages for 2 million people for a week, and released 5.2 billion gallons of untreated or partially treated sewage discharge into the City's waters. It also caused $19 billion in damages and lost economic activity. Wall Street was closed for two days disrupting the global stock exchange. Climate change projections suggest that storms such as Hurricane Sandy will become more frequent and severe. Lower Manhattan could experience 9-16 feet of storm surges during a 1% Annual Chance Storm by 2100 and daily tidal inundation could impact 20% of the neighborhood's streets and 10% of its properties.

Vision for Lower Manhattan

The Lower Manhattan Coastal Resiliency Project is an integrated coastal project initiative that identifies climate change exposure in mid to late century and long-term adaptation and resilience strategies that serve multiple benefits for its diverse community. Since Hurricane Sandy, recovery and private sector funding have already boosted the flood resilience of buildings and utilities in the area. Lower Manhattan Coastal Resiliency builds upon these strategies to create a phased series of actions and implementation strategies for the near and long-term.

Resilience Recommendations

Resilience recommendations are categorized into three different sections of Lower Manhattan- Two Bridges Coastal Resilience, the Battery Coastal Resilience, and Battery Park City Resilience Projects.

Two Bridges coastal resilience suggests deployable protection such as flip-up barriers and deployable flood walls in a manner that preserves access and viewshed of the waterfront. The deployable flood walls would become a permanent underground structure and hidden until needed for protection from a pending storm.

In the Battery, resilience strategies expand the Battery City Esplanade into the Battery with a 0.33-mile extension raised to height that would protect against sea level rise and storm surge. Its creation would provide a seamless line of protection from Battery Park City. The study identified a need for further, more detailed investigation into the Financial District and Seaport area due to significant physical constraints. Other interim flood protection measures include deployable protection including HESCO barriers, Tiger Dams, and other "just in time" deployables.

The Battery Park City Resilience strategy utilizes existing parks and open space to raise the edge of the waterfront. It also includes enhanced recreational and visual access to the water with an elevated Esplanade, a pedestrian Greenway that runs along the entire length of Battery Park, with gardens and public art installations. The plan also suggests developing a storm surge flood wall and seepage barrier to minimize flooding.

Estes Park (Colorado) Downtown Plan: A Vision for a Resilient Future (2018)

While not a coastal flooding resilience plan, this riverine flooding plan has many relevant similarities for the resilience planning in Scituate Harbor.

Site Description

Estes Park is a small town of approximately 6,000 residents that is a popular resort destination and headquarters location of Rocky Mountain National Park. It is not only known for its spectacular views, stunning location, and lively downtown but is also home to the Historic Stanley Estes Park Hotel, the inspiration for Stephen King's bestselling novel The Shining. Estes Park is also at the confluence of three rivers draining from the Rocky Mountains- Big Thompson Creek, Fall River, and Black Canyon Creek. Additionally, Downtown Estes Park is just west of the large Lake Estes. Water is a large component of this small town that is supported by a tourist economy and strong sense of place by its residents.

Challenges and Opportunities

Estes Park has suffered severe damage and fatalities as a result of three major floods. The first occurred in 1976 when a year's worth of rain, approximately 12 inches, fell in a little over an hour. The flash flooding of Big Thompson River swept through the Town taking 144 lives and causing $35 million in damages. In 1982, the Town suffered another flood from a breached dam on a tributary of Fall River. The flash flood took three people's lives and caused another $31 million in damage to Estes Park. The last flood in 2013 occurred after several days of continuous rain, swelled the rivers and overtopped the banks of both the Big Thompson and Fall Rivers. It caused widespread flooding, damage to major transportation routes, and damage to the sewer infrastructure. Hundreds of residents were isolated as a result and rivers were polluted from the damaged sewer lines.

In addition to managing water as a risk and an asset, Estes Park faces challenges with regional population growth and increased housing demand. Also, its economy is highly dependent on Rocky Mountain National Park visitor patterns and subject to the shifting, volatile tourist economy.

Vision for Downtown Estes Park

Estes Park is highly beloved by its community and they seek to create a place like no-other, "Distinct in design and integration of the built environment with its unique natural setting." Their vision is a Downtown where the water is an asset and the best location for viewing Rocky Mountain rivers. Other visionary approaches include creating a healthy mix of businesses both for locals and tourists to stabilize economic cycles, creating a range of housing options, and enhancing accessibility with multi-modal transportation.

Resilience Recommendations

The Estes Park Downtown Plan tackles the challenges of flooding, parking, economic growth, and traffic circulation with an innovative and diverse approach that blends nature-based solutions, multi-modal transportation, new vehicle circulation patterns, boosting civic space, and managing water within civic space that enhances the safety and beauty of the area. The following highlights

key recommendations by topic area.

Water Accessibility and Flooding

- Create terraces that overlook rivers,
- Create a signature park and river access amenity designed to withstand, capture, and divert flood pathways and flows,
- Improve stream conveyance by widening stream channels,
- Create terraced walls along the river for better access and better flood storage capacity,
- Improve capacity of the bridge with redesign, and
- Divert water to play pools.

Parking and Circulation:

- Enhance visitor access by requiring frequent turnover of most convenient parking spaces,
- Create long-term parking outside or on the edge of downtown to prioritize short-term parking,
- Capture vehicles with parking at visitor center before they enter the downtown, to alleviate Downtown congestion.
- Increase parking with a new parking structure,
- Improve wayfinding to eliminate vehicle congestion from seeking parking spaces.
- Utilize streets as public space that are accessible to all-pedestrians, bicycles, and vehicles,
- Expand sidewalk width and add corner bump-outs with natural features such as trees and raingardens. Bump-outs shorten pedestrian crossings and expand sidewalks increasing civic space for social gathering and greater business patronization,
- Reconfigure roadway network with a single-lane traffic loop. Single lane of traffic in downtown environment can carry 800 vehicles per hour at slow speeds, and
- Create off street and on-street facilities for multi-use paths or bikeways. Ones that are physically separated from vehicles such as separated bike lanes within the street right of way.

New and Redevelopment:

- Orient development toward the public realm,
- Activate and animate the public realm with creative visual interest such as artistic installations, outdoor dining, and landscaping/green infrastructure,
- Create greater connectivity with the Riverwalk. Eliminate gaps and improve wayfinding,
- Provide space for social interaction and seamless extension of ground floor businesses,
- Infuse art into the downtown fabric,
- Create a downtown adventure zone-park amenity to draw families with state-of-the-art downtown playground. Zip-lines, climbing boulders and modern playground structures are some examples, and
- Utilize the rooftops for expanding business, social gathering space, and access to scenic views.

Resilience Master Plan


GALLERY
DRAFT

Resilience Master Plan

The Scituate Harbor Resilience Master Plan identifies specific and viable near-term and long-term solutions to improve the resilience of Scituate Harbor. This community process began with a simple premise that meaningful solutions can only be identified if the problem to be solved is clearly defined and a shared understanding about that problem is created. This district master plan is based upon the shared understanding of community members, stakeholders, and leaders in the Town of Scituate. The community process was informed by an understanding of the current and projected risks, and the detailed evaluation of solutions based on the community's preferences. All of these efforts have helped to articulate and define the vision statement to frame the strategies and recommendations of the resilience master plan.

Vision Statement

Create a cohesive vision for Scituate Harbor that will build resilience incrementally, through coordinated and layered measures, to meet flood challenges projected for mid-century (2050) and beyond. Near-term and long-term actions should create more flood resilience while creating additional benefits to the district that will:

- **Enhance economic vitality** by protecting strengthening or expanding the key assets of the district.
- **Improve the public realm** for pedestrian and bicycle safety and more sustainable infrastructure.
- **Strengthen community and civic gathering** to reinforce Scituate Harbor as the heart of the community.
- **Improve district parking** to offer more convenient access and functionality.
- **Maintain cost effectiveness** by strategically weighing the advantages and disadvantages of investments
- **Retain the ability to implement** current and future actions to further protect and improve the district.
- **Reduce the negative impacts** that may result from an approach to resilience investments including environmental, social, economic, or community impacts.

Plan Objectives

As defined in the previous report section, the combined preferred resilience approaches are an incremental elevation of the coast and an adaptation of the coastal edge at the perimeter of the district. The coast line in the area around Scituate Harbor has already been hardened with incremental lengths of coastal protection measures built up over the years. The coast line, including areas beyond the study area (north from the coast line of Cedar Point, south to Peggotty Beach and out to include First Cliff and Second Cliff) is about 60% hardened today. Meaning that it is a coast line that is either a seawall, stone revetment, or sheet piling. The preferred approach incrementally improves the resilience of these already hardened edges at Scituate Harbor to reduce flood risk. This approach should be combined with natural approaches to reducing flood risk that will enhance the coastal edge as a living shoreline. This complementary approach will help to retain the benefits of the surrounding salt marshes and barrier beaches. In addition to increasing the resilience of the district, the improvements identified are also intended to strengthen the district according to the following objectives:

Provide immediate actions to mitigate the impact of climate change - recommendations and an implementation plan for coordinated and immediate actions that can be undertaken by the Town and others to reduce risks and impacts for the district

Encourage economic development - recommendations to enhance economic development, retail activity, and arts and cultural vitality to enhance livability while integrating resiliency

Enhance transportation infrastructure - recommendations for the improvement of the everyday functionality and resilience of multi-modal circulation, walkability, and parking to enhance district access

Beautify the area - recommendations for the beautification and enhanced resilience of coastal parks, streets, streetscape, and other public realm or infrastructure systems

Lay out long-term strategies for the district - strategies for longer term investments in infrastructure and property that will allow the district to thrive in the coming decades

Recommendations by Objective

The recommendations of the district master plan are defined in this section and organized by topic-areas. Several recommendations are defined within each topic area. The recommendations support the Vision Statement that has been articulated for the district and respond to specific challenges and opportunities that have been articulated for the district.

A. Mitigate the Impact of Climate Change

As established throughout this document mitigating the impact of climate change, specifically sea level rise and coastal flooding, is the focus of this master plan and the leading set of recommendations. The context for the challenges and opportunities are defined in detail in other sections of this document, here a description of the challenges and opportunities is followed by corresponding solutions and recommendations.

Challenges and Opportunities

A.1. Preventing coastal water that rises above the bulkhead edge and entering the business district is the primary challenge for Scituate Harbor.

A.2. Preventing coastal water that enters through other infrastructure and into the business district is a related, but distinct challenge for Scituate Harbor.

A.3. Providing secondary protection measures for buildings and other district assets from the impacts of sea level rise. Front Street could be flooded regularly under normal tidal conditions under sea level projections out to 2088.

A.4. Edward Foster Road and bridge are the transportation infrastructure components most vulnerable to sea level rise. The road is entirely submerged in 2038 when projected sea level is combined with a Category 1 Hurricane.

A.5. The bridge at Satuit Brook on Front Street will be subject to flooding at a depth of 4-6 feet from sea level rise projected in 2038. Under those conditions, the bridge will be subject to scouring and potential undermining of its structural integrity.

A.6. The Kent Street Marshes are completely submerged, compromising their flood storage capacity and increasing vulnerability of surrounding coastal areas and transportation infrastructure.

A.7. Sewer lines in the Scituate Harbor are vulnerable to flooding during a 1% Annual Chance.

A.8. Stormwater runoff from Scituate Harbor's parking lots and roadways contribute to water quality impairments in Scituate's valuable water resources and impairs the ecological integrity of salt marshes and the shoreline protection they provide.

Solutions and Recommendations

A.1. As articulated in the previous section, the community's preferred approaches for coastal resilience are to "lift the edge" and "floodproof infrastructure." The primary approach to preventing water from entering the business district from over the bulkhead is to incrementally invest in elevating the bulkhead edge. The district edge should be divided into smaller sections (refer to the Sub-area recommendations for an approach to this work) that can be pursued as independent projects that will tie-in together to form a continuous barrier. The sequence of these improvements should be prioritized based on the flood pathways study that will soon be completed on behalf of the town. Any location that presents a more imminent threat for direct flooding due to its current elevation or configuration should be prioritized as a leading project in this effort. This wall should be integrated with Harborwalk improvements and coastal amenity areas with integrated seating, lighting, and wayfinding.

A.2 The stormwater system currently has coastal outfalls that fall below the tide line under certain conditions. The stormwater outfalls have no backflow preventer devices. Installation of this type of device is being investigated by the town and should be implemented to prevent water flowing from the coast back through the stormwater pipe system and emerging in the district at stormwater catch basins. This entry occurs primarily in the Cole Parkway area today.

A.3. As the perimeter elevation of the district occurs incrementally over a period of years, the district will require a secondary line of defense. This secondary defense will also be useful in the future to provide redundancy in the protection of the district. This type of approach involves floodproofing individual buildings and installing devices in each of the gaps for the provision of deployable flood barriers. This would provide a secondary line of defense to prevent flood waters from entering Front Street, reducing the total damages and disruption that would occur due to a coastal flooding event.

A.4. Edward Foster Road and bridge should be explored with an engineering study to determine the cost and impacts of raising the roadway and bridge relative to sea level rise projections. The redesign should be combined with enhanced pedestrian and bicycle amenities to extend the Harborwalk connections from the Scituate Harbor business district to First Cliff.

A.5. The bridge at Satuit Brook should be explored with an engineering study to determine the cost and impacts of raising the bridge relative to sea level rise projections while considering the amount of adjacent regrading and impacts to the business district that would be associated with the project.

A.6. The Kent Street Marshes are a part of a living shoreline resilience solution that protects Scituate Harbor from wave energy from the south. This area should be protected and to reduce the possibility that it will become fully submerged and lost as a natural asset. [insert discussion from Darci]

A.7. In addition to keeping flood waters out of the sewer system by means outlined Recommendations A.1., A.2. and A.3. the recent Sewer Resilience Feasibility Study conducted by the Sewer Division recommends replacing gravity sewer systems with low pressure force, replacing standard manhole frames with water-tight frames and covers.

A.8. Stormwater improvements [insert discussion from Darci] Preventative measures that minimize water, both inland stormwater and coastal flood waters, entering the system can increase the long-term viability of the system and mitigate additional pollution to the harbor.

B. Encourage Economic Development

Addressing flood risks in Scituate Harbor are not the only concerns facing Scituate Harbor. Both the resilience investments and other investments in the district should address other major concerns that have been raised by the community and identified through previous studies. Aside from flood risks, community members also highlighted the businesses, shops, and restaurants, convenient parking, things to do, community events, and access to the water as major concerns for Scituate Harbor. Encouraging new economic development activity while retaining a focus on historic preservation in the district is a critical balance to maintain.

Challenges and Opportunities

B.1. One of the challenges most frequently mentioned in discussions with stakeholders is parking in the district. The district parking supply includes about 54 on-street parking spaces on Front Street, about 172 off-street spaces in private parking lots (St. Mary's, Village Market, T.K. O'Malleys, Mill Wharf), and about 431 municipal spaces (Cole Parkway, Town Pier). A lack of available district parking has been identified as an issue during busy summer weekends at the peak of district activity. Outside of peak tourist times, the district parking areas, particularly Cole Parkway are underutilized. Further, residents have suggested that Cole Parkway is unattractive with too much impervious surface and is often used by commercial vehicles for longer term parking, pointed to the inefficiency of its use as a parking area. The parking areas in Scituate Harbor, particularly the large water-adjacent Cole Parkway area, are subject to occasional flooding today and are projected to be flooded regularly to a depth two to four feet with sea level rise in 2038. Addressing the parking challenges today and strengthening future resilience around Cole Parkway is an important strategy.

B.2. The growing number of vacant storefronts in the district has been identified as an economic development challenge for the district. The study area properties are home to about 90 businesses that include a wide range of uses (banks, hardware store, coffee shop, restaurants, boutiques, personal services, salons, cinema, realtors, grocery store, an inn and others) that are well distributed throughout the district.

B.3. The seasonal nature of the district with much less activity outside of the summer boating months has been identified as an economic development challenge for the district.

Solutions and Recommendations

B.1.A. Several studies have suggested satellite parking and shuttles to Scituate Harbor as a way to expand the parking supply for the district. This may be appropriate for peak weekends, or special events, but is not likely to be an optimal solution for everyday activity in the district. Parking supply could be enhanced by looking to some of the underused parcels on the west side

of Front Street. Unfortunately, adding enough parking to satisfy peak demand in a small business district is very disruptive to the district by leaving large unused parking areas that are not offering any value or beauty when not providing convenient access for peak vehicle use.

B.1.B. Often, a more effective strategy than adding more and more parking to a small business district is to push for more effective management of the existing parking resources. In order for a district's parking supply to be operating efficiently, the parking utilization rate wants to remain at about 85% of the spaces occupied during periods of normal use. Special occasions and events may overwhelm this level of supply, but those occasions should be served by special parking considerations, not accommodated everyday to the district's detriment. A key to parking management is to set up a system of time limits or fees that are enforced to increase the turn-over of convenient well-located spaces so that they are available for short-term visits (1 hour) to the district. Parking for a long period (2 to 4 hours) should be given the next most convenient parking areas. Finally, moving to the parking spaces least convenient to the district's destinations and devoting those spaces to longer term parking (full day). District employees should be parking in the longer term parking areas. Parking uses that are not supporting district activity, such as longer term vehicle storage should be moved to another location in the Town.

B.2. Vacant storefronts occur in all business districts. Prolonged vacancies and the perception of a critical mass of vacancies become issues for a district and should be explored proactively by the town or business association. Unfortunately, no one size fits all solution is available for storefront vacancies, but each requires conversation with the property owner and potentially with the previous tenant to understand the dynamics that may be impacting that particular vacancy. An outline of this type of exploration is offered under "Complementary Recommendations - District Vitality." Another approach to address vacancies is to develop agreements with property owners to provide temporary programming or activities for the vacant storefronts. These type of short-term "pop-up" activities could be connected to events, arts, culture, local businesses, or other approaches to activate the vacancy until it can be more permanently filled.

B.3. Previous studies have identified significant opportunity to advance the economy in Scituate Harbor with the intent of creating a year-round destination. Some suggestions include adding additional residential units, diversifying restaurants for destination dining which spills over into retail, diversifying boat recreation access to paddle boards and kayaks, adding hotels, and creating better connections to the Harbor from Boston (i.e., shuttle from Greenbush). Additional redevelopment opportunities in the district could help to build the critical mass to support stronger year-round activity. Additional redevelopment could bring additional residents who live in the district, a complementary district hotel to allow for more multi-day visitors, and additional ground floor commercial space to add to the mix of offerings in the district.

C. Enhance Transportation Infrastructure

Previous planning efforts have stated the importance of increasing pedestrian and bicycle access, improving safety, and adding traffic calming to the district. Some past suggestions include creating one-way travel on Front Street, bumping out the curbs for additional civic space, adding landscaping and trees, and strengthening a network of multi-modal paths.

Challenges and Opportunities

C.1. Pedestrian safety and walkability are fundamental aspects of the present and future success of Scituate Harbor. While the district is presently walkable, issues with vehicular speed of travel on Front Street, and safety while walking have been noted as issues. A total of six crosswalks exist on Front Street over a total of about 2,100 feet of street length.

C.2. Bicycle infrastructure in the district is mostly missing today. No bicycle accommodations exist on Front Street or Cole Parkway. Once a bicyclists arrives at the district it is unclear where bicycle racks may be located.

C.3. During peak times, traffic congestion on Front Street and into and out of the primary parking areas at Cole Parkway and Mill Wharf can a frustration for visitors to the district.

Solutions and Recommendations

C.1. The business district will experience success in part because it is an attractive and pleasant place to walk. All visitors to the district will be walking some distance regardless of other modes of travel used to get to the district. Generous and continuous sidewalks and safe and well-marked crosswalks are the most fundamental and important aspects of pedestrian safety and comfort in the district and exist in the district today.

Two techniques can be used to expand the usable sidewalk area in specific locations. Curb extensions are one recommended approach to expanding sidewalk space for streetscape, street furniture, bike amenities, or outdoor seating for restaurants. This type of curb extension would typically replace one or more on-street parking spaces. Due to the associated loss of on-street parking, the locations of curb extensions should be placed strategically. The second technique to expand sidewalk width is at the edge of the right-of-way shared with the private lot lines. Buildings that may not be set directly at the back of the sidewalk, or front property line, should integrate property frontage with the sidewalk to expand the active area that can be used by pedestrians and sidewalk amenities. All private setbacks should be coordinated with the public realm of the sidewalk and the adjacent uses to leverage areas near the sidewalk for the greatest benefit of the district. This could include integrating more outdoor seating, share private space for public use, or other techniques to strengthen the attractiveness of walking. One of the zoning recommendations is to remove the required front setback to allow for flexibility in future

development, providing an expansion of the sidewalk width at the frontage of a new building could be beneficial to activating the sidewalk in front of the property.

Pedestrian crossings and signal timing at intersections are also an important part of district walkability. Crossings should be added across Front Street at Old Dock Street and across Front Street near the Town Pier. Curb extensions should be added at crosswalks to increase pedestrian visibility and reduce crossing distance. Curb extensions could be integrated with landscape improvements and green infrastructure. Flashing light beacons at unsignalized crosswalks and traffic signals designed to minimize pedestrian wait time and to provide adequate crossing intervals are important components of a safe pedestrian environment. Leading pedestrian intervals, where pedestrians are given a green signal before vehicles is another signal improvement that would benefit walking and safety in the district. Walkability should be elevated as a core characteristic of the district and all improvements should strengthen an attractive and safe experience for pedestrians.

C.2. Encouraging nearby residents to arrive by bicycle instead of vehicle benefits the district. The addition of a bicycle lane route into the district with a marked lane and signage as you enter Front Street from the south and north would help to create a more inviting and bike-friendly business district. This routing could direct bicyclists to cycle on a marked lane along Cole Parkway or Old Dock Street to move bicyclists off of Front Street to locations where there is more room to accommodate a bicycle lane. These bike lanes should lead to an easily identified, convenient and attractive place to lock bicycles on safe and secure bicycle racks in the area of Cole Parkway. This bicycle area should then be conveniently connected by sidewalks to the broader sidewalk network of the district.

C.3. Alternative traffic routes to and through the Scituate Harbor business district are not readily available. Immediately to the east of the district is the water and immediately west to the district is a residential neighborhood. Although several side streets connect to Front Street between Beaver Dam Road and First Parish Road, these streets are not presently designed for more intense business district traffic. Additionally, very few options are available for north-south alternatives to Front Street. The nearest is Hazel Avenue, a residential street, and then Tilden Road, another residential street. Therefore improvements should focus on Front Street, Cole Parkway, Mill Wharf Plaza, and Old Dock Street. Under normal operations, these areas should not be congested, but should also encourage slow travel for vehicles. During special events the best solutions, are ones that are already in practice with event signage and police officers helping to direct traffic and maintain a continuous flow of vehicles entering and leaving at critical intersections along Front Street. In some cases this may or should include the partial closure of Front Street during the event.

D. Beautify the Area

Previous planning efforts have stated the importance of beautification in the Scituate Harbor business district. Some past recommendations have been implemented and included improving wayfinding and investing in district landscaping. Cole Parkway has been identified multiple times as an area in need of improvement and additional landscape and amenities.

Challenges and Opportunities

D.1. The character of Front Street has many attributes that are positive. The character of this primary street in the district is key to the positive experiences and impressions for visitors, residents and stakeholders.

D.2. Scituate Harbor stakeholders and residents have expressed a desire for creating more civic meeting space, green areas and parks.

D.3. The Scituate Harborwalk is a great district amenity that should continue to be well-maintained and expanded.

D.4. Large parking lots in the district are the most disruptive and difficult areas in terms of district beautification. While functionally necessary, these areas have negative characteristics that must be counteracted with beautification strategies.

D.5. Signage and wayfinding in the district has been implemented based on previous recommendations and can continue to be improved as the district continues to strengthen and evolve.

Solutions and Recommendations

D.1. Front Street is a narrow and constrained right-of-way. At the center of the district, there are only about 50 feet between the existing buildings on either side of the street. That narrow width accommodates a sidewalk on both sides of the street (varying in width up to a maximum of about 7 feet per side), on-street parking on both sides of the street (about 8 feet per side), and one lane of travel in each direction (for a total of about 23 feet in width). The street is attractive and includes street trees in tree grates integrated into the existing sidewalks. Additional street trees and landscaping should be added at new curb extensions for pedestrian crossing and if a on-street parking space is converted into a parklet (small parking space sized landscape amenity). The property frontages that include parking or vehicle circulation are the least attractive segments of the street and should be given the focus of additional landscape and street tree plantings.

D.2. District civic meeting space, green areas and parks are an important part of the district today and several attractive models for these amenities already exist in the district. The private outdoor plaza at the Harborside Bar is an attractive plaza that adds amenity to the Front Street frontage. The Scituate Harbor Gazebo near the center of Cole Parkway is an attractive civic gathering space and waterfront amenity. A small private plaza at 91 Front Street offers a similar model of a small, attractive private plaza. Additional civic meeting space, green areas, and park amenities should be integrated with the elevated coastal edge as part of resilience investments. Additional small plaza spaces could be added to the district based on the models already in the

district. This could occur in the small alley between 124 and 132 Front Street or the small parking and service area south of 121 Front Street. The unique pedestrian alleys between Front Street and Cole Parkway are another great opportunity for interesting amenities and character-building features for the district that may include public art or unique lighting opportunities.

D.3. The Scituate Harborwalk connection has been created and it has the potential to grow and evolve into a remarkable regional attraction. The location of the Harborwalk at the coastal edge puts it in direct alignment with the resilience investments that are recommended for the district. These investments should be combined with a reimagining of the Scituate Harborwalk to be an elevated coastal walkway that expands as the context allows to create small elevated seating areas, plazas, parks, playgrounds, observation decks, fishing areas, or other amenities. The harborwalk should also continue to expand to connect to nearby areas in Scituate. For example, the walk should be integrated with Edward Foster Road and bridge resilience improvements to connect to First Cliff. This connection would allow the town to add additional municipal assets to the connections along the Harborwalk with the Scituate Maritime Center and newly acquired land on the west side of First Cliff. This expansion could be phased and would result in about 3 miles of Harborwalk that connects the Scituate Lighthouse to First Cliff with the Scituate Harbor business district at its midpoint.

D.4. The large parking lots at Cole Parkway, Mill Wharf Marina, and the Village Market provide a substantial proportion of the parking supply in the district. They are also very large uninterrupted expanses of asphalt that disrupt the character and walkability of the district. Adding landscaping to these large parking areas is an effective way to reduce the negative impacts of the large parking lots. Cole Parkway has seen the implementation of landscape improvements over the years, but those improvements could evolve and be strengthened as a functional feature of the district. The curbed landscape areas could be converted into bioswales to capture and filter stormwater from the surface parking areas. Additional plantings and trees could be planted in these bioswale areas to further strengthen these amenities. The parking areas at Mill Wharf and Village Market could follow these types of landscape improvements with a modest loss of parking spaces to add expanded landscape raingardens at the ends of parking aisles.

D.5. Previous planning efforts have provided recommendations for district signage and wayfinding that has been implemented with a particular focus on the Cole Parkway area. These branded signs are located near the entry points of the Cole Parkway Lot on Front Street and Old Dock Street. In the Cole Parkway area branded signs are to define the locations of parking limitations, these show the parking zones of (A) 15 minute parking, (B) 2 hour limit, (C) all Day 6am-2am, and (D) overnight. This type of wayfinding could be expanded to further direct visitors by car for example (directing short term parking to the Front Street on-street spaces). Additional branded signage would be beneficial at the north and south gateways into the district on Front Street announcing arrival into the district. Additional branded signage would also be beneficial along the length of the Harborwalk.

E. Long-term Strategies for the District

While many of the solutions and recommendations outlined for Topic Area A should be pursued in the near-term, the combination of these efforts and the funding required to complete them will inevitably make some of them long-term strategies. The strategies defined below as specific long term strategies are those that should be planned for over the course of the next 10 or more years and that may not begin to changes in the district for a long period of time. Nonetheless, it is important to set the stage for a sustainable and successful future for the district and these long-term strategies offer recommendations in that regard.

Challenges and Opportunities

E.1. Stormwater run-off from the paved surfaces of the coastal business district into the harbor has negative impacts on the water quality and natural environment of the harbor.

E.2. Undergrounding utilities would prevent overhead electrical lines from damage during a high-wind coastal storm. If the underground channel were placed behind the flood protection or floodproofed itself it would increase resilience over the long-term.

E.3. In its current configuration, the Scituate Harbor business zoning district is limited to the lower elevation coastal area along Front Street. The topography of the residential side streets rises to a higher elevation immediately to the west of the district. A long term solution that would enable the district to reorganize and migrate some of the business district uses to a higher elevation would be beneficial.

E.4. The community has noted the desire to shift the orientation and layout of the Scituate Harbor business district in a way that capitalizes on the waterfront.

Solutions and Recommendations

E.1. A continuing program of stormwater infrastructure and public realm improvements should include green stormwater infrastructure features to store and filter stormwater. Green stormwater infrastructure would help to directly address negative impacts on the water quality and natural environment of the harbor while beautifying the public realm of the district. Green stormwater features may include bioswales, rain gardens, stormwater tree pits, infiltration planters, or constructed wetland areas. Each feature would be designed for infiltration, evapotranspiration, or temporarily storage of stormwater runoff and reduce the likelihood of untreated runoff entering the harbor from the business district.

E.2. Undergrounding utilities would prevent overhead electrical lines from damage during a high-wind coastal storm. If the underground channel were placed behind the flood protection or floodproofed itself it would increase resilience over the long-term.

E.3. A long term zoning solution that would provide more opportunities for the Scituate Harbor business district to adapt is to expand the boundary of the business district along higher elevation side streets to the west. For example, Otis Place could be one such street that would allow the district to expand perpendicular to Front Street. This type of change would be a long term solution. The residential property owners would remain as they are for the foreseeable future. An expansion of the business district would create new potential uses for these properties and allow properties owners to benefit, if private developers pursued the opportunity created by the expanded zoning. Other improvements would need to be pursued to enable this change such as ensuring proper infrastructure at potential redevelopment properties and appropriate street improvements and circulation patterns. This potential solution is outlined further under "Complementary Recommendations - Long-term Zoning Recommendations for Migration."

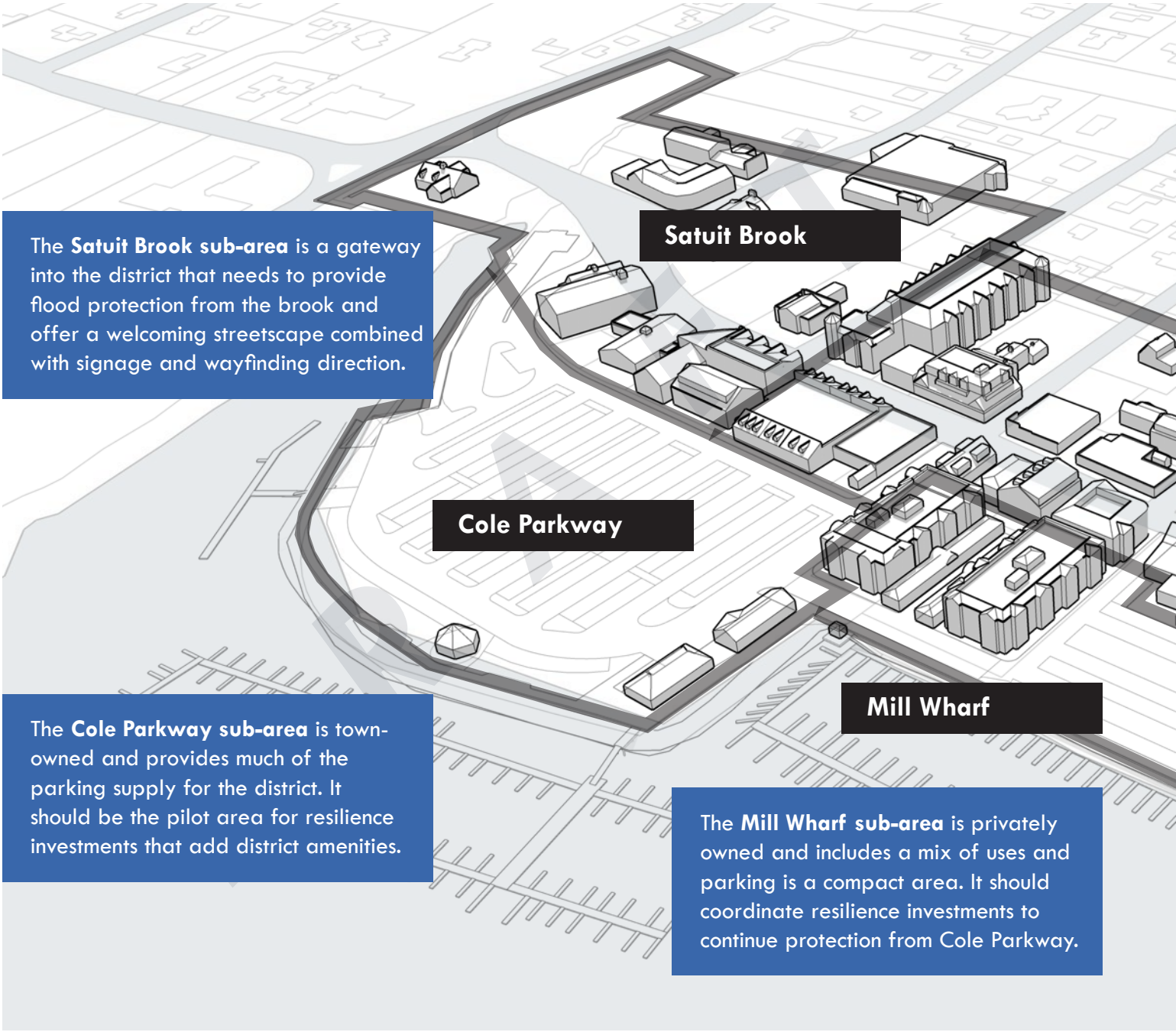
E.4. An enhanced district orientation to waterfront should begin with a continued focus on improving amenities at the water's edge. These improvements should be combined with the resilience investments to elevate the coastal edge. Another long-term effort should be creating and reinforcing more pleasant pedestrian connections between Front Street and the waterfront and by turning activity toward the waterfront whenever possible. This may include additional redevelopment opportunities that may be associated with coastal resilience improvements. For example, additional development at the waterfront end of Otis Place could be integrated with the resilience improvements for Cole Parkway, contribute funding to improvements, and turn the orientation of Front Street toward the waterfront.

Detailed Resilience Recommendations

The following section focuses on the district resilience recommendations and a spatial organization of the recommendations by sub-area in the district. These recommendations build on the topic area descriptions of this section and offer more specific locations for where specific recommendations would apply in the district.

Recommendations by Sub-area

The sub-area recommendations offer specific and detailed resilience investments that can be made across the Scituate Harbor business district to provide district-wide protection. The recommendations offer examples of the type of improvements, other investments may be appropriate or could be used to achieve the same objectives. Items noted as "priority" are those that combine to form a continuous district flood barrier.



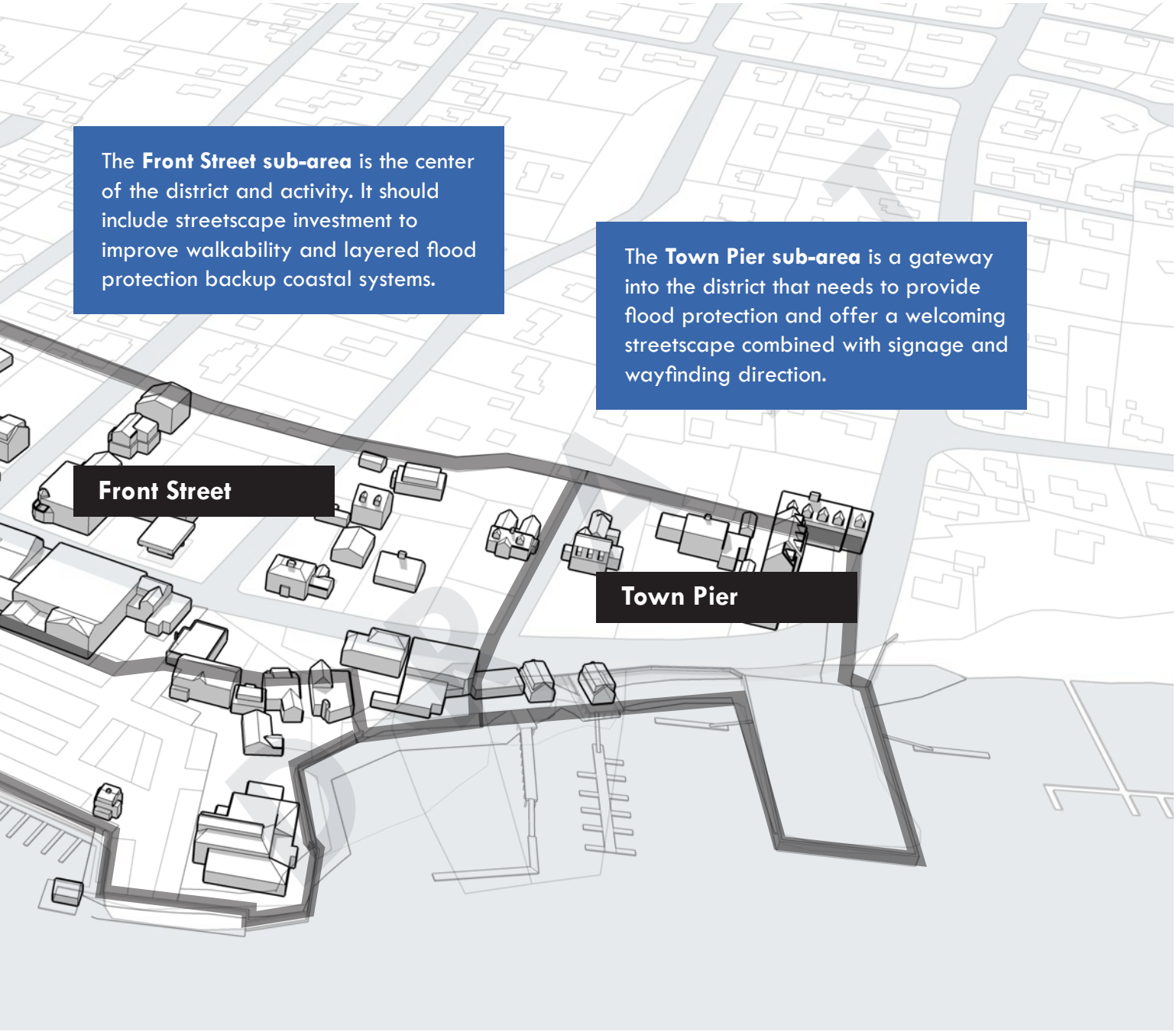
The **Satuit Brook sub-area** is a gateway into the district that needs to provide flood protection from the brook and offer a welcoming streetscape combined with signage and wayfinding direction.

The **Cole Parkway sub-area** is town-owned and provides much of the parking supply for the district. It should be the pilot area for resilience investments that add district amenities.

The **Mill Wharf sub-area** is privately owned and includes a mix of uses and parking is a compact area. It should coordinate resilience investments to continue protection from Cole Parkway.

Sub-area Location Diagram

The following section of the district master plan divides the Scituate Harbor business district into five (5) subareas to offer more detail and location-specific resilience recommendations. The sub-area location diagram below shows the (5) subareas including: **Satuit Brook** is the south gateway into the district including Satuit Brook and Front Street from First Parish Road to Beal Place. **Cole Parkway** is the large waterfront municipally owned parking area. **Mill Wharf** is the large privately owned waterfront area with mixed-use buildings, restaurants, and parking area. **Town Pier** is the north gateway into the district including the Town Pier and Front Street from Beaver Dam Road to Morton Place. **Front Street** - The inland Front Street blocks at the center of the district from Beal Place to Morton Place.



Satuit Brook

The **Satuit Brook sub-area** is a gateway into the district that needs to provide flood protection from the brook and offer a welcoming streetscape combined with signage and wayfinding direction.

PRIORITY

A. Build up reinforced earthen berms at both banks of the Satuit Brook planted with non-invasive salt-tolerant vegetation.

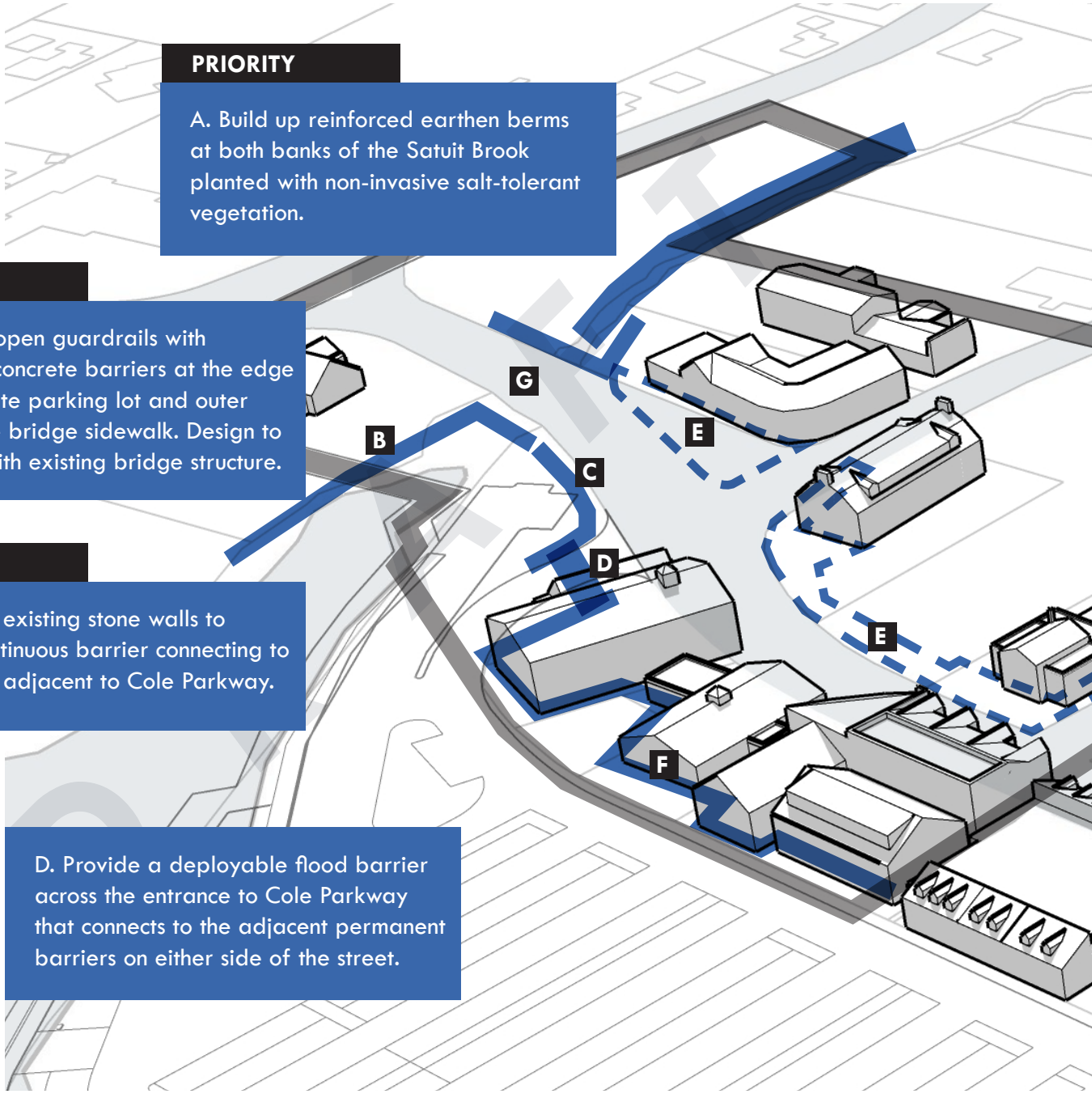
PRIORITY

B. Replace open guardrails with reinforced concrete barriers at the edge of the private parking lot and outer edge of the bridge sidewalk. Design to integrate with existing bridge structure.

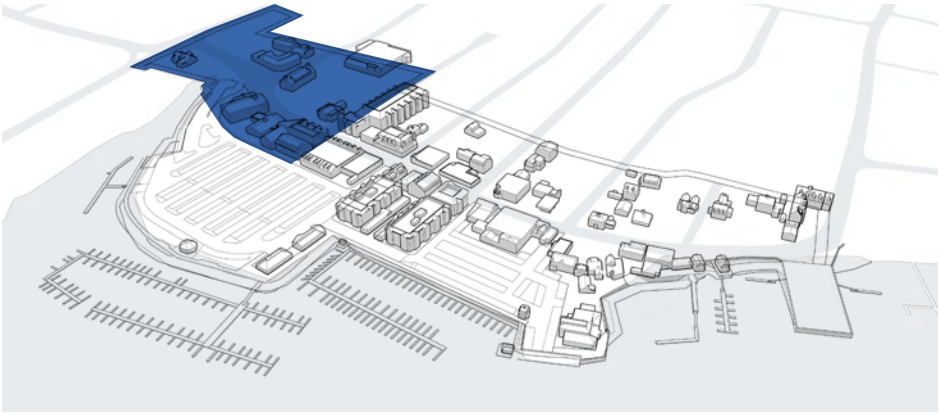
PRIORITY

C. Continue existing stone walls to provide continuous barrier connecting to bridge and adjacent to Cole Parkway.

D. Provide a deployable flood barrier across the entrance to Cole Parkway that connects to the adjacent permanent barriers on either side of the street.



Satuit Brook sub-area
location map



Satuit Brook sub-area
aerial image

E. Close driveways and parking areas that open onto Front Street. Redesign these areas as continuous reinforced berm and vegetated landscape areas.

F. Floodproof Cole Parkway side of existing buildings. Build permanent or deployable flood barriers between each floodproofed building.

G. Develop an engineering study to evaluate the cost and impact of elevating the bridge over Satuit Brook for resilience to sea level rise

Cole Parkway

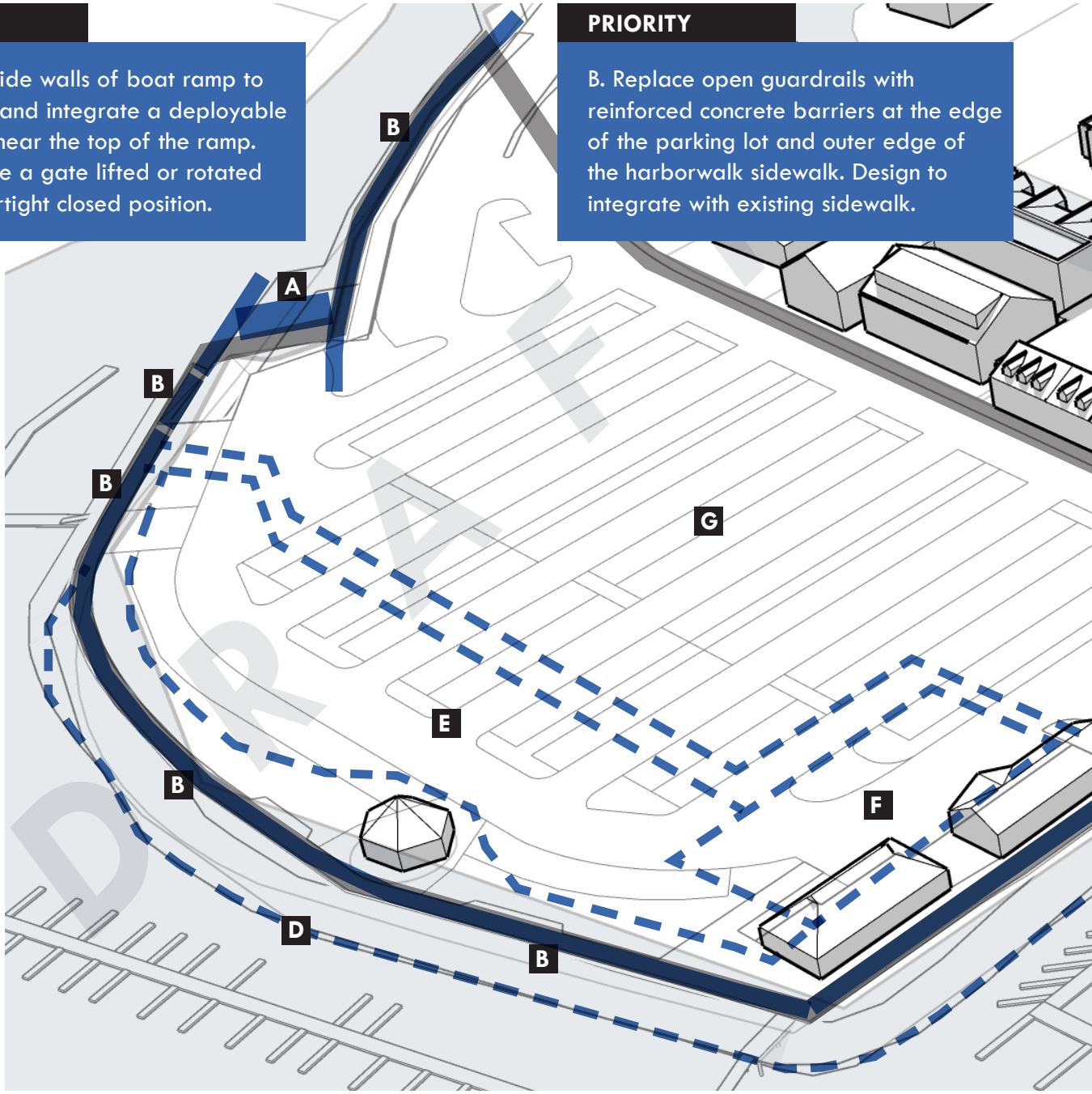
The **Cole Parkway sub-area** is town-owned and provides much of the parking supply for the district. It should be the pilot area for resilience investments that add district amenities.

PRIORITY

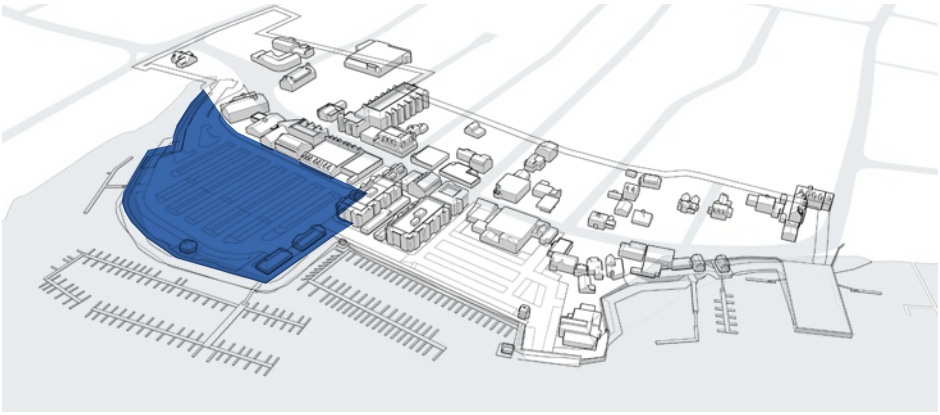
A. Rebuild side walls of boat ramp to add height and integrate a deployable flood gate near the top of the ramp. This could be a gate lifted or rotated into a watertight closed position.

PRIORITY

B. Replace open guardrails with reinforced concrete barriers at the edge of the parking lot and outer edge of the harborwalk sidewalk. Design to integrate with existing sidewalk.



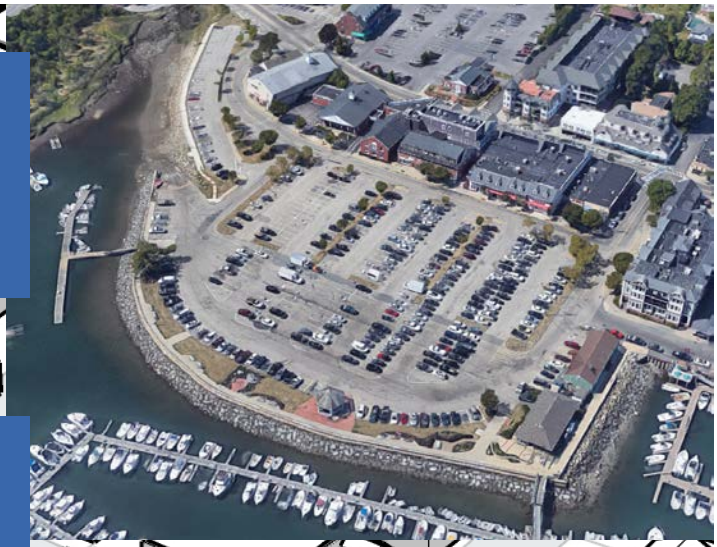
Cole Parkway sub-area
location map



PRIORITY

C. Heighten and extend the existing reinforced concrete wall at the outer edge of the harborwalk. Design to integrate with the existing wall and sidewalk.

D. Explore replacement of stone revetment with vertical bulkhead structure to allow more efficient use of waterside edge for additional revenue generating dock and slip space.



Cole Parkway sub-area
aerial image

F. Consider long-term lease for a future mixed-use structure with the Harbormaster and Coast Guard as ground floor tenants that could provide a funding source for improvements.

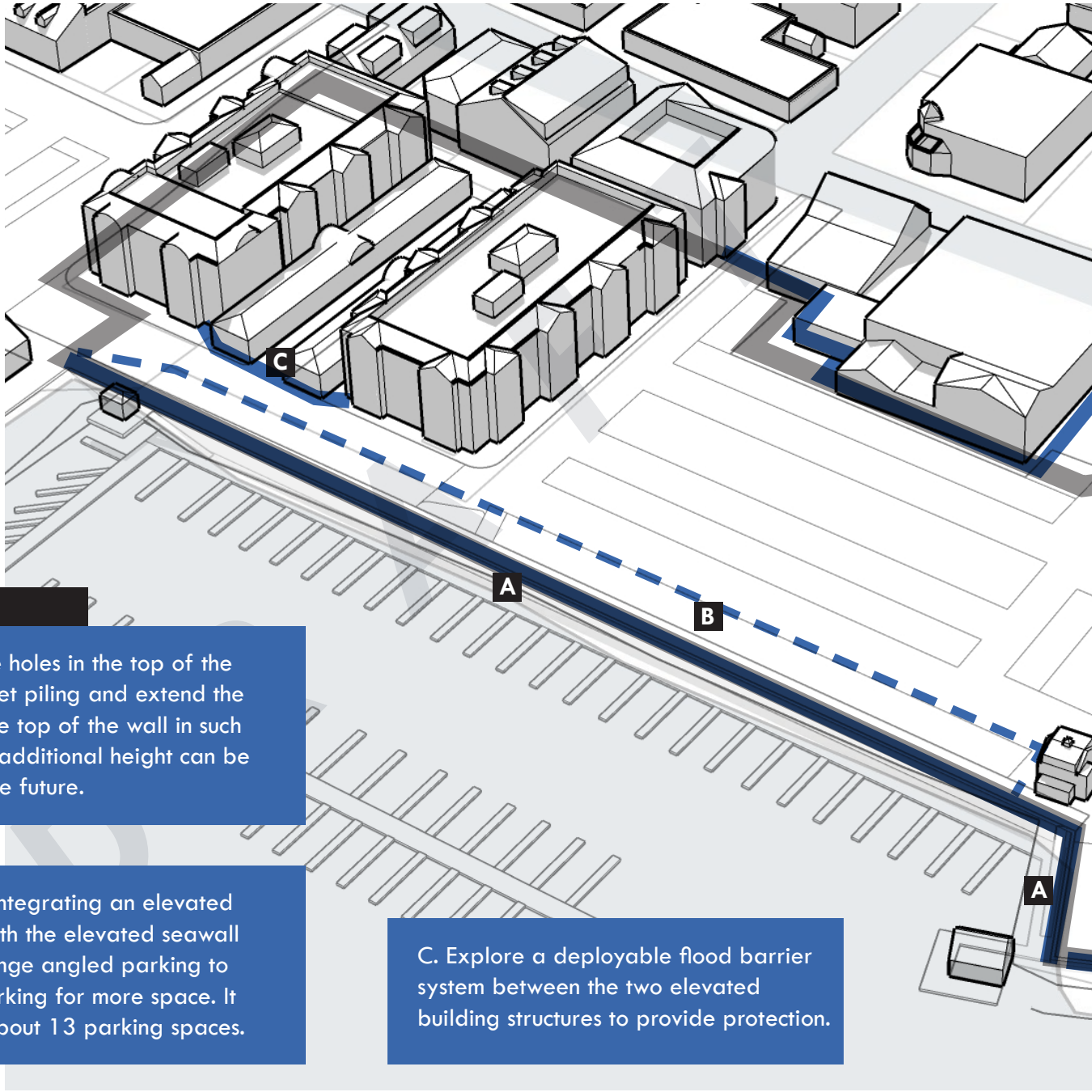
C

G. A more visionary concept for this large parking area would be extend the coastal park further inland while increasing the height of the park's topography to allow parking under it.

E. Elevate a coastal amenity area, either in the existing footprint of the landscape buffer or expand an amenity area into the parking lot. As shown, it displaces about 55 parking spaces.

Mill Wharf

The **Mill Wharf sub-area** is privately owned and includes a mix of uses and parking is a compact area. It should coordinate resilience investments to continue protection from Cole Parkway.



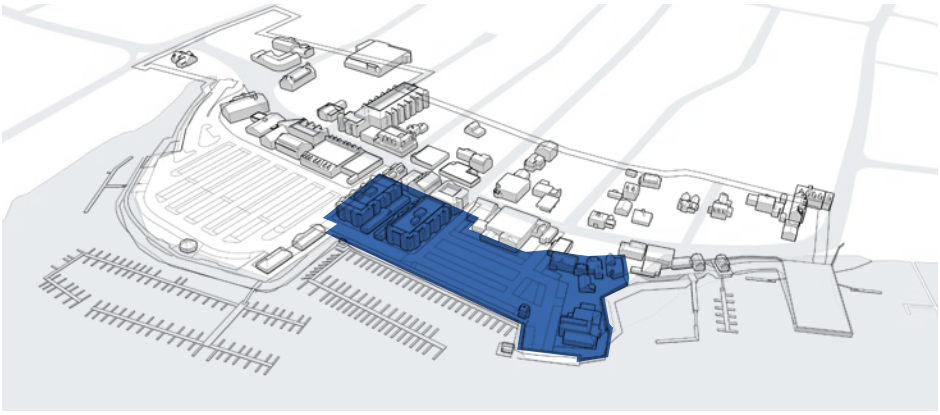
PRIORITY

A. Close the holes in the top of the existing sheet piling and extend the height of the top of the wall in such a way that additional height can be added in the future.

B. Explore integrating an elevated walkway with the elevated seawall height. Change angled parking to parallel parking for more space. It displaces about 13 parking spaces.

C. Explore a deployable flood barrier system between the two elevated building structures to provide protection.

Mill Wharf sub-area
location map



Mill Wharf sub-area
aerial image

PRIORITY

D. Heighten and extend the existing reinforced concrete wall at the outer edge of the harborwalk. Design to integrate with the existing wall and sidewalk.

E. Floodproof Mill Wharf side of existing buildings. Build permanent or deployable flood barriers between each floodproofed building.

Town Pier

The **Town Pier sub-area** is a gateway into the district that needs to provide flood protection and offer a welcoming streetscape combined with signage and wayfinding direction.

Town Pier sub-area
aerial image

PRIORITY

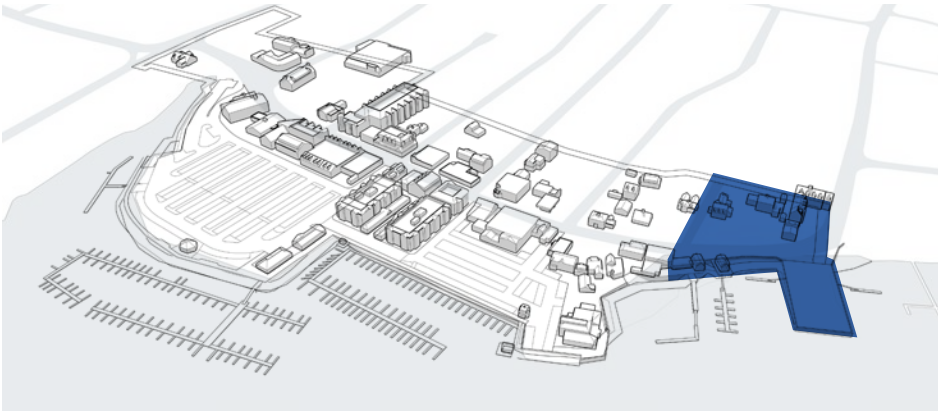
A. Floodproof waterside of existing buildings. Build permanent or deployable flood barriers between each floodproofed building to form a continuous barrier.

PRIORITY

B. Replace open guardrails with reinforced concrete barriers at the edge of the outer edge of the sidewalk. Design to integrate with existing sidewalk.

C. Explore elevation of existing structure on piles. Existing structure would be on the waterside of the flood barrier. A gap in the barrier would remain for access filled with a deployable gate.

Town Pier sub-area
location map



PRIORITY

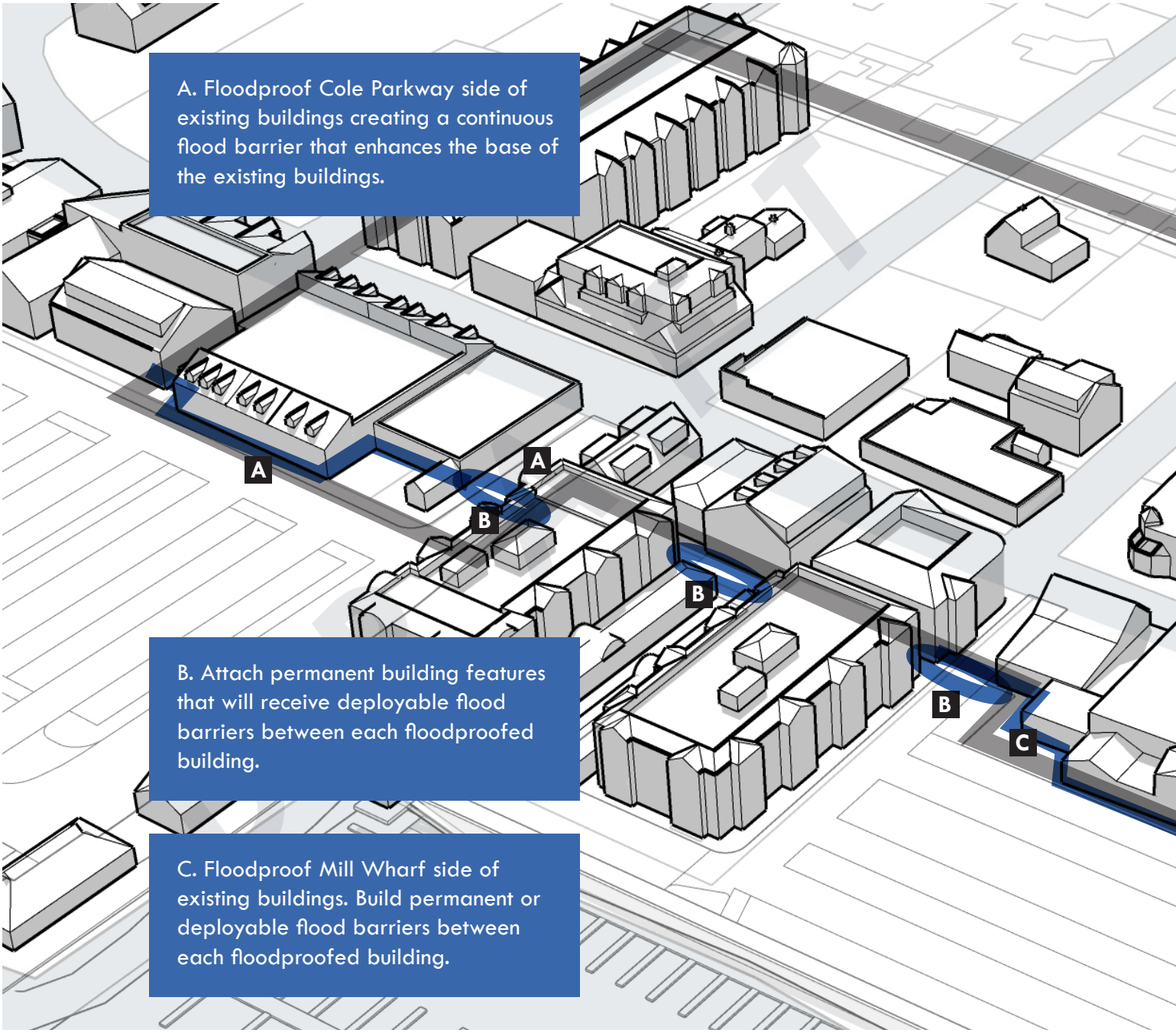
D. Elevate the perimeter of the existing Town Pier. The elevated area could include the entire perimeter walkway and commercial end of the pier that ramps down to existing grade for trucks.

PRIORITY

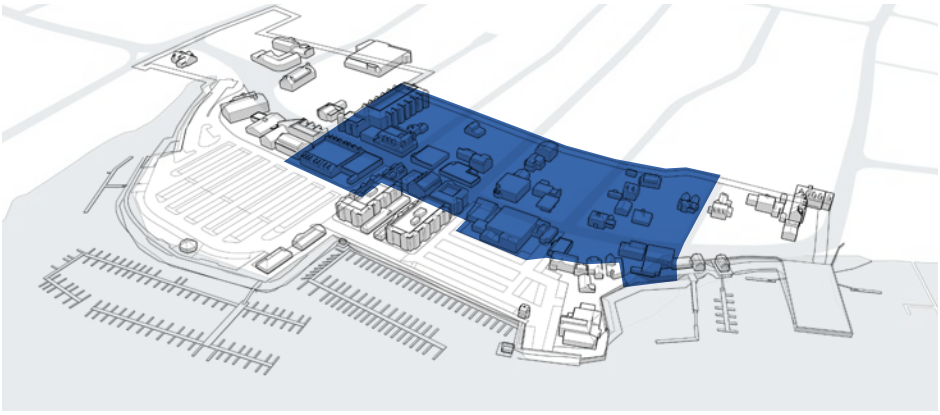
E. Extend reinforced concrete flood barrier to the approximate end of the existing vehicular guard rail. Design to integrate with existing concrete wall below pedestrian guard rail to the pier.

Front Street

The **Front Street sub-area** is the center of the district and activity. It should include streetscape investment to improve walkability and layered flood protection backup coastal systems.



Front Street sub-area
location map



Front Street sub-area
aerial image

PRIORITY

D. Floodproof waterside of existing buildings. Build permanent or deployable flood barriers between each floodproofed building to form a continuous barrier.

B

C

D

Complementary Recommendations

Context for Complementary Recommendations

The following recommendations complement the Topic-area and Sub-area recommendations and solutions that have been defined. Each complementary recommendation provides an additional set of complementary recommendations for several of the primary areas of concern that have been raised in addition to district resilience including district vitality and the management and capacity to accomplish district improvements and recommendations.

District Vitality

Storefront Vacancies

Coastal flooding presents challenges for small businesses and property owners in the district resulting in high rates of flood insurance, repeated flooding damaging infrastructure, or structures that will no longer meet minimum flood requirements, and repetitive loss insurance claims. Other issues impact the vitality of the business district. The Scituate Harbor business district includes 60 properties that vary in use, size, and ownership. The district has a strong concentration of commercial uses that are interspersed with several properties that are mixed-use, typically with residential uses placed above ground floor commercial uses. A few properties in the district are residential only, municipal, or institutional. These properties and buildings are home to approximately 90 businesses that comprise the commerce, vibrancy, and attraction of the district. These businesses are well-distributed throughout the district, but do have a higher density clustered near the center of Front Street and moving south from the center. Many of the district businesses are small and locally-owned. These types of businesses may be more sensitive to disruptions that may be caused by district floods, seasonal fluctuations in customers, or the general economic health of the district.

The resiliency investments outlined in this master plan would help to reduce disruptions caused by district floods. Adding amenities and attractions to the district may help to reduce seasonal fluctuations in customers and add to the number of year-round visitors. The general economic health of the district is closely linked to the number of storefront vacancies in the district. This specific issue has been mentioned frequently by participants in this planning process. Storefront vacancies usually are associated with the loss of a business or service in the district. Several vacancies or persistent vacancies can contribute to a perception issue for the district that impacts visitor's impressions and willingness to return for future visits. It is difficult to address vacancies generally due to the unique and specific circumstances of each property and tenant. One big question is the cause of the vacancy. Is it because property owners are waiting for particular tenants that can sign longer, more expensive leases? Or is it that they're having difficulty recruiting

businesses? Is it that businesses are struggling in the district? Or another reason? Several important follow-up items could be pursued by the town or Scituate Harbor Business Association, including:

1. Meet with property owners to explore the cause of the vacancies to determine potential solutions.

2. Work with property owners to do pop-up events in vacation locations as an opportunity for emerging businesses to test their concept and as a way of activating the storefront.

3. Work with realtors to share information about current vacancies and ideal business types based on market analysis.

4. Establish a vacancy registry that requires property owners to register their vacancies and pay a fee. (Arlington has done this—I wouldn't recommend it since it's complicated to manage and doesn't really get at the root of the vacancy problem since the fee isn't high enough to disincentivize property owners from keeping spaces intentionally vacant, but it is an option.

District Events

Scituate Harbor was designated as a Cultural District by the Massachusetts Cultural Council in 2015. The designation places Scituate Harbor among a select group of about 30 cultural districts in Massachusetts and makes the district eligible for state grants to promote the arts, receive technical assistance, and marketing assistance. The Scituate Harbor Cultural District is larger than the Scituate Harbor business district and extends from St. Mary's Church near the southern extent of the district all the way along the coast to the Scituate Lighthouse as its northern extent. The district hosts several civic events throughout the year that attracts residents and visitors. These past events have included Heritage Days, St. Patrick's Day Parade, First Fridays, Classic Cars on Cole Parkway, Harbor Art Walk, Halloween in the Harbor, Holidays in the Harbor, and Restaurant Week. Each event reinforces the district as an important destination in Scituate and the South Shore.

District events and arts and culture activity strengthens Scituate Harbor as an attractive destination by providing unique experiences that engage people in the district. From a practical standpoint, events and special activities are an important part of the life of a district because they invite and attract new patrons to visit. The events that the Scituate Chamber of Commerce holds each year offer this benefit, such as the winter time visitors who attend the Scituate Harbor Holiday Stroll. This type of visit draws new people to the district and introduces them to the other great things that are happening there. During these events, it is important for the other attractions

of the district - small businesses, restaurants, shops, plazas, river paths - to form a great first impression of the district to strengthen the likelihood of a repeat visit. In this regard, shared knowledge and coordination about district events are important. Lastly, arts and culture activity is a very effective way to strengthen community relationships and connections in the district. The events are not just for attracting new patrons, but celebrating the regular visitors and bringing people together in new and different ways. Special events and celebrations should be inclusive for everyone and should not make any group feel unwelcome or inconvenienced.

The active promotion of the creative economy yields many benefits for both the district and the broader area. For example, in a long-range, nationwide study of the economic impact of the arts conducted by Americans for the Arts, research showed that places with a thriving creative economy have a competitive economic advantage because they improve the area's quality of life and create vibrant districts that attract additional economic activity.

Culture and arts events can also be used as an approach to support local businesses and spending. According to Americans for the Arts, studies on consumer behavior show that tourists that seek out arts and authentic cultural experiences such as festivals and performances, are more likely to stay longer at their destinations and spend more at local businesses. Moreover, attendees of arts events spend an average of $24.60 per person beyond the cost of admission for their event on items such as meals, retail, childcare, transportation, and parking. While this may not be the primary driver of economic development, it is another form of support for a vibrant local economy in Scituate Harbor.

District Management

In order to effectively implement a number of the resiliency master plan recommendations, direct management and guidance at a district level would be advantageous. District management can assist in the recruitment and balancing of district businesses, provide supplemental district services, facilitate sharing of district parking, and provide a funding source for district resilience improvements. Two approaches to district management are available for consideration, both have disadvantages and advantages. Both approaches are outlined and either could be pursued depending on preferences of the town and business community. The approaches include the creation of a Main Streets District or a Business Improvement District. Either district management structure could be used to invest in resilience, promote economic vitality, build community, improve experiences, and facilitate sharing of resources within the district. Main Street programs are locally organized, funded and operated. They are typically independent nonprofit organizations located in the community and usually affiliated with the municipality in which they operate. Main

Street districts are typically initiated by a group of interested partners that will discuss goals, establish the organization, and raise money to hire a full-time Main Street director. The Main Street district is typically funded by local sources including town, Chamber of Commerce, business, and foundation support. The Main Streets district can also be an organizer of district events and attractions, or coordinate and support events that already exist, and enhance the experience of visitors. It can provide financial incentives for business owners to improve facades and beautify properties, provide guidance and support for starting a business, and work with town officials to modify policies or bylaws as issues are identified with businesses. The primary disadvantage of a Main Streets district is that it is not integrated with a funding mechanism. The funding is dependent on municipal budgets, voluntary donations, or fundraising.

A Business Improvement District (BID) is another district management structure would provide the ability for similar district organization and oversight with some other advantages A Business Improvement District can provide similar functions as a Main Street program, but has one significant difference. A Main Street district is funded through voluntary contributions with no guarantees for continued support, whereas a BID is a special assessment district with financial support built into the establishment of the district. A BID can be established under Massachusetts General Law Chapter 40O by petition signed by owners of at least 60% of the real property and at least 51% of the assessed valuation of the real property in the proposed district. The amount of the assessment is decided by participants in the district and is a common area fee levied on property in the district. A BID is authorized to perform a wide variety of management, administrative, marketing and economic development activities including district management, maintenance, promotion and marketing, business services, and capital and physical improvements. This would allow the BID to address the recommendations outlined in this master plan and provide a funding source to advance capital improvements for district resilience. A Memorandum of Understanding would be outlined in the creation of the BID with the town to define the relationship, involvement, and support of the town as a member and partner in the district. The process to explore, create, and authorize a BID takes anywhere from 18 to 24 months.

Sustainability Recommendations

The following recommendations should be part of the Town's efforts to advance sustainability and resilience for Scituate Harbor. The recommendations intend to promote buildings and properties that are sustainable and resilient to coastal flooding and climate change. The recommendations are intended to guide private development and public investments for new construction and renovations. Given the known risks for coastal flooding, future investments should integrate these resilient strategies to improve the sustainability of the district over the coming decades. The zoning recommendations outlined below could be established as part of the underlying Business District zoning for Scituate Harbor or could be created as a new Coastal Resilience Overlay Zone that applies to the Scituate Harbor Business District.

Short-term Zoning Recommendations for Future Sustainability

Introduction

The Scituate Harbor district is regulated by the current zoning regulations for Business (B) zoning district. The regulations do not currently include sustainability requirements. One approach to increasing sustainable building practices in the district would be to encourage participation in a sustainable building program, such as the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system. It is the most widely used green building rating system and provides a framework for sustainable building design. The rating system is tiered and a requirement or incentive could be tied to different levels of achievement in the rating system. For example, all projects could be required to be "Certified" as a LEED project and a height or density incentive could be offered if a project achieves a higher "Silver", "Gold", or "Platinum" rating level. While this approach is attractive in that it is a rating system many developers and building professional are familiar with, it is sometimes viewed as burdensome and complicated.

Another approach would be to integrate several of the most critical building sustainability areas into the underlying or overlay zoning for the district. Several areas of sustainability zoning requirements would serve to improve the environmental responsibility of the district with each incremental investment by private property owners and developers. These sustainability requirements relate to the increase in building energy efficiency, reduction in energy use, and reduction in water use. In addition, resiliency requirements for future investments will also increase the overall sustainability of the district. The resilience requirements should also be integrated into the underlying or overlay zoning for the district. The requirements for resilience include investment in floodproofing, protection of building utilities, protection of critical systems, creation of redundant critical systems, and the elevation of occupiable building levels.

Zoning Recommendations for Sustainability

The sustainability requirements relate to the increase in building energy efficiency, the reduction in energy use, and the reduction in building water use. Additional detail about these three sustainability topic areas is outlined below.

Require increased building energy efficiency - Increasing the energy efficiency for a new or renovated building begins with the building envelope or the enclosure formed by the building's exterior walls and roof. The building envelope can be enhanced for energy efficiency through the careful specification of building materials, insulation, and the design of building details. For an existing building, an energy audit can be conducted to test for air leaks and thermal conduction. Where existing building envelopes are not providing adequate thermal protection, blown-in cellulose insulation can be installed in wall cavities and additional roof insulation can be installed. Windows can be specified to be low emissivity (low-e) or low U-factor windows to improve the thermal properties by controlling radiant heat that will enter or leave a building through window openings. Roofing material that is light in color or includes natural vegetation reduces roof temperatures and mitigates the heat island effect.

Require reduced energy use - The mechanical and utility systems of the building should be designed or renovated to be energy efficient. In conjunction with increased building energy efficiency, critical systems can be improved as well. An improved building envelope could result in a down-sized HVAC system that is more efficient and costs less to operate. This may include an electric heat pump system that is highly efficient, particularly if upgrading from a oil or gas furnace. In addition to upgrading building utilities and mechanical systems. Buildings should be encouraged to provide on-site energy generation through a solar photo-voltaic panel system installed on the roof or micro-wind turbines installed on the building or site. The on-site energy generation equipment will result in less dependence on the electric grid, particularly if the equipment is installed as islandable with battery storage.

Require reduced building water use - The water use on a property should be reduced through the careful selection of plumbing fixtures including toilets, showers, and faucets that are low water flow. This may be specified for new construction or be included as part of a renovation. Designing and specifying the appropriate planting materials for use on the property is important as well with salt and drought tolerant plantings that can be watered with harvested rain water or a low water use drip irrigation system.

Zoning Recommendations for Resiliency

One of the most straightforward approaches to improving the resilience of buildings is to elevate

the building so that it is freeboard above predicted flood elevation levels. Freeboard is a term defined by the Federal Emergency Management Agency (FEMA) as a factor of safety between the predicted flood elevation and a building's lowest occupiable floor. In the context of Scituate Harbor, this approach is complicated because most of the buildings exist and would need to be adapted to elevate them. Also, it was not an approach preferred by the community and it is difficult to have a walkable and accessible business district when the window shopping is elevated above the elevation of the sidewalk.

Other approaches to improve the flood resilience of the buildings in Scituate Harbor include elevating critical infrastructure, dry floodproofing, and wet floodproofing the building. The resiliency requirements don't need to prescribe which of these approaches should be used in any specific circumstance, leaving the final decision to the property owner. However, the recommendation to improve the future resilience of the district would be to require new construction and renovations to incorporate one of these approaches. Additional detail about these three resiliency topic areas is outlined below.

Require elevated critical infrastructure - The building systems that are most critical to operation of the building should be raised above the projected flood elevation. These systems include building electrical and mechanical equipment that is costly to replace and that presents a safety hazard if inundated with water. If an elevator is present in a building, this consideration applies to that infrastructure as well. The motors, controls, and backup power system should all be elevated or relocated above the projected flood elevation. The elevator cab should be programmed to stay at a floor level that is above the projected flood elevation for the duration of a flood event.

Require floodproofing - The property owner would have a choice of complying with a floodproofing requirement either through dry floodproofing or wet floodproofing. This decision would be based on the particular circumstances of a building, site, and owner's goals for the improvements.

Dry floodproofing is a system of components that are designed to stop water from entering a building. This system typically includes watertight enclosures for doors and windows, flood shields, membranes and sealant, and backflow preventers for pipes. Backup systems for pumping and drainage are often a feature in the event of water intrusion. This approach allows active uses, such as retail, to remain on the ground floor of the building with little disruption to normal everyday operations. The floodproofing components would be made operational in advance of a anticipated flood event. This approach requires a structure that can withstand flood water inundation and building materials that are flood damage-resistant.

Wet floodproofing is an approach designed to allow flood waters to enter and exit portions of the building while causing as little damage as possible. This approach is used for floodable basements, crawl spaces, or ground floors. Flood openings are designed in the lower portions of the building's walls to allow water to enter and exit the structure to equalize the water on the inside of the building with the water on the outside of the building to prevent structural damage.

Design Guidelines for Future Sustainability

Introduction

Design guidelines could also be used to enhance the district sustainability and to resolve coordination issues that may result from resiliency investments. If adopted by the Town, the following design guidelines could accompany review and approvals processes for projects proposed in Scituate Harbor. The design guidelines are intended to strengthen resilience and sustainability in the district and to improve urban design in the district with each investment.

Design Principles

Scituate Harbor is a compact business district. It is important for every property in the district to positively contribute to the flood resilience, sustainability, and attractive appearance of the district regardless of the use of the property. The design principles further define the positive contributions each property in the district should make and the description of each offers additional design guidance for improvements in the district.

Contribute to Incremental Resilience

For properties in a location that requires resilience improvements to assist in the protection of the district, all private resilience investments should coordinate with the district strategy and adjacent public or private properties to contribute to continuous district floodproofing, whether planned or implemented on adjacent properties. If adjacent properties have already completed resilience improvements, the property missing resilience investments should be prioritized by the owner and the Town. All resilience investments should also coordinate with and contribute to improvement of the public realm. Resilience strategies should provide secondary benefits to improve sustainability, improve stormwater management, enhance landscaping, and increase energy efficiency in the district.

Define Street Frontage

A compact business district must have a cohesive sense of place and attractive street frontage for nearly all of the district. The Scituate Harbor business district is presently in a great position in terms of the sense of place and attractiveness of Front Street as a pedestrian environment.

Every new investment must contribute to this strength by further defining street frontage in the district. All new buildings must abut the edge of the sidewalk or provide a modest plaza along its primary frontage and add to the continuity of the primary street frontage, whether on Front Street, Otis Place, Old Dock Street, or Mill Wharf Plaza. New additions to street frontage should also integrate with flood resilience approaches specific to the location. For example, if the site is in a location of using the buildings as a continuous flood-proofed barrier, the new building should maintain or improve this continuity in contributing to the continuous barrier.

Increase Density of Activity

The compact district must make the most of its available space and assets and add layers of interest and activity to strengthen the attraction of the district. This approach applies to many aspects of the district including waterfront activity, housing, businesses, and amenities. Identifying locations where water access can be increased or made more efficient with additional docks, moorings, or other infrastructure would benefit the district's function as an active waterfront. Future investments in redevelopment in the district should look to add more housing units above ground floor commercial uses. More residents living in the district would support local businesses and the vitality of the district. Additional businesses contribute to the critical mass of attractions and destinations that are needed to draw patrons and visitors back to the district on a regular basis. Amenities in the district should be increased through investments in parks, seating, lighting, art, and landscape. Every project should be evaluated in terms of the density of activity it will be contributing to the district with a particular focus on whether the proposed changes are an improvement upon the property's current contributions to the district.

Active and Flood Resilient Ground Floor

Each ground floor in the district should be contributing to the active uses and attractiveness of the district. Ground floor spaces, particularly those facing primary streets in the district, should be retail, restaurant, or commercial space that adds to the critical mass of destinations in the district. Residential uses should be reserved for upper levels, except for residential lobbies and entry areas. In addition to ground floor contributions to the attractiveness of the district, the ground floor should be flood resilient. The ground floor should at minimum be designed to be floodable with no damage to the building structure or utilities. Alternatively, buildings should be designed to be floodproofed with exterior measures such as deployable flood gates or an elevated building base elevation that includes stairs and ramps up to a higher ground floor, similar to the existing Mill Wharf Plaza buildings. Buildings should not be placed on stilts or other elevated columns, but should integrate an elevated building base into the surrounding public realm and pedestrian circulation features. All elevated ground floors should integrate required accessible ramps in such away that they are an integral part of the design and complement planters or other features.

Context-sensitive Harbor Orientation

Investments in Scituate Harbor should highlight the waterfront as the main asset of the district. Designing buildings and properties to showcase views of the harbor and access to the waterfront should be a top priority. The orientation and buildings should help to turn attention to the waterfront and facilitate connections to it. Private alleys, pedestrian circulation, or other physical connections should be strengthened to reinforce the porosity between Front Street and the waterfront. Each of these circulation routes should be designed with deployable flood gates where appropriate relative to the district resilience strategies.

Resilient, Sustainable and Healthy Buildings

All improvements to existing buildings or designs for new buildings should protect building structure and utilities from flood by elevating critical infrastructure out of harms way. Building improvements should be designed to increase energy efficiency, reduce energy use, reduce water use and contribute to the broader sustainability of the business district. The site design should integrate green infrastructure features that contribute to an attractive public realm and that coordinate with other district green infrastructure improvements such as rain gardens, bioswales, or other features.

Reduce and Conceal Parking

The prominence and visibility of parking areas should be minimized in the district. Any new parking areas should be located to the rear of buildings and accessed from side streets to minimize the driveway connections onto Front Street. New parking areas to the west of Front Street could utilize the grade change to potentially create vertical space for two levels of parking at a cost lower than a typical parking structure. This type of efficient parking solution would be an effective way to address district parking supply. Parking areas that are able to be provided under the building footprint should also be considered when possible due to location, topography, and resilience considerations. Where larger parking areas are required, those parking areas should be interspersed with landscape or public art.

Long-term Zoning Recommendations for Migration

The resilience investments in the district will enhance district safety and vulnerability for several decades. However, any fortification against the ocean will degrade over time and require additional investment. That fact, combined with the projected impacts of climate change on sea level rise, point to the need for additional long-term strategies to provide a sustainable future for Scituate Harbor. Creating a framework for migration of the business district to higher ground is a viable long-term option for this sustainable future.

The natural topography west of Front Street rises quickly along each of the streets perpendicular to it. These streets, from north to south, include Beaver Dam Road, Morton Place, Harbor Heights Road, Allen Place, Otis Place, Beal Place, and Brook Street. The topography protects each of these streets from flooding regardless of future sea level rise projections. Each of these streets is residential today. A long term zoning change would allow the non-water dependent retail, service, and restaurant uses that are primarily located on Front Street today to be relocated over time to new mixed-use buildings on one or more of these side streets.

The type of zoning change that would accomplish this type of flexibility for the district would be to extend the Business "B" Zone up one or more of these side streets. The zoning boundary change could be combined with additional design guidelines to consider the impact of new mixed-use buildings that may be developed on a residential side street. This type of zoning change would not mandate any changes to the current properties, but provide the opportunity for a future change if the coastal circumstances warranted moving non-water dependent uses away from the water's edge. Residential owners on these streets would have the opportunity to sell their property for potential redevelopment. A homeowner would not be compelled to sell and would benefit financially if they did decide to sell. This type of change would allow the business district to transition over time to be more "T" shaped with two primary intersecting streets, perhaps Otis Place and Front Street.

If this type of transition of uses and evolution of the coastal business district at Scituate Harbor is not desirable, an alternative would be to enable and support this type of long term transition of uses to another location in the town. This type of transition could target another village center in the town that is served by transit and that could be set up with the proper infrastructure to support an expanded business district. One possible location would be North Scituate. Non-water-dependent uses could be encouraged or incentivized by the town to relocate over the long term. Businesses may also elect to move to other locations out of self-interest as the district and flood risks evolve in the future. It would be best to have a proactive plan in place to collect

local businesses in another location, whether it be a location that is Scituate Harbor adjacent or somewhere else in the town.

As this transition happened, the uses that are least critical to occur on Front Street could relocate to new ground floor space created uphill, while remaining within easy walking distance of Front Street. The uses that remain on Front Street and at the water's edge should be those that are water dependent or that have been adapted to be flood resilient over the intervening years. The investments in district resilience would remain useful in maintaining the water access provided by the district. Even with sea level rise and a potentially changing coastline over the long term, the docks, moorings and waterfront assets for commercial and recreational boating would benefit from remaining in their current location. If more of the non-water-dependent uses were to migrate away from Front Street over the long term, then more of that area may become available to support water dependent uses. This could result in an expansion of the water access and boating activities related to the harbor. The district could transform over the long-term to maximize the asset of water access. The other public realm improvements and coastal amenities would remain effective investments in the district under this future scenario.

Implementation Action Plan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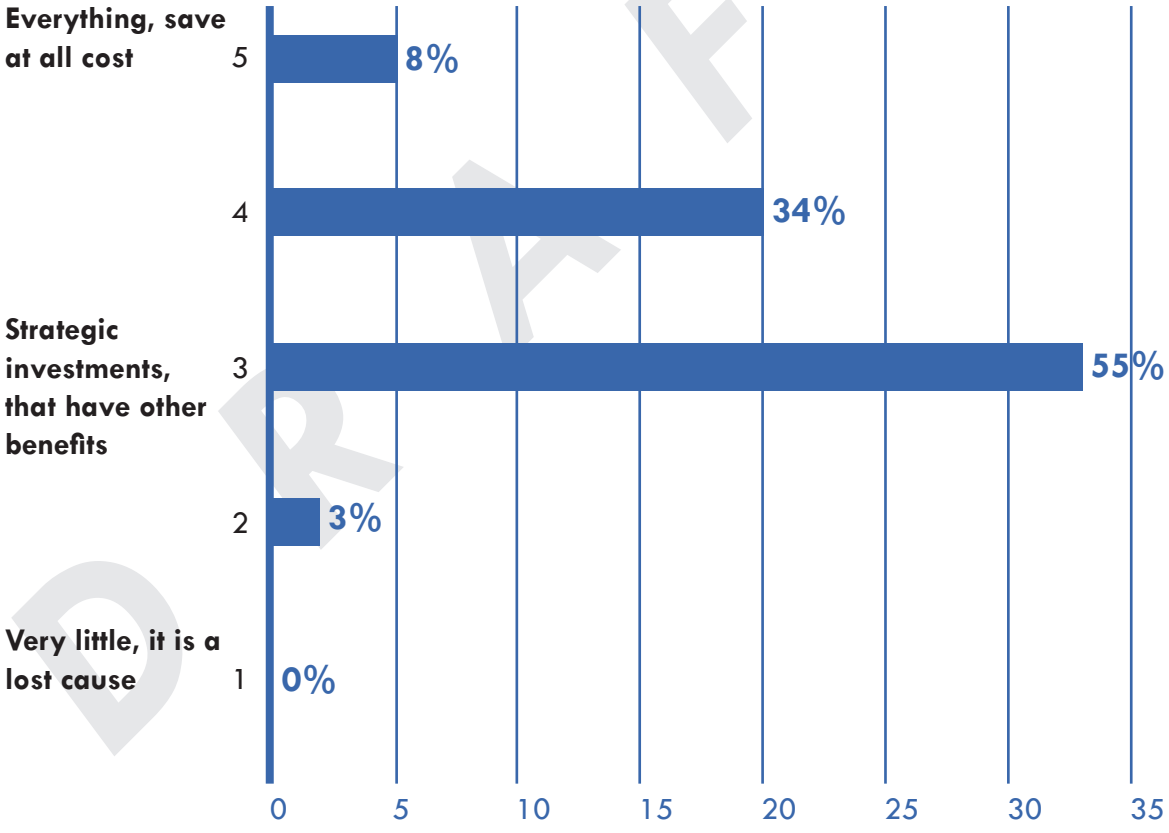
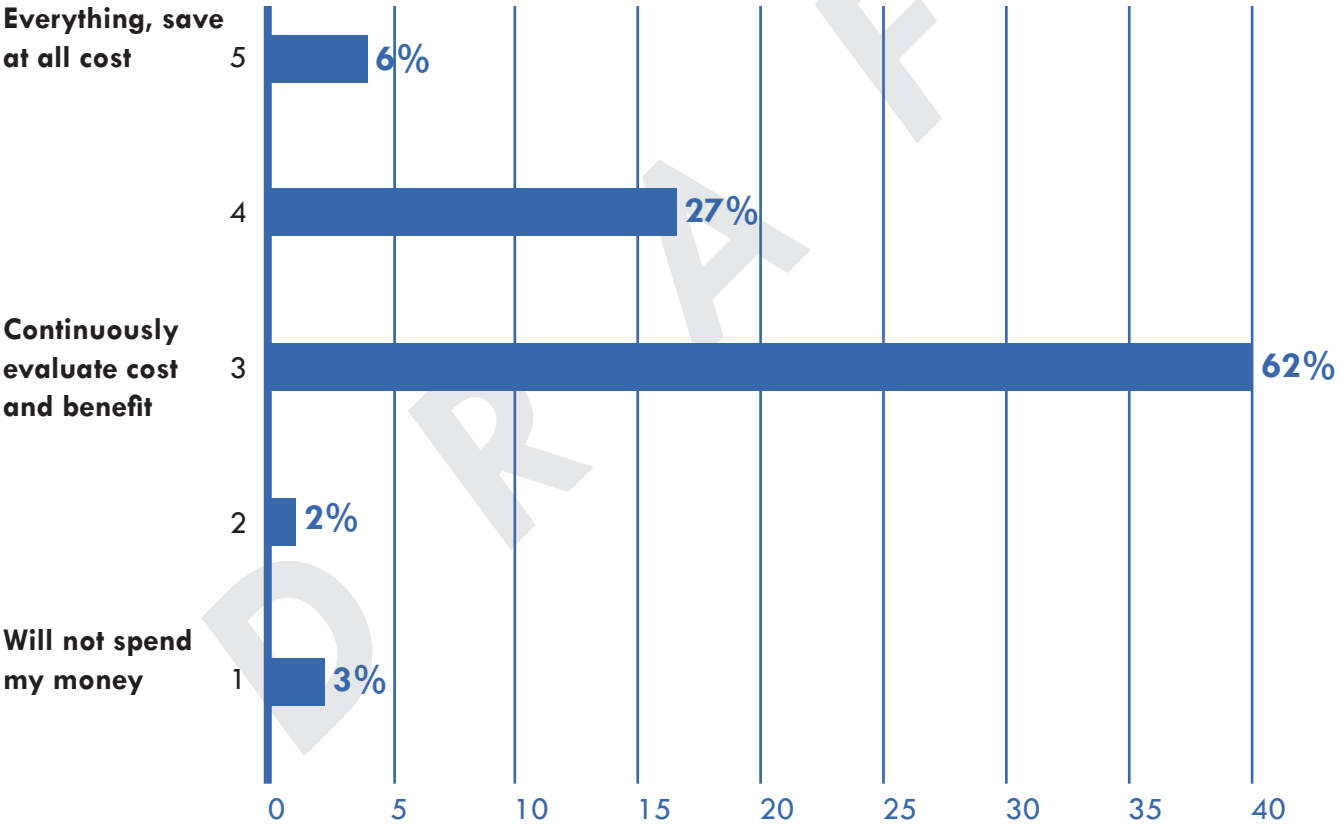
Implementation Action Plan

During the engagement process, the community was asked about their opinions relative to implementation. The following shows questions and responses were used to better understand the community's willingness to invest in resilience implementation actions that are outlined in this Implementation Action Plan. The two questions were posed to Focus Groups composed of Front Street businesses, water-based businesses, property owners, cultural institutions, municipal staff and leadership, and residents. The same questions were posed to the Task Force and the general public in attendance a the first Community Forum. The results combine each of these responses

What should be done collectively to protect against floods?



What would you do to protect against floods?



Implementation Action Plan

Coordinated and immediate actions that can be undertaken by the Town and others to reduce risks and impacts for the district. Provide strategies for long-term investments in infrastructure and property that will allow the district to thrive in the coming decades. Specific project champions have been identified, where appropriate, to offer recommendations for the parties that could undertake actions to advance the recommendations.

Prioritized List of Near-term Actions (1-5 years)

The two largest parcels in the district are at the water's edge including the town-owned property at Cole Parkway and the privately-owned property at Mill Wharf. These two properties should be a focus for near-term actions to increase flood protection and pilot investments for resilience.

Key	Action and Description	Lead	Timing	Funding	Assistance
1	**Install backflow preventers** - the stormwater drains in Cole Parkway that drain to the harbor need water to flow in one direction to prevent nuisance flooding.	Department of Public Works	Currently underway	Town support	None required
2	**Complete flood pathways study** - the results of this analysis will guide prioritization of the implementation actions. The entry points for water into the district should be the first investments.	Coastal Management	Currently underway	Grant funded	None required
3	**Define a pilot resilience investment** - based on a priority flood pathway, define a segment of bulkhead edge to elevate with integrated harborwalk improvements. Define this implementation project and pursue external funding.	Coastal Advisory Commission (CAC), Coastal Management, Engineering	Near-term	Seaport Economic Council, CZM Grants, Town Support	-

Key	Action and Description	Lead	Timing	Funding	Assistance
4	**Property owner conversations and resources** - focus on owners of property on the east side of Front Street to discuss floodproofing of buildings and deployable barriers to form a continuous flood barrier.	CAC, Coastal Management	Near-term	Town Staff and Support	-
5	**Install deployable flood barrier infrastructure** - at gaps between buildings on the east side of Front Street and boat ramp.	Coastal Management, Harbormaster	Near-term	CZM Grants, Town Support	-
6	**Pilot a parking space parklet** - remove on-street parking space(s) in front of a restaurant for expanded outdoor seating.	Planning Board, Engineering	Near-term	Town Staff and Support	-
7	**Amend district zoning with resilience requirements** - add resilience requirements to future proposed private improvements.	Planning Board	Near-term	Town Staff and Support	-
8	**Stripe new crosswalks on Front Street** - add crossings at Old Dock Street and the Town Pier.	Engineering, Public Works	Near-term	Town Staff and Support	-
9	**Add new bike lanes and parking area** - add bike lanes and signage with an expanded Cole Parkway bike parking.	Engineering, Public Works	Near-term	Town Staff and Support	-
10	**Explore Business Improvement District (BID)** - a resilience and improvement funding source.	Planning Department	Near-term	Town Staff and Support	-
11	**Protect Kent Street Marshes** -	Conservation Commission	Near-term	-	-
12	**Replace sewer manholes** - replace standard frames with water-tight frames and covers.	Sewer Division	Near-term	MVP Action Grant	-
13	**Identify additional parking supply** - parcels on west side of Front Street.	Scituate Harbor Business Assoc.	Near-term	Town Staff and Support	-
14	**Refine parking management and enforcement** - enhance functionality of existing supply.	Planning, Police Departments	Near-term	Town Staff and Support	-
15	**Create vacant storefront task force** - explore reasons for vacancy and work with owners.	Planning Department	Near-term	Town Staff and Support	-

Prioritized List of Mid-term Actions (5-10 years)

The mid-term actions build on the near-term actions and continue to advance flood protection and resilience in the district, as well as increase the attractiveness of the district as a destination.

Key	Action and Description	Lead	Timing	Funding	Assistance
1	**Second round of coastal resilience investments** - the next layer of resilience investments modeled on the pilot that expands a continuous floodproof barrier at the waterside perimeter of the district.	Coastal Advisory Commission, Coastal Management, Engineering	Mid-term	Seaport Economic Council, CZM Grants, Town Support	-
2	**Edward Foster Road and Bridge** - initiate engineering study to determine costs and impacts for raising roadway and bridge while integrating harborwalk connection.	Engineering	Mid-term	Seaport Economic Council, CZM Grants, Town Support	-
3	**Satuit Brook Bridge** - Initiate engineering study to determine cost and impacts for raising the bridge and regrading connecting roadways.	Engineering	Mid-term	Seaport Economic Council, CZM Grants, Town Support	-
4	**Identify additional waterfront/ water dependent uses and recruit** - expand water-based activity to leverage waterfront resilience improvements.	Harbormaster, Economic Development Commission	Mid-term	Town Support	Lobster-men's Association

Key	Action and Description	Lead	Timing	Funding	Assistance
5	**Define and pursue a redevelopment opportunity/ resilience investment at Cole Parkway** - consider all options for major resilience and destination park investment that may create development site.	Board of Selectmen	Mid-term	Seaport Economic Council, CZM Grants, Town Support	Mass-Develop-ment
6	**Add curb extensions to all Front Street crosswalks** - invest in the initial walkability improvements	Engineering, Public Works	Mid-term	MA Complete Streets	MassDOT
7	**Invest in green infrastructure pilots** - Front Street rain gardens, Cole Parkway bioswales.	Engineering, Public Works	Mid-term	MA Complete Streets	-
8	**Activate and improve small plaza spaces** - work with property owners to leverage all spaces in the district.	Planning Department and Property Owners	Mid-term	Town Support	Scituate Harbor Business Association
9	**Expand district signage and wayfinding** - district gateway signage, improved and more frequent harborwalk signage, and additional parking signage.	Planning Department and Beautification Commission	Mid-term	Town Support	-
10	**Amend district zoning with sustainability requirements** - bring building and site investments in alignment with district sustainability.	Planning Board	Mid-term	Town Staff and Support	-

Prioritized List of Long-term Actions (10-25 years)

The long-term actions build on the near-term and mid-term actions and address major components of flood protection and resilience in the district, some of these items may be pulled forward depending on the analysis of potential flood pathways.

Key	Action and Description	Lead	Timing	Funding	Assistance
1	**Re-evaluate sea level rise projections and potential flood pathways** - projections and risks are frequently updated and remodeled, this analysis should be used to evaluate progress and reprioritize as needed.	Coastal Management	Long-term	EEA, CZM Grants, Town Support	Coastal science community
2	**Coordinate with Scituate Coastal Vision** - long-term 50-year vision for Scituate Coast and Harbor.	Coastal Advisory Commission (CAC), Coastal Management	Long-term	Staff time and Town support	-
3	**Third round of coastal resilience investments** - the next layer of resilience investments modeled on the pilot that ties together with the first two rounds and expands a continuous floodproof barrier at the waterside perimeter of the district.	CAC, Coastal Management, Engineering	Long-term	Seaport Economic Council, CZM Grants, Town Support	-
4	**Town Pier** - initiate engineering study to elevate perimeter for floor protection.	Harbormaster, Engineering	Long-term	Seaport Economic Council, CZM Grants, Town	-

Key	Action and Description	Lead	Timing	Funding	Assistance
5	**Invest in green infrastructure** - continue investments in stormwater improvements and integration of natural systems in the district.	Department of Public Works	Long-term	MVP Action Grants, EEA, Town Support	-
6	**Improve riverbanks at Satuit Brook** - earthen berms with non-invasive salt-tolerant vegetation	Conservation Commission, Coastal Management	Long-term	MVP Action Grants, EEA, Town Support	-
7	**Develop plan and estimate for undergrounding utilities** - overhead electrical wires in the coastal business district would be placed into resilient below ground utility conduits.	Engineering	Long-term	MVP Action Grants, EEA, Town Support	-
8	**Define long-term zoning amendments and district boundary expansion** - expansion of district boundary to allow for potential migration of non-water-dependent uses.	Planning Board	Long-term	Staff time and Town support	-
9	**District sewer resilience** - replace gravity sewer systems with low pressure systems beginning with the coastal business district.	Sewer Division	Long-term	MVP Action Grants, EEA, Town Support	-
10	**Expand water-dependent uses** - capitalize on resilience investments by adding moorings, commercial docks, and additional water access offerings with kayak or other rentals.	Harbormaster, Economic Development Commission	Long-term	Staff time and Town support	Business community, Shellfish Advisory Committee

Scituate Harbor Sustainability and Resilience Master Plan

Final Report