

AUGUST 2020

A Vision for Scituate's Coast in 2070



Scituate2070Vision





Photo courtesy of Theresa O'Connor, Flickr.

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This vision is the result of the shared efforts of a large project team: Kyle Boyd, the Town of Scituate Coastal Management Officer; John Ramsey, Principal Coastal Engineer and Morgan Simms, Coastal Scientist of Applied Coastal Research and Engineering; Josh Fiala, Principal Planner and Darci Schofield, Senior Environmental Planner of the Metropolitan Area Planning Council; Barbara Landau, Noble, Wickersham and Heart, LLP. Carri Hulet, Senior Mediator; Elizabeth Cooper, Associate; Sofia Soto Reyes, Junior Associate; and Maggie Osthues, Junior Associate of the Consensus Building Institute were the project managers. Special thanks also to Emily Innes and Camilo Espitia of Harriman, who provided insight and coordination with the planning process for Scituate's 2020 Town Wide Master Plan.

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Report Design: One Visual Mind



Executive Summary

Executive Summary



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Scituate, Massachusetts, is a special place. For many who call Scituate home, the sea is the reason they are there, whether they have only recently discovered the charm of this small seaside community or their family goes back multiple generations. The Town's identity and economy are intertwined with the ocean.

That relationship is being tested. While residents say Scituate is an idyllic place to live "360 days of the year," it is exceptionally vulnerable to storm damage. Scituate's coast is densely developed, resulting in a static border of land facing the dynamic and powerful force of the ocean. The community has survived many storms over time, though damages and losses in some cases have been significant. Risk has always been a part of living and working on Scituate's coast, and the community prides itself on the way it has bounced back again and again. But looking ahead, most Scituate residents understand and appreciate the reality that the risks over the next 50 years are not the same as they were in the last 50. Storms are intensifying. Seas are rising. Coastal erosion has been exacerbated by coastal development and will only get worse if the community doesn't act. These risks have been studied

extensively in Scituate. In fact, Scituate is fortunate to know more about its coastal hazards and the options available to manage them than most communities of similar size and means. A detailed analysis completed in 2016, for example, evaluated Scituate's entire coast in discrete sections, from north to south, and identified a range of possible approaches to increase the safety and resilience in each area, including likely costs and trade-offs. Prior to the development of this 50-year coastal vision, however, the community members had not come together to establish a cohesive, long-term set of goals for the future, which has made it difficult to establish priorities and choose among the range of options before them.

This document articulates that long-term vision. It names the values and features the community most wants to preserve and create for its future. It also lays out the challenges and considerations the community will need to weigh as it develops detailed plans to achieve that vision. The vision serves as a beacon toward which the community might measure progress and a trajectory around which other planning efforts and projects might align.

Key components of the community's vision for Scituate's coast in 2070



BEACHES We envision Scituate with several beautiful, clean, well-maintained, and accessible beaches, each with their own character. Most, if not all, of the beaches should be accessible to the whole Scituate community. Beaches provide a place for community recreation as well as a natural protective buffer from the water and storms.



THE HARBOR We want Scituate Harbor to continue to be a gathering place and an attraction, particularly in the summer, for both year-round and summer residents, and for tourists. We envision places in the harbor to meet up with others and to sit and enjoy the ocean views. We picture a small but thriving harbor economy on land and robust marine commerce. We picture local businesses that cater to summer crowds, including restaurants, cafes, and gift shops that accommodate and attract foot traffic, and boating and other marine activities.



COASTAL DEVELOPMENT In addition to the beaches and the harbor, we imagine a 2070 coast with developed areas that are safe from storm and flood damage, intermingled with natural spaces, such as salt marshes and trails, that are thoughtfully maintained to provide protection to the Town from the ocean, support wildlife, and offer recreational options. We want our critical infrastructure, such as utilities, water, and wastewater facilities, to be safe from storm damage and sea level rise.



COMMUNITY CHARACTER Scituate is a little “off the beaten path,” and we hope it maintains its appeal as a year-round bedroom community, with a sufficient local economy, easy access to Boston, and coast-driven uptick in activity and population in the summer. We envision a coastal community that is family-friendly and socioeconomically diverse. We hope in 2070 the coast maintains its New England look and feel, even as hard decisions must be made to prioritize safety and viability.



Photo courtesy of Steve Steinmetz, Flickr.

In late 2019 and the first half of 2020, members of the Scituate community engaged in dialogue with each other and a team of advisors in small gatherings in residents' homes and online to create this vision. The community is now eager to build on this vision to craft a 10-year action plan that sets Scituate on a trajectory to realize the future the community has imagined. Much of that work will involve weaving together aspects of the previous studies and other planning efforts that have taken place in Scituate over the last several years.

This vision document is organized in three key sections: the vision, coastal risks, and implementation considerations. The vision seeks to convey what the community expressed in response to the question, "What do you want Scituate's coast to look, feel, and 'act' like in 2070?" in the context of the changes and challenges we know the coast will face in the next 50 years. The coastal risks section is a primer on Scituate's key coastal vulnerabilities and challenges: storms, erosion, and sea level rise. The final section focuses on the next steps—how to go about building a detailed plan and implementable list of key actions to complete over the next 10 years.

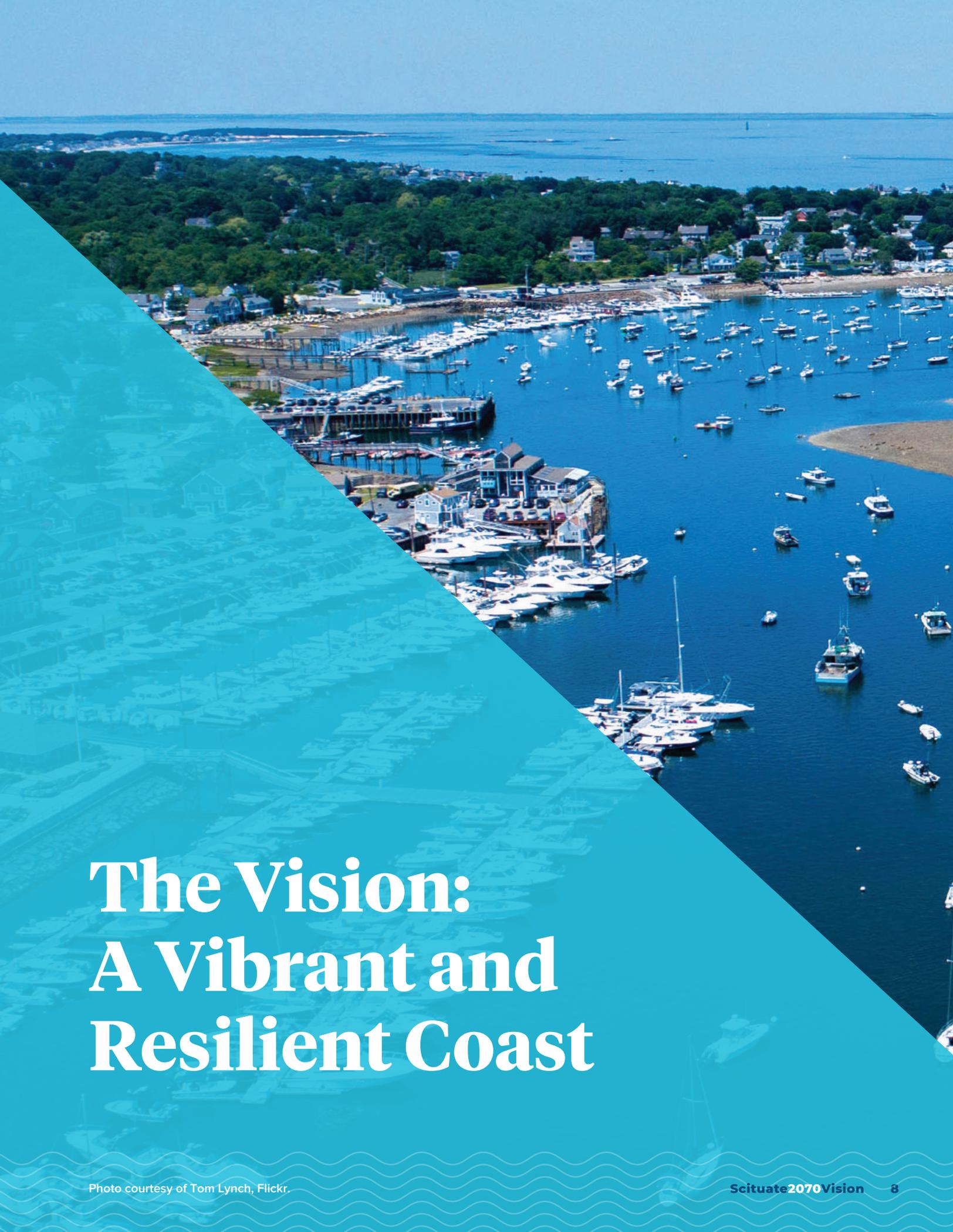
From inception, this project has included two phases:

- ① **a 50-year, community-led coastal vision for the Town of Scituate and**
- ② **a near-term, 10-year action plan for implementing that vision.**

At the time this vision was being drafted, the Town was applying for support to develop the 10-year action plan. The 10-year action plan will seek to identify the key actions the Town, residents, businesses, and civic organizations in Scituate must take in the coming decade in order to move Scituate toward the 2070 vision of a more resilient coast. This cohesive, two-phased approach makes it possible for the Town to emerge after this combined three-year effort with a long-term vision and a near-term plan to start making the vision a reality.



Photo courtesy of Steve Steinmetz, Flickr.



The Vision: A Vibrant and Resilient Coast

The Vision: A Vibrant and Resilient Coast

Scituate is a classic coastal New England town. Our identity is forever entangled with a relationship to the sea, both the lifeblood of our town and its greatest adversary. As we look to the future, we know our coastline will need to adapt to a changing climate, and we will need to make many difficult choices in order to remain resilient through those changes. We have built this vision with great appreciation for the magnitude of the task and great trust in our community to achieve it. We have built this vision of our future 50 years from now so we can chart our course toward it. By crafting this vision, we are choosing to be proactive and hopeful, rather than fearful and reactive.

Our vision for 2070 is focused on a safe and thriving coast with four prominent features:

- beautiful beaches
- a bustling harbor
- a mix of accessible natural spaces and safe development along the water
- a socio-economically diverse, family-friendly community character.



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Photo courtesy of Steve Steinmetz, Flickr.

Beaches are an important part of Scituate’s identity and way of life. They are a source of recreation, habitat for wildlife, and economic activity due to tourism, real estate, local businesses, and tax base. Beaches provide safety and protection as buffers between coastal development and the ocean. In our 2070 vision for the coast, there are multiple beaches, each with its own “personality,” that are properly composed to slow down and absorb wave action, thus reducing impacts to the neighborhoods they border. It is also important to our community that the beaches are enjoyable—clean, easy to get to and use (e.g., parking or shuttles), and accessible to people of all abilities (e.g., wheelchairs and strollers, young and old).

- We love our beaches because of the memories made there, both for recreation and quiet reflection.
- We need our beaches because they are a key source of protection from storms and sea level rise.
- We want our beaches because they are a major economic driver for the Town. People come to Scituate as tourists and summer visitors, and many of us live in this Town because of the beaches and access to the ocean.
- Our beaches are important for wildlife and plant life, as well.

In 2070, we expect **Scituate Harbor** will continue to be the focal point along the coast for public gatherings, shopping, eating, and viewing the water. The harbor should be a place for “things to do,” particularly in the summer for both tourists and the local population. Scituate Harbor in 2070 may not need to be as active year-round as it is in 2020; as year-round businesses should be supported in other areas of town that are less vulnerable to winter storm impacts.

- We imagine a mix of businesses and activities that support a fun destination “sense of place,” such as restaurants and boutiques.
- We envision open spaces where people can eat, walk, meet up, and stop and enjoy views of the water.
- We hope Scituate Harbor has more places and services that support maritime tourism so people can approach and depart Scituate from the water, as well as the land.
- We need places for people to park in the harbor that are convenient and unobtrusive, and/or shuttles and bikes to get people to and from the trains. Once in the Harbor, we would like more walkable connections from the harbor to the beaches.

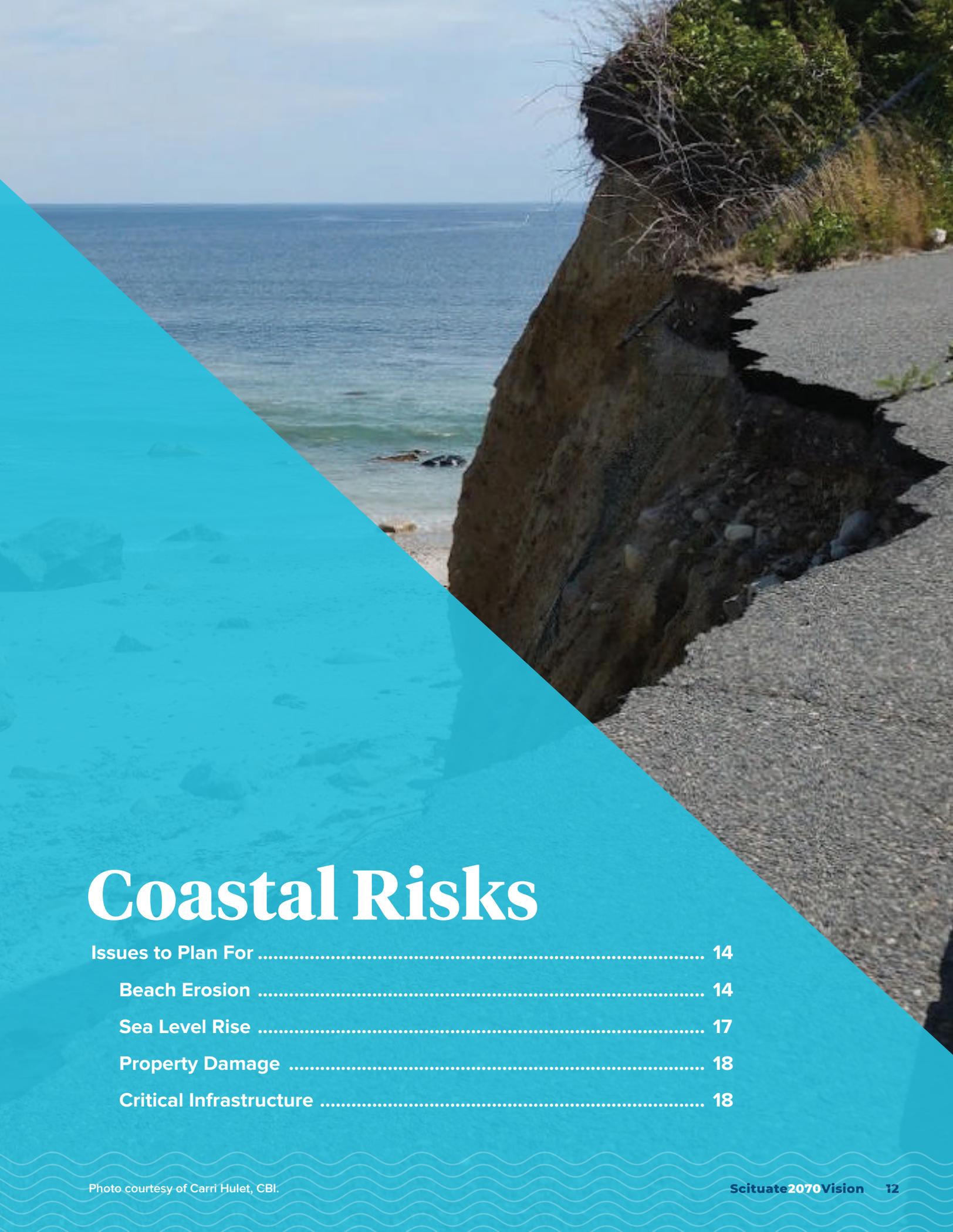
Coastal Development. Living and working right on the water has been one of the great jewels of Scituate’s coastal community, but we are all too aware of the risks. We have experienced many storms and witnessed the rise in sea levels and erosion of our beaches. We recognize our great challenge in determining how, where, and what type of development to support along the coast over the next 50 years, but we believe we can create a safer future, which includes:

- Coastal homes, businesses, historic structures, and critical infrastructure are either protected from the water or moved out of harm’s way.
- Utilities are resilient, so they don’t fail and don’t exacerbate dangers (e.g., power lines in the water, wastewater backup, and anything that might interfere with a sustainable supply of clean drinking water).
- Roads are raised out of the floodplain, so areas of town don’t get cut off from one another

Coastal Community. Scituate residents value the small-town, family-friendly feel of our coast and harbor and are generally pleased to be a little “off the beaten path.” We want to strengthen the resilience of the coast so it can continue to be the Town’s main asset. The coast is the main reason we live in Scituate, even those of us who don’t have homes right on the shore. The coast is the reason people summer in Scituate, and the beaches, the lighthouse, and the harbor are the tourist attractions that bring visitors and economic activity. An important part of the vision for 2070 is that the Town of Scituate continues to be able to accommodate the seasonal fluctuation in our population by finding ways to increase coastal activities and lodging for the summer while reducing exposure to coastal risks in the winter. And, we want to accomplish the above while still preserving the small-town feel and history of the Town.



Photo courtesy of Tom Lynch, Flickr.



Coastal Risks

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Coastal Risks

Living on and near the water is Scituate's key draw. As the community worked together to build this vision, they did so with a strong desire to pass along to future generations the unique opportunity they have enjoyed on Scituate's coast. The community did this with an awareness of the challenges they face. They have seen the water rise over the last many decades. Many have lived through devastating Nor'easters and other coastal storms. They have seen properties come and go, and many have built and rebuilt homes themselves. Members of the community appreciate the substantial changes that have already occurred along the coast, from shrinking beaches to lost marshes to larger homes and denser development.

Scituate has extensive, low-lying development along the coast that is especially vulnerable to coastal storm flooding and impacts from storm waves. Since 1978 through the time of writing this report, nearly \$73M has been paid by the National Flood Insurance Program for 4,016¹ claims for damages to structures in Scituate, far beyond what has been paid out in any other municipality in Massachusetts. For comparison, the total cost of claims of the three communities with the highest claims after Scituate—Marshfield, Hull, and Nantucket—

Figure 1. Flood Insurance Claims These communities had the highest National Flood Insurance Program claims payments since 1978.

MUNICIPALITY	TOTAL CLAIMS SINCE 1978	TOTAL PAID SINCE 1978
Scituate	4,016	72,863,542.00
Marshfield	1,768	23,727,116.00
Hull	2,424	17,776,187.00
Nantucket	598	17,674,417
Revere	2,590	15,291,447.00

is approximately \$59M. And in that same time frame, all of Barnstable County, which is vulnerable to hurricanes and tropical storms coming from the south, has had 3,131 claims totaling nearly \$39M.²

To be a resilient coastal community, Scituate must think about its vision for its future in the context of sea level



Photo courtesy of Carri Hulet, CBI.

rise, natural coastal processes, storms, and available strategies and resources to deal with those risks. The community's ability to realize this vision and adapt to significant climate change impacts on its coast depends on how well it can plan for beach erosion, storm impacts, and sea level rise, as well as overcome funding challenges to address those issues.

Issues to Plan For

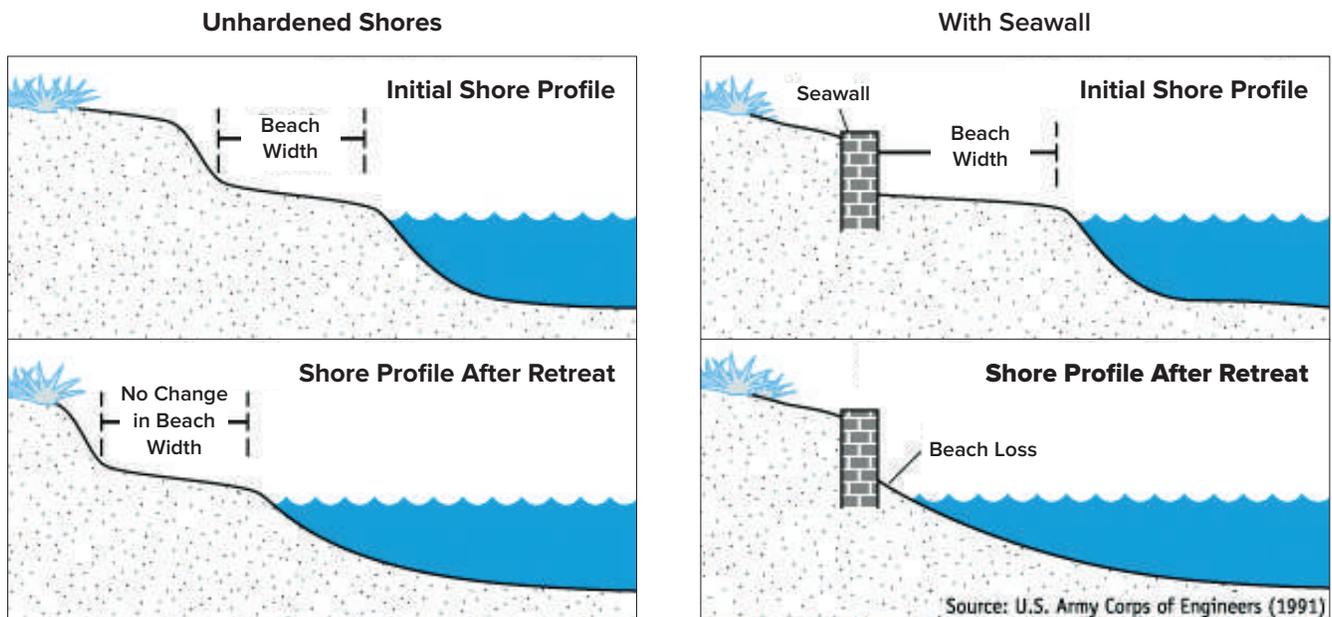
Beach Erosion

Scituate's beaches are precious to the community, yet many sandy beaches have eroded and properties along the beach have become increasingly vulnerable to the water over time. Typically, open ocean beaches remain stable when they have a consistent unimpeded sediment supply from adjacent areas or through nourishment (sand and other material that gets imported from somewhere else and placed on the beach). Beaches are dynamic features that need space to move—to erode and rebuild naturally. On developed coastlines, that space can be made by removing existing structures/infrastructure on the shore or pushing the beach out farther into the water through engineered beach nourishment.

Coastal armoring is the construction of hard structures, such as seawalls and revetments. These structures can provide protection to inland structures, but they also block sediment sources to the beach and inhibit their movement. This causes long-term erosion and beach lowering directly in front of the structure, shown in Figure 1, as well as erosion to adjacent areas.

This erosion and lowering in front of the structures leads to deeper water in front of seawalls/revetments and allows larger waves to reach the coast. Waves approach the shore until they 'feel' the bottom, then break and release their energy. In other words, they break when they encounter a water depth that is too shallow for them to continue. In areas where water depths have deepened (commonly in front of seawalls and revetments), large waves can come closer to shore, increasing damage, particularly during storms. Larger waves mean an increase in power of waves breaking on the seawall. Some of that power overtops the seawall, which is the cause of much of the property damage from storms, and amplifies the lowering in front of the structure by creating a "scooping out" of sand in front of the sea wall, shown in Figure 2.

Figure 2. Shoreline Hardening and Beach Loss Chronic beach erosion on unhardened shores (left) and with seawalls in place (right). (Applied Coastal, 2016)



Seawalls are in place in Scituate and many towns and cities in the world because they provide a measure of protection by “fixing” the location of the shoreline and preventing erosion landward of the coastal structure. Seawalls have made it possible for many areas in Scituate to remain in place to this day. As the community looks ahead to 2070, rebuilding some of Scituate’s seawalls will surely be part of the strategy to realize the vision, though the extensive costs of repairing and maintaining seawalls will need to be weighed carefully to prioritize where these investments will have the greatest benefit. Additionally, Scituate residents must grapple with two challenges seawalls present:

- ① a false sense of security, and
- ② accelerated beach erosion and associated storm damage resulting from larger waves.

The false sense of security results from people feeling that a seawall (or a higher seawall) eliminates the risk from storms, when, in fact, the walls can increase the risk of damage in storms. Seawalls are vulnerable to overtopping by large and powerful waves, as described and illustrated in Figure 2, a phenomenon that can lead to inland damage and structural damage to the seawall itself. Several members of the Scituate community advocate for stronger and higher seawalls—a strategy that will surely make sense in some places along

Figure 3. The Effect of Coastal Armoring Coastal armoring amplifies beach lowering in front of structures such that larger waves reach the coast, bringing greater energy that can overtop the structure as well as create a “scooping out” immediately in front of the structure. (Applied Coastal, 2016)

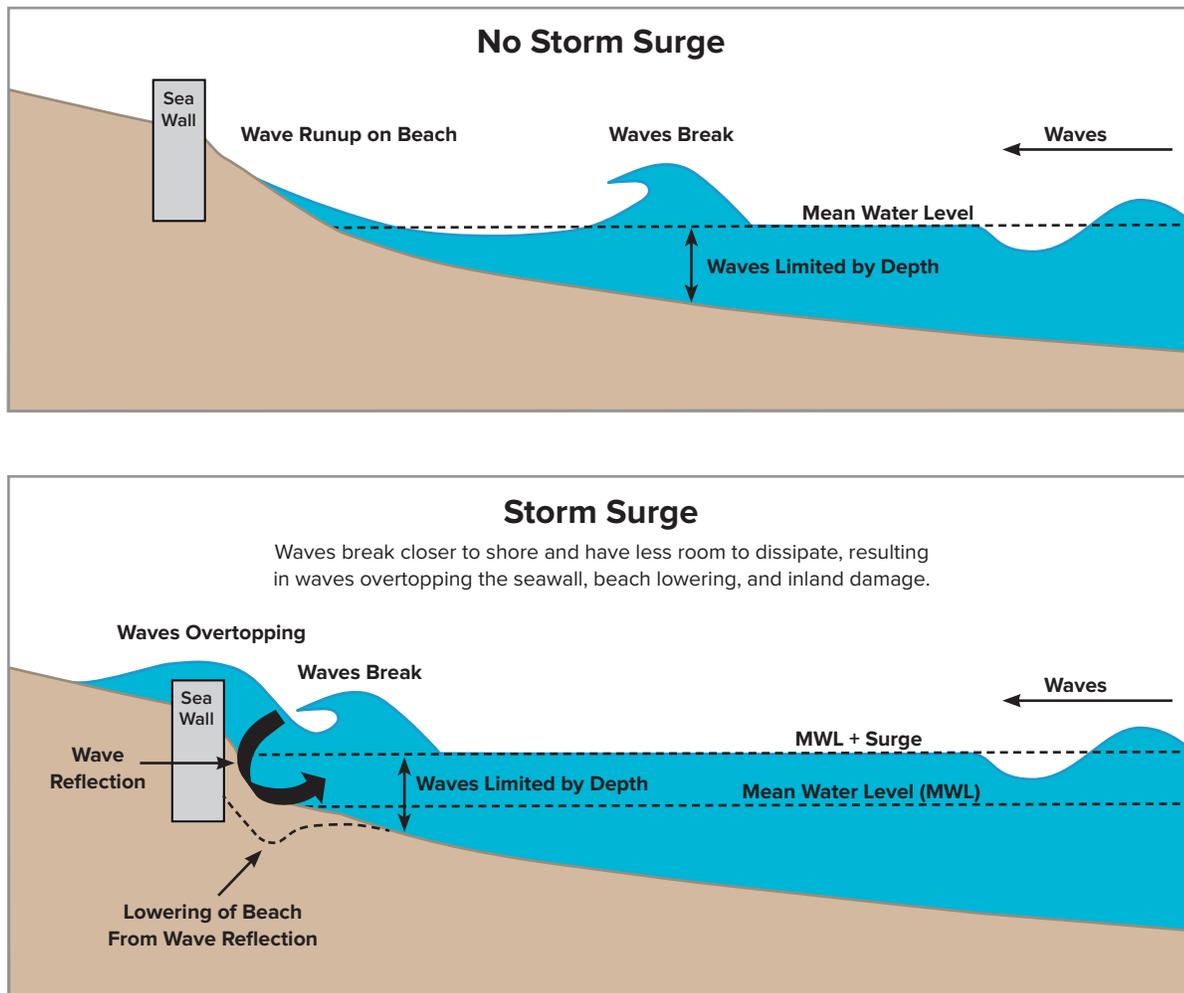


Figure 4. Historical Change in Peggotty Beach Shoreline Historical shoreline change for Peggotty Beach from 1950/1952 to 2008. (Applied Coastal 2016)



Scituate's coast. As this option is considered, the balance of protection and risk that seawalls provide should be accurately weighed.

An understanding of the second challenge with seawalls—accelerated beach erosion—reveals the tension between two elements of the community's vision: beaches and coastal development. Seawalls make it possible to build close to the water. Seawalls also cause beaches to erode and disappear, not just directly in front of the wall, but in the areas adjacent to the walls. Seawalls and beaches, therefore, can only exist in the same place if the beach is engineered. This is possible but not likely to be feasible everywhere in Scituate, so, among the many hard choices the community must make is this one: where to have walls, where to have beaches, and where to try to have both. An example of erosion in areas adjacent to coastal armoring is evident when looking at the shoreline change from 1950 to 2008 on Peggotty Beach in Figure 3. Peggotty Beach has been eroding since the 1950's, with erosion rates of up to 4 feet per year at the south end of the beach. This erosion rate represents the highest shoreline change rate along the developed portions of the Scituate coastline. Additional details on shoreline change along other parts of Scituate's coastline are detailed in Section 2 of the [Coastal Erosion, Sediment Transport, and Prioritization Management Strategy Assessment for Shoreline Protection](#)³ study, which was completed by Applied Coastal in 2016 and focused on Scituate's options to become more resilient along its coast (hereafter referred to as "the 2016 Shoreline Protection Study"). Additional details on effects of coastal armoring are in Section 6.0 of the same report.

Beyond seawalls and beach nourishment, other methods for dissipating wave energy should be considered, including reducing/flattening the slope of armoring, cobble dune construction, increasing the height of shore protection, and utilizing other "natural" structures to break waves in the nearshore area.

Storm Impacts

Scituate's geography and its position relative to the open ocean make it vulnerable to storms. Nor'easters are named for their strong winds that blow from the northeast and are, therefore, a significant issue along

the northeast coast, and Scituate is among the most vulnerable. During Nor'easters, wind generates very large waves along the coast, and the storm action tends to last multiple days. Scituate faces the open ocean in the direction of East-Northeast, from which the biggest waves come, as visualized on the wave rose below in Figure 4. The greatest impacts from storms tend to be due to the overtopping of seawalls by wind-driven waves. Additional details on storm analysis are provided in Section 4.0 of the 2016 [Shoreline Protection Study](#).⁴

Storm surge is an increase in water surface elevation during storms. The severity of the surge is dependent upon multiple factors: tide, atmospheric pressure reduction, wind speed/direction, and wave direction. This increase in elevation is shown by the dotted white lines on Figure 5. Waves then set up on this additional depth and hit the coast with more power and height, which is called wave runup. These waves cannot fully flow back out to sea and are, instead, absorbed into additional incoming waves, making the surge even higher, shown as the red dotted line in Figure 5.

Sea Level Rise

Sea level rise will compound the coastal issues of beach erosion and storm impacts for Scituate. Over the past 100 years, the sea level has risen approximately one foot in Scituate, due to a combination of rising water levels and land subsidence. Figure 6 shows substantial annual variation in sea levels 1920-2020, but a clear increase over time.⁵

Climate change is causing the rate of sea level rise to increase; however, the magnitude of increase in the coming years is uncertain. Warmer global temperatures due to the "greenhouse effect" of certain emissions being trapped in the atmosphere are causing glacial and polar ice-cap ice to melt and seas to expand as they become warmer. Figure 7 shows estimates of possible sea level rise by the year 2100 in lower- and higher-emissions scenarios. There is uncertainty over longer time frames because it is not known to what extent global greenhouse gas emissions will be curbed. Given last century's rate of approximately one foot during an era of lower emissions, a higher rate of rise can safely be expected.

Higher sea levels are already impacting Scituate's coast, making the community more vulnerable as the ocean moves landward and storms cause waves to reach farther inland with more force and height. If the sea rises only another two feet by 2070, the type of flooding that occurs in Scituate today during a 10-year storm, such as 2015 storm Juno, is equivalent to the flooding Scituate will experience almost every day during most high tides. Figure 8 illustrates this. Further details on storm recurrence probability are provided in Section 4.0 of the [2016 Shoreline Study](#).⁶

Property Damage

Scituate has extensive, low-lying development along the coast that is especially vulnerable to storms. Since 1978 through the time of writing this report, nearly \$73M has been paid by the National Flood Insurance Program for 4,016¹⁷ claims for damages to structures in Scituate, far beyond what has been paid out in any other municipality in Massachusetts. For comparison, the total cost of claims of the three communities with the highest claims after Scituate—Marshfield, Hull, and Nantucket—is approximately \$59M. And in that same time frame, all of Barnstable County, which is vulnerable to hurricanes and tropical storms coming from the

south, has had 3,131 claims totaling nearly \$39M.⁸ One measure of damage is “repetitive loss.” Repetitive loss properties are defined by FEMA as those properties with more than one claim over \$1,000 within a rolling 10-year period. Scituate has high rates of repetitive losses, and a substantial number of repetitive losses in the Town occur in areas above the 10-year storm surge elevation, indicating that the damage is due to waves on top of storm surge.

Critical Infrastructure

Critical infrastructure near the coast is also particularly vulnerable to storms. The coast has overhead power lines, storm drains and outfalls, sewage pump stations, a wastewater treatment plant, and septic tanks. Other below-ground utilities, including gas lines, drinking water, and telecommunications are less vulnerable, but at increasing risk over time. Figure 10, below, shows the locations of pump stations in yellow and the wastewater treatment plant in red. The plant and many of the pump stations are vulnerable to storm damage, as seawater can enter the stations and compromise their ability to function. Figure 11 shows Otis Avenue, where a pump station is located, during a flood in February 2013. It was rendered inoperable at the time.



Photo courtesy of Steve Steinmetz, Flickr.

Figure 5. Waves Offshore of Scituate The image below is called a “wave rose.” The long-term wave rose for National Data Buoy Center Station 44013, located 11 miles offshore, shows waves propagating towards the Massachusetts coast from the east and east-southeast approximately 59% of the time. (Applied Coastal, 2016)

Waves Offshore of Scituate: Conditions (1980-2012)

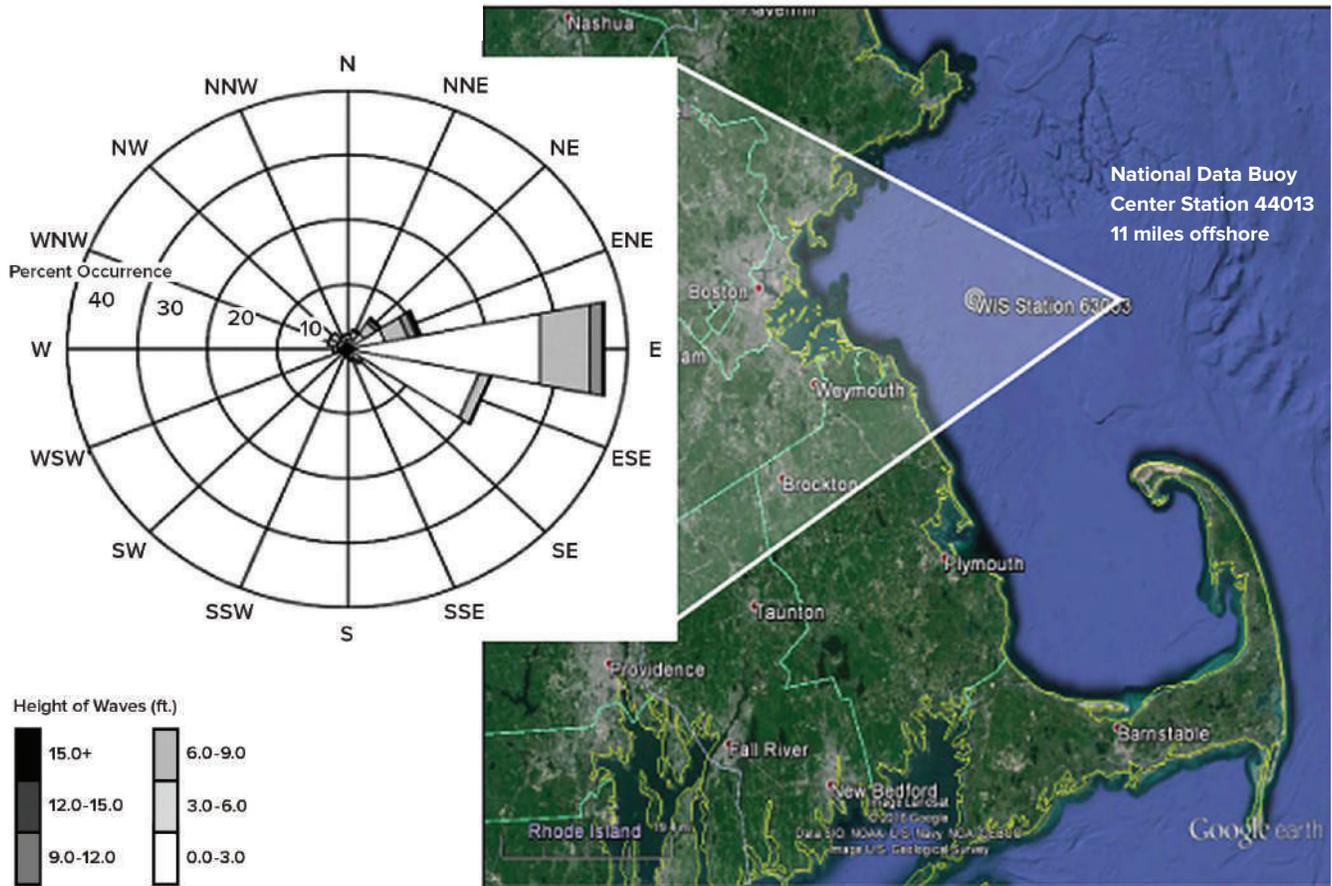


Figure 6. Storm Surge and Wave Runup Storm surge, an increase in water surface elevation during storm events, is shown as the white dotted line above normal tide. Wave runup, where waves build up on the shoreline because they cannot flow back out to the sea, increases water elevation even higher and is shown as the red dotted line. (Applied Coastal, 2016)

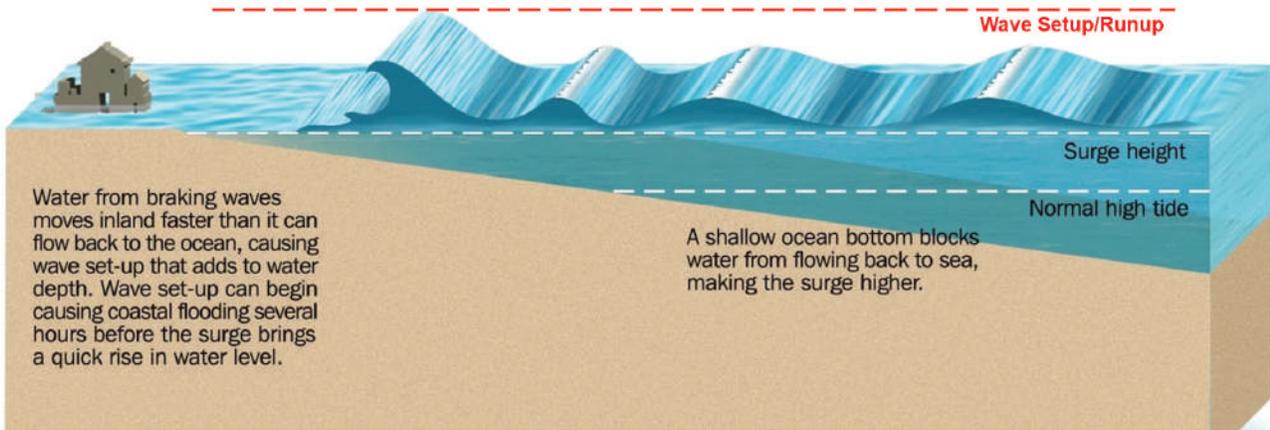
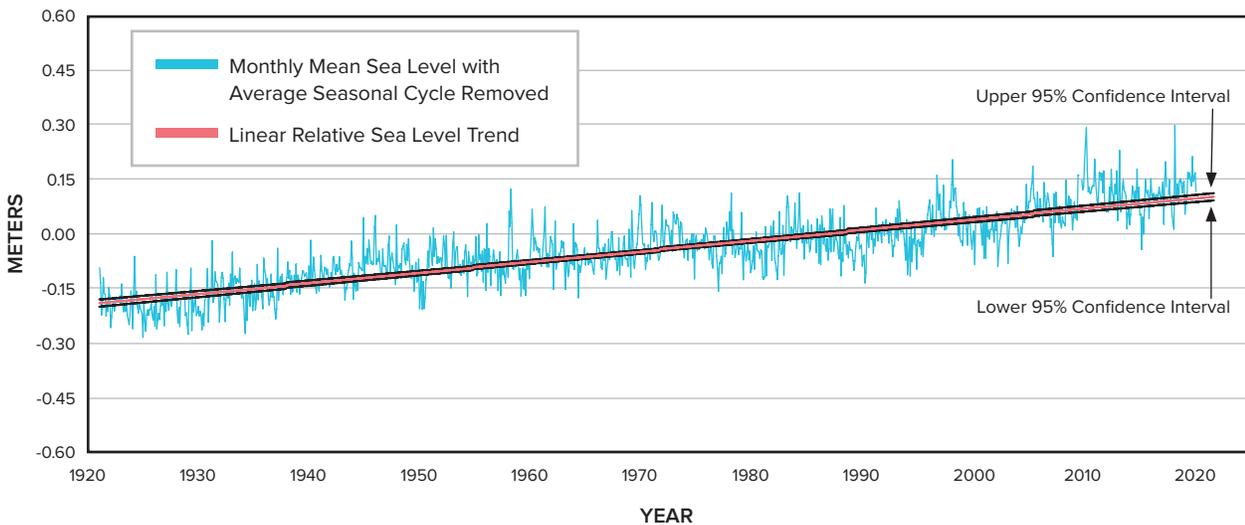
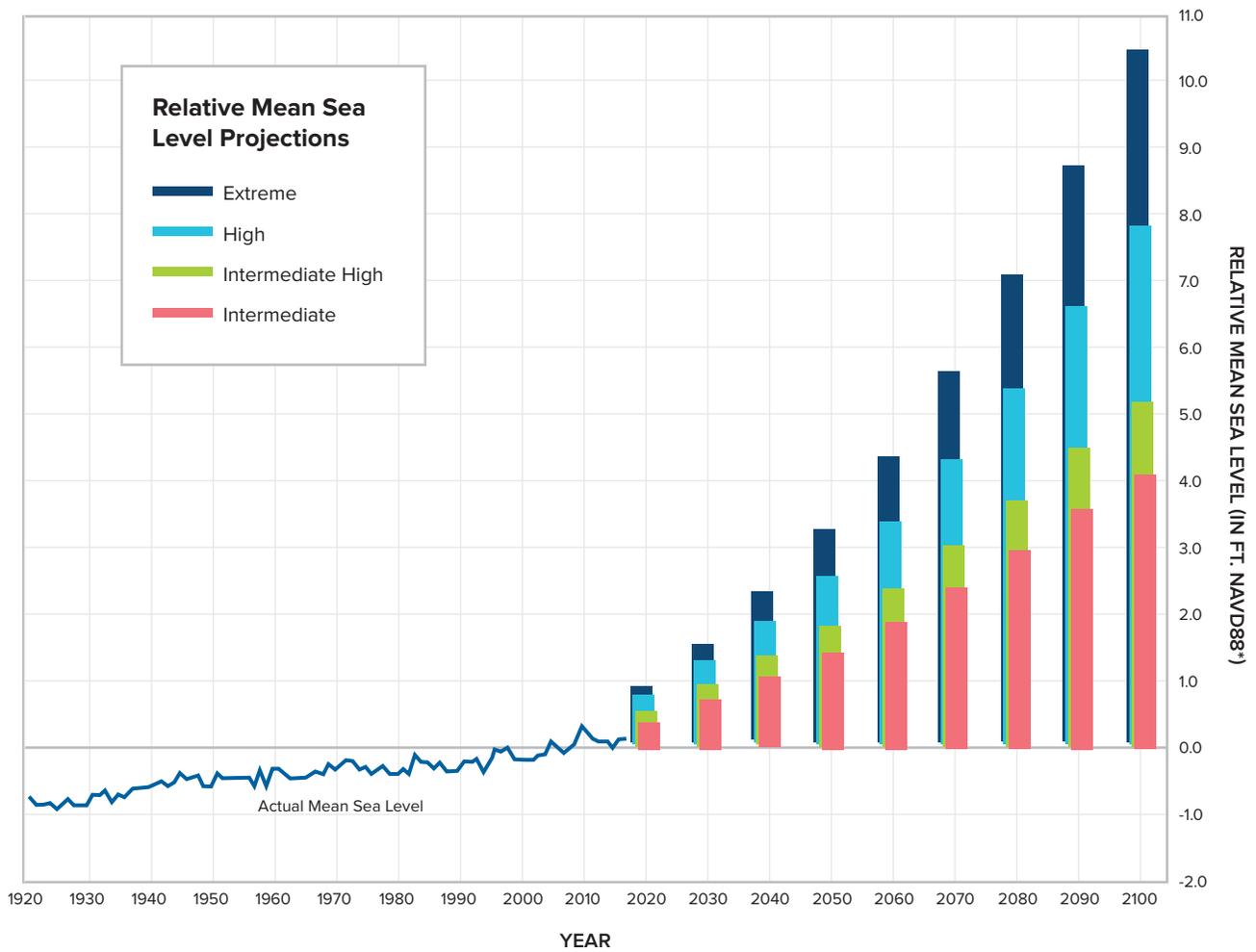


Figure 7. Relative Sea Level Trend The plot shows the monthly mean sea level without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. The long-term linear trend is also shown, including its 95% confidence interval.⁹ The relative sea level trend is 2.86 millimeters/year with a 95% confidence interval of +/- 0.15 mm/yr based on monthly mean sea level data from 1921 to 2019 which is equivalent to a change of 0.94 feet in 100 years. (National Oceanic and Atmospheric Administration, 2020)



NOAA Tides & Currents Station ID #8443970 – Boston, Massachusetts
 Mean Deviation/Standard Deviation: 2.86 +/- 0.15 mm/yr.

Figure 8. Sea Level Rise Projections for Massachusetts (Northeast Climate Science Center, 2018¹⁹)



* North American Vertical Datum of 1988

Figure 9. Flooding from Two Feet of Storm Surge in Scituate Harbor The areas in light blue show the present-day (2020) extent of flooding during a spring tide due to two feet of storm surge from a 10-year storm (a storm with a 10% probability of occurring in a given year.) This storm surge level is equivalent to the projected height of water during a spring tide on a clear day if the sea rises another two feet by 2070. (Applied Coastal, 2020)



Figure 10. FEMA Claims from 1991 Storm Each red dot represents a FEMA claim following the 1991 “No Name” Storm. Note that the claims are not just from homes directly on the water and that there are claims from almost every section of the coast, north to south. (Applied Coastal, 2016)



Figure 11. Pump Stations and Treatment Facilities Along Scituate's Coast Locations of some of Scituate's pump stations (yellow) wastewater treatment facility (red) along the coast. (Applied Coastal, 2016)

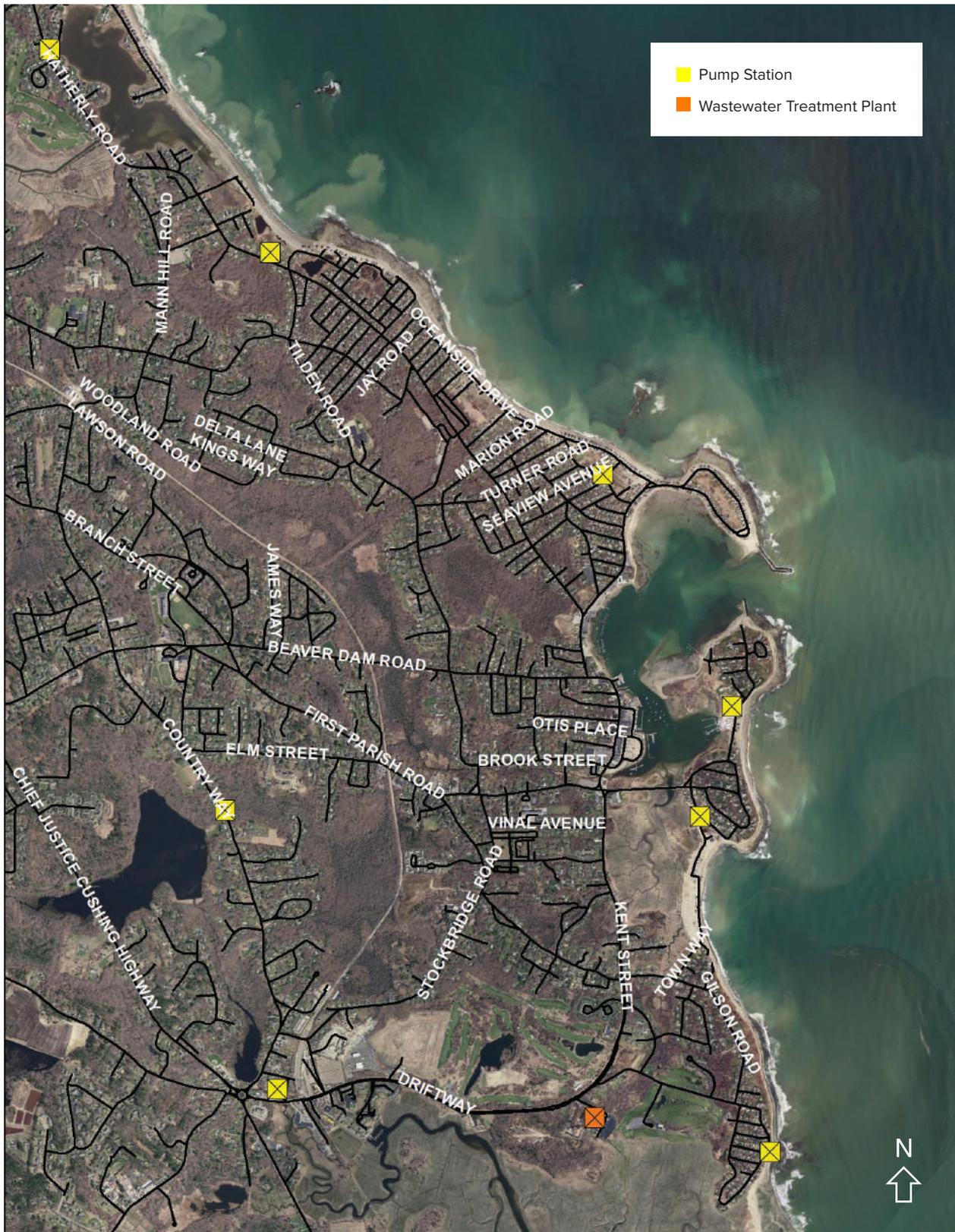


Figure 12. Pump Station Flooded in 2013 The site of a pump station on Otis Avenue, flooded by a storm in February 2013. Note the stop sign for a sense of depth.



Photo courtesy of Jason Burtner, Massachusetts Coastal Zone Management.



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Implementation Considerations



Photo courtesy of Carri Hulet, CBI.

The next step toward achieving the 2070 coastal vision is to develop a 10-year action plan, or a “punch list” of actions and strategies the Town of Scituate should pursue to set itself on track for the 50-year vision articulated in this document.

As this document was being drafted, a proposal for funding to support the development of a 10-year action plan was under review. The goal of this section is to share with the team that will develop that plan, specifically, and the Scituate community more broadly, the considerations and options they may need to weigh to develop that plan. The content in this section includes a mix of ideas that came from the public and from the project team, including experts in coastal engineering, municipal legal and regulatory matters, and municipal planning.

Understand Resilience Strategies

When community members in Scituate read through this vision, they might think, “This sounds great! In

2070 I would love Scituate to have clean and accessible beaches; a thriving harbor; safe places to live, work, and play on the coast; and a typical New England, family-friendly community character...but how? How do we navigate all the risks we are facing and come out the other side with this vision fully realized?”

First, it helps to think about the kinds of things Scituate might do along the coast in four general categories: **accommodate, defend, move, and no intervention.** Communities may need to take one or some or all of these actions in different places at different times in order to become more resilient. In Scituate’s case, the question that needs to be asked and answered to realize the vision is: “At each point along our coast, should we elevate or otherwise alter existing structures so they can stay where they are, build or improve something to try to prevent the water from causing future harm, move people and structures out of harm’s way and restrict future development, or do nothing to intervene—or some combination of these things over time?”

Accommodate

GOAL: To keep existing structures in place and allow the water to move under and around them, even as the sea rises and the risk of damage from storms increases.

EXAMPLES



ELEVATE STRUCTURES Elevate structures, e.g., raise homes and other buildings on pilings or other supports, allowing the structure to stay where it is and let the water pass under it. Many homes in Scituate have been elevated. The [2016 Shoreline Protection Study](#)¹¹ estimates the cost of elevating a home to be around \$175,000 and notes that this may be needed in combination with larger-scale approaches in areas that are vulnerable to flooding.¹²



CONVERT ROADS TO BRIDGES Convert roads to bridges, e.g., elevate a road and re-engineer it as a bridge, allowing water to pass under it.

PROS

May buy some time in places that are usually free from water and only flood in severe storms.

May preserve real estate values for some time and lower insurance premiums.

May allow access between distinct parts of town on an existing road for some time.

Funding for this adaptive strategy is currently available through various programs.

CONS

Does not resolve concerns beyond the structure, such as septic systems being compromised or marshes behind roads being inundated or utilities needing to be salt-proofed or otherwise altered to continue to function.

May or may not make structures safer, depending on how high and powerful the waves are in a storm (e.g., 6 or 8 additional feet of elevation may not move the structure out of the “strike zone” for waves).

Requires significant adaptation and can decrease accessibility for those who use the elevated structures (e.g., must be able to manage stairs, must be able to secure or remove everything that is stored beneath the structure when storms are expected.)

Defend

GOAL: To prevent the water from getting to the structures or other areas one wishes to protect.

EXAMPLES



SEAWALLS AND REVETMENTS: Seawalls and revetments: Approximately half of Scituate's shoreline is armored with seawalls, including along Minot Beach, North Scituate, Surfside Road, Oceanside Drive, Cedar Point, Edward Foster Road, and the southern end of Humarock. All four cliffs are armored with revetments. The [2016 Shoreline Protection Study](#)¹³ notes several areas on the coast where seawall and revetment improvements may be needed, including along Minot Beach, North Scituate Beach, Surfside Road, Oceanside Drive, Cedar Point, and along First, Second, and Third Cliffs, where improvements are already planned.¹⁴



BEACH NOURISHMENT: Beach nourishment involves bringing in sand from other places and adding it to an existing beach. This makes the beach larger by extending it out farther into the water. Beach nourishment has been recommended for North Scituate Beach and the north end of Humarock, among other locations on Scituate's coast. Because of coastal sedimentation and erosion processes, beach nourishment typically requires ongoing maintenance and investment; however, alongshore migration of beach nourishment sediments can often help bolster shore protection along downdrift shoreline areas. A regional example of a beach nourishment project that Scituate might learn from is Winthrop Beach in Winthrop, Massachusetts.



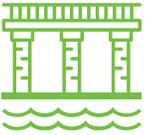
DUNES AND BERMS: Berms are uniform stretches of sand that rise from the beach to the upland areas behind the beach, often covered with sea grass or other plants. A dune is the mound of sand or cobble that rises from the beach or berm. Dunes and berms can occur naturally or be engineered. Mann Hill is an example of an engineered cobble dune. In the [2016 Shoreline Protection Study](#)¹⁵, constructed dunes are suggested in a number of places, including North and South Humarock, Peggotty Beach, Egypt Beach, and Mann Hill Beach.¹⁶



BREAKWATERS, JETTIES, AND GROINS: Large structures that are built offshore or extend out into the water to dissipate waves create sheltered areas, like a harbor or a marina, and/or to manage the flow of sediment. Artificial reef technologies and Wave Attenuation Devices (WADs) are designed to function in a similar way. The large rocky extension into the water beyond the lighthouse is a jetty.



BOULDER DIKES: Massive boulders placed on flat, rocky stretches of the coast can serve as shields that take the blow from waves before they crash into other structures on the shoreline. In the 2016 Shoreline Protection Study, a large boulder dike project has been proposed as a component of a possible defensive strategy for Cedar Point.¹⁷



ELEVATE ROADS: Roads that border the coast and are consistently inundated may be elevated and serve as barriers to water passing beyond them. For example, the [2016 Shoreline Protection Study](#)¹⁸ suggests that it may be necessary to elevate Gilson Road at Third Cliff, Edward Foster Road and Edward Foster Road Causeway at Second Cliff, and Central Avenue in Humarock to continue to protect the road from storm damage and ensure that access to Humarock is maintained.¹⁹



ADD DEFENSIVE MEASURES FOR CRITICAL INFRASTRUCTURE: Scituate's coastal development is supported by water, wastewater, telecommunications, and electrical systems. To defend them where they are requires targeted strategies, which will depend on the function and type of equipment. The pump station at Chain Pond in the Egypt Beach parking lot and the pump station at the intersection of Otis Road and Scituate Avenue are both highly prone to flooding because of their low elevations. These stations could be made more flood-resistant by installing flood doors and watertight hatches and by raising the generators, for example.

Each of these examples is quite different and has its own unique set of advantages and disadvantages, but the following set of pros and cons is helpful to consider for a majority of the “defend” adaptations listed here. Also, the key consideration for most of these measures may be that many require **collective agreement among abutting private or public property owners** along a defined stretch of the coast to be effective. Seawalls, beach nourishment, dunes and berms, roads, boulder dikes, etc., only work properly to make the community safer if they are built and maintained to appropriate specifications, often along multiple properties. This can be a pro or a con, depending on the community's collective appetite to support the projects.

PROS

Defensive strategies have made it possible for coastal communities to exist for a long time and will undoubtedly continue to be a big part of the mix of approaches communities choose well into the future.

Many of these strategies are very expensive, but when compared with the value of the assets they protect, they are often deemed to be worth the expense. Also, external funding to augment local contribution and help cover the costs does exist through various programs.

CONS

Any strategy that limits the natural movement of sediment (as explained in the above section on beach erosion) has a significant, and usually negative, effect on the beach and the other natural features that would have been there otherwise.

The external funding that is available for these strategies is highly competitive and therefore risky to plan around.

As with the previous category of strategies (Accommodate), many of these measures only buy time, as sea level rise will eventually render many of them nonfunctional.

Move

GOAL: To get out of harm's way.

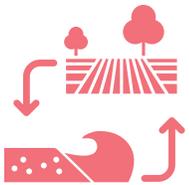
EXAMPLES



BUYOUTS: A government or philanthropic entity may offer to buy a vulnerable property and demolish the structure that is on it. Usually, the goal is to convert the land to open space to serve as a buffer in the form of conservation land, public space, or some combination. Buyouts have occurred in Scituate on Peggotty Beach and in a few other places. While most of the funds for buyouts are linked to post-disaster relief funding, other sources of funding can be used for buyouts as a preventative measure, such as municipal Community Preservation Act funds. The [2016 Shoreline Protection Study](#)²⁰ suggested that buyouts or moving properties landward may be an approach for Peggotty Beach and Mann Hill Beach.²¹



LAND SWAPS AND RELOCATIONS: In places where a vulnerable structure might be moved to a safer location, and the owners of the two parcels can agree to swap the land, the structures may be moved or rebuilt on the new parcel so the original parcel can become a natural buffer or be repurposed for another defensive measure. One example in Scituate is the relocation of the road and utilities that used to be seaward of the homes on Peggotty Beach to the land behind the existing homes. The recent [Peggotty Beach Retreat Feasibility Study](#)²² looked again at a land swap as an option for the homes to move back onto the town-owned land behind them in exchange for the beach property, which would be placed into public ownership and use.



TRANSFER OF DEVELOPMENT RIGHTS: This occurs when the owner of a property on the coast that is not developed is willing to sell or trade those rights for another parcel inland, in exchange for placing the coastal parcel under restrictions so it cannot be developed in the future. A transfer of rights might also occur when the owner of a developed property is willing to abandon or limit the right to develop the property in exchange for increased development rights on an inland parcel. A variation on this is the creation of a Transfer of Development Rights Bank in which property owners wishing to exceed existing zoning development rights can purchase additional rights from the bank. The funds paid into the bank would be used to assist in buying out property owners wishing to move away from the most vulnerable locations. The coastal property would be returned to open space and restricted to prevent future development.

PROS

“Move” strategies are generally considered permanent solutions because they eliminate the risk for the people and structures that were previously in harm’s way.

Money is available for properties that meet certain criteria and often, in the wake of natural disasters, the funds for buyouts increase. A lot of innovation in buyout funding is happening around the country to try to make this option available and attractive to more property owners.

Utilities and public services, such as emergency response, are no longer needed if the people and structures are no longer in danger, saving money and enhancing safety.

CONS

Moving or relocating is often very difficult emotionally and logistically for the individuals and communities involved.

Municipal tax revenues are tied to development, so removing the structures and reducing the taxable value of the property has a long-term impact on local budgets.



Photo courtesy of Carri Hulet, CBI.

No Intervention

GOAL: In some places, the property owners, whether public or private, may choose to “allow nature to take its course.” This may mean choosing not to repair a seawall or allowing a road to flood during storms or waiting for a storm to damage a property beyond repair and using the insurance payout to demolish it.

In some places, the property owners, whether public or private, may choose to “allow nature to take its course.” This may mean choosing not to repair a seawall or allowing a road to flood during storms or waiting for a storm to damage a property beyond repair and using the insurance payout to demolish it.

PROS

May avoid costs that may not be deemed “worth it,” given the risks.

May be part of an overall strategy to prioritize some interventions over others, in line with personal or community values.

CONS

May be seen as “giving up” or interpreted simply as a loss.

Could put people in danger if a more proactive strategy could have avoided damage or an emergency situation.



Photo courtesy of Carri Hulet, CBI.

Review and Build on Existing Studies/Plans

There are existing examples in Scituate of all of the adaptation options described above -- accommodate, defend, move, and no intervention--and most of Scituate's coast has been evaluated relative to these options to determine which strategy or combination of strategies are the most cost-effective or otherwise "best fit." Scituate has been planning for its future, including developing a range of technical studies of its coast, considering options for projects, and seeking to

become more resilient to current and future coastal vulnerabilities. The next step toward implementation will be to review and synthesize this extensive work to prioritize where and how to make resilience improvements to the coast.

The key findings and recommendations from the following studies and plans are summarized below. The full documents for those that are complete can be found on the [Scituate Coastal Advisory Commission web page](#).²³

Planned
for
2021

2021 HAZARD MITIGATION PLAN (ANTICIPATED): A hazard mitigation plan helps the community understand its risks from natural hazards and develop long-term strategies to reduce the impacts of these hazards on people, property, and the natural environment. The plan engages Town officials, experts, and public stakeholders to identify local policies and actions to mitigate the community's risk to natural disasters. This plan will replace the Town's 2016 hazard mitigation plan.

In
Progress
Now

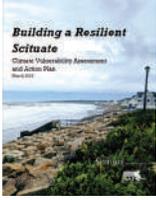
2020 TOWN WIDE MASTER PLAN (IN PROGRESS): A master plan serves as the long-term guidance document and shared vision for responsible growth and preservation throughout the Town. The Planning Board has a statutory responsibility to update the Town's Master Plan, and this plan will replace the existing plan from 2004. The plan is expected to be complete by the end of 2020.



2020 SCITUATE HARBOR RESILIENCY MASTER PLAN: The Scituate Harbor Resiliency Master Plan identifies specific and viable near-term and long-term solutions to improve the resilience of Scituate Harbor. It makes recommendations focused on mitigating the impacts of sea level rise and coastal flooding, including "lifting the edge" of the harbor up higher and flood-proofing infrastructure; encouraging economic development, including addressing parking challenges, vacant storefronts, and diversifying attractions in the downtown area; enhancing transportation infrastructure, including improving walkability and multimodal transportation infrastructure; beautifying the area; plus other long-term recommendations regarding improving stormwater infrastructure and updating zoning.

In
Progress
Now

2020 PEGGOTTY BEACH MANAGED RETREAT FEASIBILITY STUDY: This feasibility study assesses options for moving homes along Peggotty Beach further from the water to make them less vulnerable. The report identifies steps to better understand the permitting and regulatory requirements for considering a potential land swap, including challenges to moving the structures into wetlands behind the beach.



2018 BUILDING A RESILIENT SCITUATE, CLIMATE VULNERABILITY AND ACTION

PLAN: This report assesses the vulnerability of Scituate’s people and places to the impacts of climate change and proposes a plan for protecting the Town from these impacts. It summarizes the latest climate risks, including sea level rise, increasing storm intensity, higher precipitation, and more intense heat. It evaluates the vulnerability of Scituate’s critical infrastructure and resources, and creates an action plan for incremental steps toward greater resilience and community vibrancy focused on interconnected goals of adapting to a changing climate, mitigating climate change, and improving emergency preparedness.



2018 COASTAL COMMUNITY ASSESSMENT: This assessment gauged the concerns and hopes of coastal residents regarding plans and improvements for the coastline. This vision was funded and completed in response to one of the recommendations in the 2018 Coastal Community Assessment—to develop a comprehensive, long-term vision for the coast.



2017 ELEVATING ROADWAY IMPROVEMENTS AND DUNE/BEACH NOURISHMENT ALONG NORTH HUMAROCK FOR IMPROVED COASTAL RESILIENCY:

This study developed recommendations to improve North Humarock’s resilience to storm impacts. It recommended constructing a dune along North Humarock to protect against flooding and overwash from storms in combination with elevating the road to prevent flooding from the river side of Humarock and help maintain emergency access.



2016 COASTAL EROSION, SEDIMENT TRANSPORT, AND PRIORITIZATION MANAGEMENT STRATEGY ASSESSMENT FOR SHORELINE PROTECTION:

This comprehensive study involved detailed analysis of erosion and sediment transport patterns along the Town’s coast and developed prioritization criteria and recommendations for actions to improve resilience along various sections of the Town’s coast.

Ten-year Action Plan

The second phase of this process, the 10-year action plan, will define clear priorities to analyze the extensive technical work that has been done of the coast to date and identify innovative approaches and key actions the Town must take in the coming decade (by 2032) in order to move Scituate toward the 2070 Vision. This will allow Scituate to emerge after the combined three-year effort of first visioning and then planning for implementation with two significant planning documents towards which other Town planning, fundraising, and implementation efforts can orient. The 10-year action plan would include conceptual plans for the highest priority near-term projects that the community seeks to move forward, identifying permitting and regulatory requirements and/or hurdles, estimating costs, and establishing preliminary timelines for the design, permitting, and execution of each project.

The 10-year action plan will be developed through a combination of local stakeholder guidance incorporating diverse perspectives and technical expertise spanning planning, engineering, coastal processes, landscape architecture, legal issues related to land use, and economic analysis and costing. The team will brainstorm options based on the extensive existing analysis of potential strategies for Scituate's coast and best practices and new, innovative approaches to coastal resilience. It will require continued substantial

community engagement to gather input, educate the community about options, and build consensus on the plan. It should include both a broad public outreach, education, and engagement process as well as skilled facilitation of a representative Stakeholder Advisory Group to work with technical experts to develop prioritization criteria and evaluate the project options.

Over the course of the project, the Stakeholder Advisory Group, with support from technical consultants, would iteratively analyze and refine the list of priority project options, sharing the results with the broader community at key points in order to improve the options and build public buy-in, until an implementable plan of strategic, targeted projects and other actions are defined and phased over the next 10 years. As the 10-year action plan emerges, the community would also determine a series of steps to advance longer-term projects that will occur outside the 10-year action plan, including developing recommendations for further study and research needed to accomplish these longer-term goals to reach the Town's 50-year vision. Finally, a high-level funding strategy will also be developed to guide the Town's efforts to access local, state, and federal resources for the projects in the implementation plan. With the 10-year implementation and funding strategy together, the Town should be well positioned to accomplish projects that move the community towards its long-term vision for the coast.



Photo courtesy of Carri Hulet, CBI.

Priorities and Wrestling With Trade-offs to Achieve a Resilient Future

There is broad community consensus on the importance of realizing all four elements in this vision, but there is work to be done to align the vision with what is possible, given the risks, and what is probable, given the funding and other challenges the Town faces as they try to bring about that vision. Hard choices will be required to determine where to focus energies and resources.

The following matters were raised by the community or the expert advisors during the development of the vision and can serve as a guide on the issues that must be considered and the questions that must be resolved during the development of the 10-year action plan.

Overarching Considerations

Impermanence

The coast is a dynamic system. When planning for 50 years, it is important to appreciate that no intervention along the coast is likely to remain as a static or even permanent feature. Every element of coastal solutions will be subject to the impacts of a volatile natural system and coastal processes. Walls will deteriorate, beaches will erode and migrate, coastal storms will continue to take their toll on anything that is built right along the shore or flood pathways. Because of this, the cost of every option to improve resilience along the coast must be weighed against the benefit it may provide over the time frame that it is reasonable to expect those benefits.



Photo courtesy of Tom Lynch, Flickr.

Coastal Connectivity

The coast and its effects are not differentiated between parcels or municipal lines. Every intervention along the coast, whether by an individual property owner or the Town, affects those adjacent to them and beyond. Building the 10-year action plan will be more than a technical exercise—it will require building community cohesion and willingness to collaborate within households and among neighbors. The Town may also consider the value of coordinating and collaborating with adjacent communities, such as Cohasset and Marshfield.

Prioritizing Beaches

The vision articulates the community's deep desire for multiple beaches in 2070 with their own "personalities," connected to each other or other natural resources and town amenities, such as marshes, trails, and Scituate Harbor. This vision is achievable, but it comes with some significant trade-offs because Scituate's coastline is currently highly developed. As explained above, beaches need to be able to move and adjust by taking and giving back sediment. Walls and other structures built along the beach to provide defense against the water impede that process. Seawalls are highly valued infrastructure for some in the Town. However, to achieve the vision of multiple beaches in 2070, the Town will need to reduce the density of development and remove some of the seawalls, or, in some cases, commit to beach nourishment projects that require public easements to secure public funding, or a combination of both strategies. The protective benefits of seawalls—along with their risks and drawbacks given the storm damage from wave overtopping of them in intense storms—will need to be weighed against the unintended impacts of seawalls' exacerbating shoreline erosion.

The 10-year action plan should look at which of the existing beaches could be preserved, maintained, or expanded in the next 50 years to achieve that diversity and connectivity, and which beaches may need to be allowed to recede. The [2016 Shoreline Protection Study](#)²⁴ suggested preferred approaches for protecting

various areas along the coast; it found that the places that are most likely to be able to support a beach in the future are those places where beaches are currently found. The study found that places where beaches could be nourished to provide protection and recreational assets included North Scituate Beach, Surfside Road, and North and South Humarock.²⁵

Most people in the community understandably value the beaches, primarily because of their recreational value for play, relaxation, and making memories. Many people also recognize that tourism, real estate, and some commercial value is directly tied to the quality and accessibility of Scituate's beaches. Additionally, understanding the value of the beaches from a safety and resilience perspective is key to planning for 2070 for at least three reasons:

- ① **Community Support:** The beaches only function as buffers if all the properties that border them work together to support whatever strategy is chosen to maintain them.
- ② **Funding:** External support to help maintain beaches is available to increase safety, not generally to increase recreational value.
- ③ **Regulations:** All interventions on the coast are subject to extensive regulatory restrictions and reviews, and any impact to the environment is evaluated in light of the benefits or justification for the project.

Community Support and Cohesion Around Resilience Plans

Many of Scituate's coastal property owners enjoy claims to private access from their dwelling to the water. Some residents with private beach access imagine a future where private beach access is preserved for coastal property owners, while others would like to see more beaches become publicly accessible and, in so doing, encourage more public investment in them. This introduces two challenges for realizing the 2070 coastal vision in terms of public access and collective will.

Beaches cannot be adequately improved in slices. In order to nourish a beach, for example, all the property owners along a given stretch must agree to the project, or it will not move forward. Generally, if such a project will be publicly funded, an easement or other agreement around public access from each property owner is required, though not all property owners have been willing to grant such a provision in the past. Also, because the beach is a dynamic system, any effort a single property owner may make to protect their own home could end up harming their neighbors.

Gaining community buy-in for projects that benefit the whole community requires a lot of individual and small group conversations and grassroots leadership from people who are trusted members of the neighborhood. These community conversations must bridge individual differences in risk tolerance and even differing senses of coastal identity. For some in the community, adapting homes better to withstand storms—and repairing and rebuilding after storm damage—is itself an indication of the community’s resilience. For others, the repetitive nature of the damages is a sign that significant changes are necessary.

Also, there are few public beaches in Scituate, and access is controlled, to some extent, by issuing parking permits for the limited public spaces at a steep discount for Scituate residents. The result is that most beach areas (or potential beach areas) in Scituate are not broadly accessible to the public.

Public access would not necessarily be an issue or require consideration of trade-offs if individual property owners had the resources and the collective will to uniformly improve the beaches to which they have private access, but the cost of beach improvements far exceeds the resources of most individual property owners. The Town also lacks the resources to pay for all of the coastal improvements that will be necessary to realize the 2070 vision without external support. And state and federal dollars, which come from people across the state and the country, are generally made available for projects that improve or increase public access and amenities or public safety.



Photo courtesy of Steve Steinmetz, Flickr.



Photo courtesy of Carri Hulet, CBI.

Funding

Maintaining and improving beaches over the next 50 years will be costly. The Town of Scituate will need to prioritize its own resources for beaches and become increasingly skilled at matching those resources with external sources, such as the state and federal government and philanthropic interests. One big challenge is that those resources will be in higher and higher demand as communities like Scituate experience the same kinds of impacts and seek the same kind of help.

Funding and community support for long-term coastal resiliency efforts is likely to flow toward adapting and protecting areas with high public value, such as commercial areas, landmarks and historic areas, and important public services and infrastructure; it is less likely to be prioritized to private dwellings. Funding is also more likely to flow towards investments for which there is strong community support and that provide very long-term or permanent solutions to coastal vulnerabilities.

Beyond just considering the financial impacts of Scituate's beaches, the Town will also need to explore in-depth how to ensure that their beaches are an economic asset in 2070, aiming to offset maintenance costs and generate revenue. Scituate's beaches are a quintessential part of its character, drawing in residents and tourists alike, and the Town should strategically maximize the potential economic benefits of this resource.

Regulations

All coastal engineering projects including beach nourishment, coastal armoring, and others, as well as construction of coastal structures, introduce impacts on the environment. Environmental regulations, such as the Massachusetts Wetland Act, Chapter 91 and Army Corps Section 401 and 404 programs, steer projects toward improving habitat quality and can limit the extent to which projects can extend into the water or otherwise impact ecosystems or habitats. Strategically speaking, Scituate should design projects that maximize synergies, including increasing safety, improving habitat, and preserving recreational value. For example, a bike path along a stream bank could connect the beach to the stream, and the construction of the path could be combined with stream bank restoration and stormwater management improvements, such as dredging and minimizing invasive plants.

In addition to beaches, the community is concerned about preserving its salt marshes. Scituate's marshes also provide coastal protection and commercial fish habitat and are currently eroding and degrading. If they continue to degrade, they will become mud flats and then, eventually, shoreline that will become a velocity zone for coastal storms. The loss of salt marshes would be the loss of another flood protection measure and could have implications for other coastal systems and processes. Marshes need to migrate with sea level rise. This is a consideration for future coastal land use regulations.

The Harbor

The community named several possible adaptations for the harbor in order to ensure that it is vibrant in the summer and safe the rest of the year. Broadly speaking, one idea is to decouple the business model of the downtown area from the water. The Scituate Harbor business district is currently tied to water access (not just viewing/seeing the water, but actually being able to transfer goods and people between land and water). This assumption could be uncoupled in the future to improve resilience. It would allow main street activities to either migrate to higher ground or to another commercial activity center in the town. It would also allow the district to transform over time to maximize the asset of water access and the economic and tourism benefits associated with that access. Managing the parking needs in the district should also become easier if such an uncoupling were to occur. If such a concept were to be pursued, the receiving area(s) for Scituate Harbor main street activity would need to be defined and incentives or regulations put in place to encourage this transition.

Some Scituate community members who participated in the development of this vision suggested that Scituate redesign the areas that immediately border the water

so they can serve one purpose in dry times and take on water during storms without incurring large amounts of damage and repairs. For example, the Town could reimagine the border between land and sea as a park or public boardwalk, a place that everyone can enjoy in the summer but that can flood with limited repercussions in storms. This type of solution would still require building a permanent or temporary flood barrier somewhere between the coastal edge and Front Street where storm damage is already a problem.

One long-term recommendation in the Scituate Harbor Resiliency Master Plan for transitioning Harbor businesses is to expand the boundary of the coastal business district to the west of Front Street along what are currently residential side streets that are at a higher elevation. Another long-term suggestion is to move year-round businesses, such as the post office, pharmacy, optometrist, and real estate offices, to North Scituate and along Route 3A, to both move them out of harm's way and bring energy and economic activity to an area of town that may benefit from revitalization.

A key question to answer when considering any sort of relocation plan is what sort of funding or support mechanism the Town would need to put in place to ease the

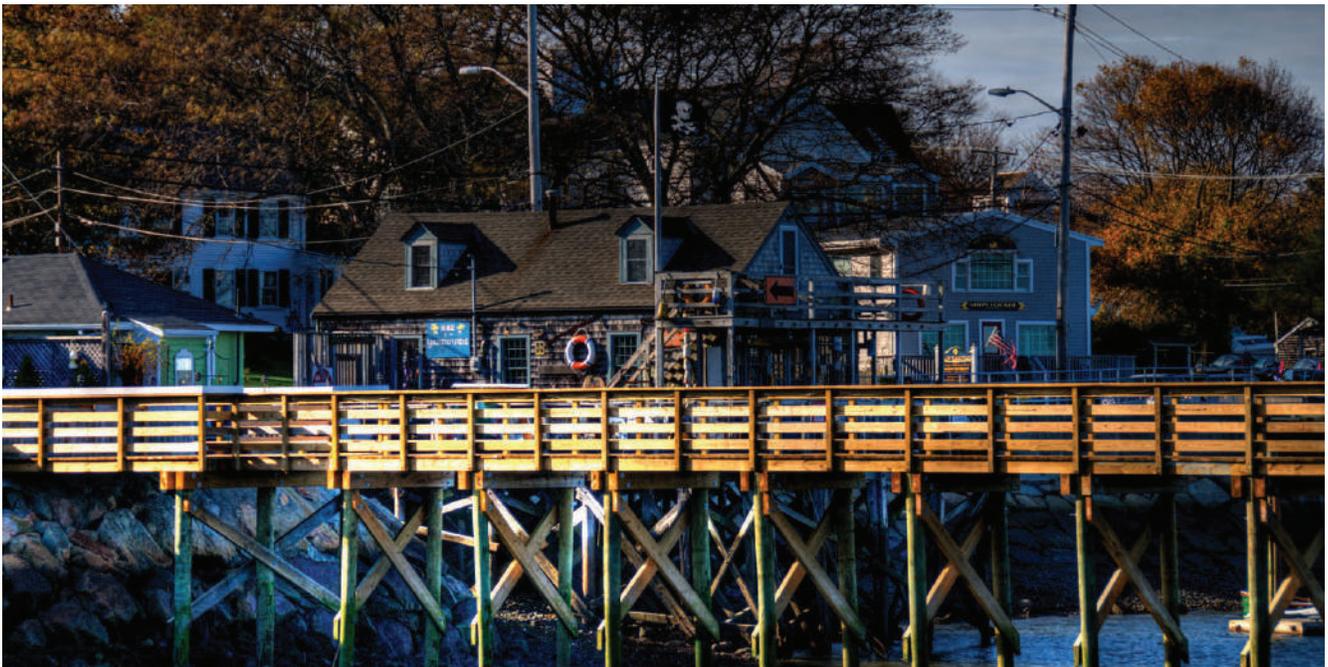


Photo courtesy of Steve Steinmetz, Flickr.

transition of its local businesses. Community members also suggested that Scituate consider new management structures, such as a coastal Business Improvement District, to help support local business resilience and other district improvements as well as create a mechanism for the business community to collaborate and jointly pursue funding for necessary adaptations.

Others suggested the need to rebuild a working waterfront and said Scituate could use this planning effort as an opportunity to explore if and how it should revitalize maritime industries, like fishing, lobster, and oysters. One rationale for this is that bolstering industries that naturally occur at the ocean's edge could benefit the town economically and take the place of other businesses that will relocate to higher ground.

When considering impacts on existing businesses, it is important to note that questions about the Harbor are not restricted to the land. The waterside implications of coastal resilience solutions should be considered for impacts to boating and fishing, as well. How the harbor is reimagined may impact navigability, water current velocity, and access to the land-based infrastructure that supports commercial and recreational water use. One concern that deserves further consideration is how to wrestle with the increasing distance, over time, between the coastal infrastructure that supports water-dependent activities, which will likely remain where it is now, and the downtown area if it migrates away from the water.

These questions and suggestions should be considered in light of the results of the [Scituate Harbor Sustainability and Resiliency Master Plan](#),²⁶ which was developed through a separate public and technical process at the same time as the coastal vision. The 10-year action plan should address the recommendations in the [Scituate Harbor Master Plan](#),²⁷ which suggest a new elevated waterfront park at Cole Parkway, new seating and coastal amenities along an elevated Scituate Harborwalk, elevation of existing seawalls and bulkhead edges, floodproofing the waterside of buildings along Front Street and adding floodgates, and exploring roadway infrastructure resilience improvements at the Satuit Brook bridge and Edward Foster Road bridge.²⁸

Zoning

One way to manage coastal development is through zoning. Scituate will need to grapple with when and how to adjust local zoning in order to regulate development along the coast, including prohibiting new construction and rebuilding in high-risk flood areas. These ideas were raised many times by members of the community throughout the engagement process.

Zoning governs the use and dimensions of buildings and properties. The State Building Code addresses the design and construction of buildings. Zoning is enacted at the local level, but the State Building Code is enacted at the state level and prohibits municipalities from requiring standards that are more or less stringent than the State Building Code. Land use regulations that improve health, safety, and welfare are well within the bounds of zoning, provided that those regulations do not modify the State Building Code. Wetlands regulations protect wetlands and water resources, including coastal resources and can govern or limit construction in wetlands and flood zones to protect those water resources. The community could use this 2070 Coastal Vision to build support for stricter regulations in zones that flood to protect the public good. Local rules, such as the Flood Plain District Overlay, may need to be refreshed based on the coastal vision to refocus the management of coastal areas to be consistent with the vision and address the changes due to sea level rise and storm surge that are anticipated in the future.

One related question posed by community members is whether the Town should make zoning rules that would slowly transition the development along the coast to smaller, simpler dwellings, reminiscent of older coastal residential developments that were both accessible to people with limited economic means and less expensive to repair when damaged.

Utilities

Critical infrastructure near the coast, like pump stations, the wastewater treatment plant, power lines, and gas lines, is particularly vulnerable to rising seas and storms (more information above in Section D). Moving into the 10-year action plan and other future Town planning efforts, Scituate should develop a plan for how to keep its stormwater systems working despite impacts from

rising seas and increased storms and flooding. The Town should also develop clear analyses of the costs and benefits of providing public services to highly vulnerable areas to understand the fiscal impacts of utility and road repairs and cleanup costs from storm damage.

During this visioning process, community members wondered whether Scituate might harness the power of the waves and storms or otherwise see the ocean as a potential energy resource (e.g., use the waves to create energy, desalinate the water for drinking and/or gray water, build “multi-use” foreshore protections that generate energy and protect the Town). Multiple community members expressed desires to see Scituate as a “greener” community in 2070, suggesting that the Town work to lower its carbon emissions and/or turn to more renewable energy sources.

Managed Retreat

Scituate has experienced property losses in the past, and the community is well aware that many existing coastal properties are at risk for damage or destruction from both storms and sea level rise in the future. The community needs to consider where to protect properties with seawalls and similar structures, where to elevate them to accommodate flooding, and where to buy out properties and convert the land to a buffer zone to protect the rest of the community. For a number of residents in the community, buyouts are an appealing option because the large investment to buy and convert coastal parcels into public space is an essentially permanent solution.

The regulatory environment could pose significant challenges to attempts to increase the overall size of



Photo courtesy of Carri Hulet, CBI.



Photo courtesy of Josh Mormann, Flickr.

coastal armoring and/or roadway footprints. There are regulatory obstacles under c. 91, Army Corps Section 401 and 404 and the Wetlands Act (outlined in [Appendix D](#)) that could affect road expansion or raising, or coastal armoring or placing fill material (including extensive cobble) in the water. Moving out of harm's way is an option that some places in Scituate will need to prepare for.

The Town should investigate and make clear the legal rights of all stakeholders related to managed retreat, for both infrastructure and private/public structures, and engage the community in the process so it is a transparent and collective community endeavor. Some considerations that should be explored/understood include:

- Voluntary incentives. Currently, limited incentives and funding are offered through FEMA, and there is no statewide buyout or other managed retreat program, so the burden to create voluntary incentives rests with the Town. Some ideas for improvements might be zoning relief for property owners relocating inland, such as construction or renovation with greater height or square footage than is permitted by right, or exemptions from some permitting restrictions, or streamlining variance procedures. The Town could reduce or eliminate the building permit fee. The Town could offer property tax relief at the new location within a given allowance or offer financial assistance through Transfer of Development Rights, as described above.

- Mandatory requirements. Given the scale of the challenge with development all along the coasts (in Massachusetts and throughout the U.S.), federal, state, and local agencies are increasingly debating the outlines of a regulatory framework for managed retreat. Some considerations the Town should be aware of include regulatory enforcement through local zoning or wetlands rules that could prohibit rebuilding dwellings that are repeatedly damaged. Public health and safety emergencies could trigger requirements to permanently vacate properties. Eminent domain could be employed to buy out properties.
- Prohibition on new development, substantial expansion, or restoration after storm damage can be implemented through changes to Zoning Bylaws and Scituate's Wetlands Rules. Examples can be found in [Appendix C](#). A majority of Scituate's coast has dwellings that are in high-risk flood zones now, so these changes could be substantially impactful over the near-term if implemented.

Managed retreat is a complex option to consider. It is hard for individuals and neighborhoods, and for the whole community, in large part because much of the Town's budget is dependent on coastal property taxes.

The community may benefit from thinking outside the box on this issue and drawing on examples from other places. For example, the community may consider the option of long-term leases for waterfront/beach

property in the summer for mobile, seasonal dwellings that could be removed in the off-season.

Coastal Community Character

Scituate has clearly articulated that it would like to preserve its small-town feel and history along the coast while still being able to accommodate the seasonal fluctuations in resident and tourist populations in the summer. Some members also suggested that Scituate should aim to attract a more socioeconomically, ethnically diverse population of residents and tourists, which may require ensuring that there are affordable and desirable housing and lodging options available.

When it comes to attracting new residents and pursuing a population that fluctuates seasonally, the Town must also grapple with important questions about

representation and decision-making for year-round and summer-residents, as well as concerns about cultural or community divisions based on residency status. The 10-Year action plan will surface many areas for decision-making and implementation in the coming years, which will require robust community input and buy-in, and the Town will need to consider how to approach and design its planning processes in ways that are considered fair and equitable by its community members.

Community members also suggested that planning and implementation decisions should be informed by local expertise. It was noted that Scituate should strive to maintain strong working relationships with state regulatory agencies to help advance creative and collaborative solutions to the adaptation challenges that Scituate will face.



Photo courtesy of C. Hanchey, Flickr.



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Appendix A

Glossary of Key Terms

COASTAL RESILIENCE: the coast needs to be resilient to climate impacts of stronger storms and sea level rise. Related: desire for the coast to be SAFE from impacts

COASTAL PROCESSES: how the ocean and waves impact the beaches and coast. E.g., how sediment gets moved around, how wave action is or is not broken by natural or built structures near or on the coast.

PRIVATE VS PUBLIC ACCESS: a lot of beach areas are privately owned. For progress on many of these issues, at least easements on private property will need to be granted, if not for them to become publicly accessible altogether.

FUNDING: like all municipalities, Scituate is highly dependent on property tax revenue to fund local projects. Given the fact that Scituate's coastal tax base will be affected by decisions about how to realize the coastal vision, the Town will need to consider and balance tax revenues and losses along with long-term maintenance and emergency response costs associated with any and all interventions. Also, the Town will need a strategy to secure and match any state or federal resources that may be desirable to pursue.

ENVIRONMENTAL CONCERNS: the Town cares about preserving the environment for the ecology and wildlife. Additionally, environmental resources like salt marshes and wetlands provide flood protection benefits if they are allowed to function properly.

MANAGED RETREAT: removing or moving structures vulnerable to climate impacts out of harms' way (e.g., taking down houses on the coast. Sometimes they are actually moved, sometimes demolished, and the people are given opportunities to buy new homes elsewhere.) Often, the land left behind is made into publicly accessible "commons," like a park, walkway, wetland, etc. The land can often provide more protection benefits to structures "behind" it by being floodable.

ADAPTATION: make structures resilient to impacts (e.g., from storms). This could be by elevating structures, "floodproofing" (where they are not or only minimally damaged when they flood), etc.

PROTECT: keep safe or cover or shield from exposure, damage, or destruction. E.g., building walls or high berms to prevent flooding from reaching developed structures.

Appendix B

Community Engagement Process

Objectives and Methodology

The engagement process reached a wide range of community members to build a positive and proactive vision for how they would like to see their coast evolve to meet challenges and opportunities 50 years in the future. Though there had been extensive analysis of the coast and its vulnerabilities and options for addressing them, a [2018 Coastal Community Assessment](#)²⁹ suggested residents felt that a long-term, coherent vision for the Town and a sense of overarching goals towards which the community should work were needed. Absent a sense of what the community could and should create, community members found it more difficult to contemplate and weigh the challenging questions about the coast's vulnerabilities and its future.³⁰ This process aimed to address that need.

A 50-year vision is an unusual exercise. Fifty years is beyond the window of even long-range planning processes and represents the change of more than one generation in the Town. The process was intentionally focused on this long time horizon to encourage creative thinking beyond the constraints of a particular piece of infrastructure, neighborhood, or one's particular property or circumstances. Climate projections for 2070 include substantial sea level rise and even higher vulnerability to coastal storms. This exercise in long-term thinking encouraged residents to grapple with these challenges and adopt a mindset of big-picture thinking and the legacy they wanted to leave their Town. It allowed those who engaged to contemplate the implications of climate impacts in the long-term, rather than focusing on detailed near-term options, obstacles, or solutions.

Beginning the engagement process in the format of small, living-room style conversations allowed for highly interactive workshops where participants could ask plenty of questions and digest clear, easy-to-understand information about future "constraints and considerations" for the coast. Working with community members across the Town to invite their own

Figure 13. Project Timeline



neighbors, friends, and networks helped engage residents who may otherwise not have participated in the process. Beginning with a wide framing and by encouraging participants to share their hopes and desires—and ensuring that this feedback was reflected back to them—helped build buy-in and investment in the process.

Information-sharing and education about the coast’s vulnerabilities occurred iteratively, with increasing levels of detail in each subsequent phase of the process. This also ensured that community members participating at any phase learned the crucial information about vulnerabilities and considerations for the coast, to help develop understanding that a business-as-usual approach will not be possible for the future.

After each phase of engagement, the community was invited to review and refine the vision they were helping build. Draft products shared with the community combined community input and expert advice about considerations and, as the process advanced, options for advancing the emerging community vision. This iterative process helped participants see how the vision was evolving and how their input was being incorporated.

Combined In-person and Virtual Engagement to Maximize Input and Reduce Barriers to Participation in the Process

Approximately 230 community members participated in in-person or live virtual gatherings over the course of the process. For each in-person phase of the visioning process, there was a parallel online engagement component, run through the project’s interactive platform at Scituate2070Vision.org. This website was a critical piece to improving accessibility of the process for those who were unable to attend in-person gatherings, for summer residents who were not in Town during key engagement points, or for those who felt more comfortable engaging from home. It became even more critical when the entire engagement process moved to virtual due to requirements by the state not to meet in person, in response to COVID-19.

Phase 1: Neighborhood Gatherings: What’s Your Vision?

Neighborhood Gatherings took place January through March 2020, and provided an opportunity for members of the community to sit down with family, friends, and neighbors in a casual environment, often in a fellow Scituate resident’s home, to learn about the process and share their thoughts about the future of Scituate’s coast. During these sessions, participants learned key considerations about how Scituate’s coast will change over the next 50 years and were invited to imagine future generations living in Scituate and to share their hopes for how the coast should evolve to meet the challenges and opportunities of 50 years in the future. Feedback gathered during the Neighborhood Gatherings formed the framework for the vision.

The facilitation team ran the workshops using a multimedia presentation with interactive activities for attendees to generate ideas and hear from each other. Any interested community members were invited to host gatherings, though the facilitation team also conducted outreach and invited some community members to host and invite their networks to ensure a wide range of neighborhoods and demographics across the Town were represented in the gatherings. Gatherings were scheduled as people volunteered to host and were

Figure 14. Community Workshop Community members participated in a workshop to build the framework for the Vision at Scituate Library in March 2020.

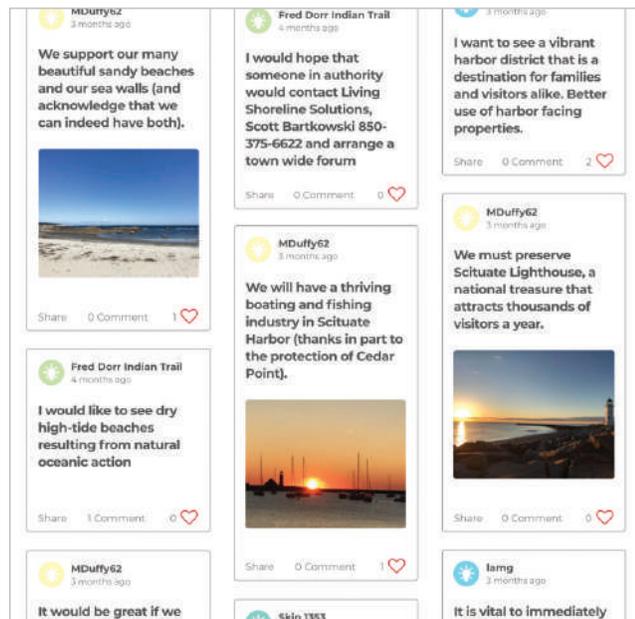


Photo courtesy of Elizabeth Cooper, CBI.

scheduled at a range of times and days of the week to accommodate a wide range of availabilities. Eleven gatherings were held in total, including a live virtual gathering on Zoom and a large event at Scituate Library that was widely publicized. Additionally, the facilitation team delivered the workshop in several Scituate High School civics classes.

In addition to the in-person meetings, there was a two-part online engagement component for this phase of the project. A Virtual Neighborhood Gathering was held in late February to accommodate anyone who was unable to attend a meeting in-person at someone’s home. Additionally, an online interactive forum was offered via the project platform on. Community members were invited to use this forum to submit and view each other’s ideas for this phase of the coastal visioning process. The online activity mirrored the activities that took place during the in-person gatherings. There were more than 750 site visitors to engage online in this phase. Examples of input in the virtual forum are in Figure 13 below.

Figure 15. Online Engagement Image of online engagement during the virtual Neighborhood Gatherings.



Phase 2: Community Workshops to Give Input on the Emerging Vision

Due to requirements by the state in response to COVID-19, the planned in-person Community Workshops to present and refine the Emerging Vision were converted to two virtual meetings, held in April.

The “Emerging Vision” document was the central focus of these Community Workshops. This document synthesized the input solicited from community members during the Neighborhood Gatherings phase and presented emerging themes from that input. During the two interactive virtual Community Workshops in April, participants were asked to further hone the community’s “Emerging Vision” and weigh options, considerations, and constraints for their vision of Scituate’s coast in 2070.

In conjunction with the virtual Community Workshops, the visioning team also solicited input via surveys to gather more insight into shaping and refining the Emerging Vision. There were more than 500 site visitors to engage online in this phase.

Phase 3: Community Workshop to Refine the Draft Vision–July 2020

In July, a draft vision document was released for community review and input. The facilitation team held a virtual question and answer session and received community member feedback on the vision via that workshop, direct correspondence with community members, and via a survey on the web platform. There were 600 site visitors to engage online in this phase.

Publicity Strategy

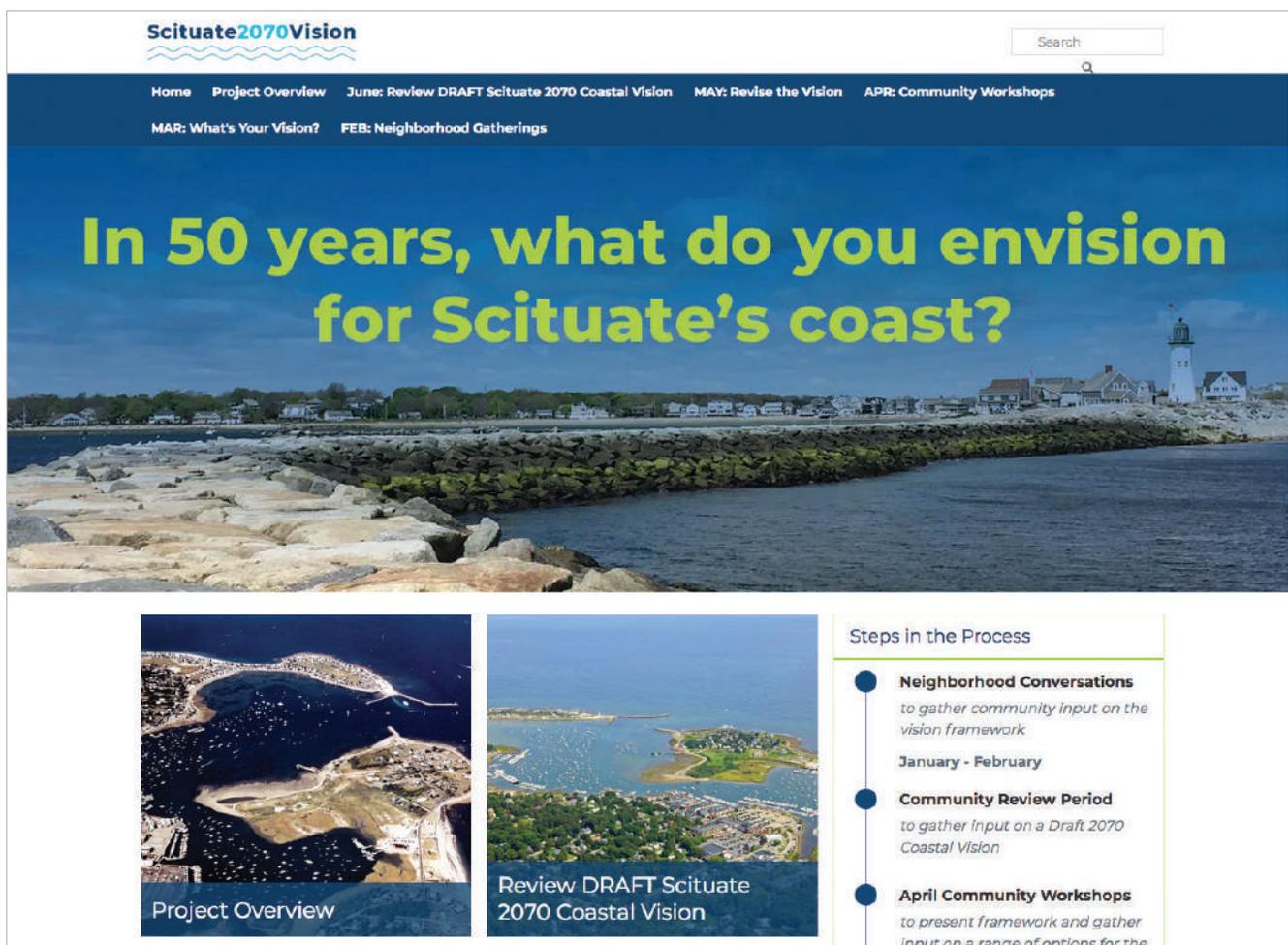
Consistent connection with community members during this project was critical. The facilitation team focused on strategic use of already-established Town channels as well as connections made throughout the project’s various stages. In particular, the Coastal Advisory Commission played a key role in getting the word out at the outset by providing the team with key contacts. As the team proceeded through each phase, interacting with more community members helped to build a robust list of community members who were interested, and willing to reach out to their own networks when

tapped. Using word-of-mouth and augmenting this by building more contacts at each iteration of the process helped ensure that a wide range of residents who could participate in person and virtually were reached. Communications sent out via this mailing list for each phase of the project were also released via the Town’s official email list and Facebook page. All communications specifically sought to drive traffic to the web platform for the project which was used as the sole repository for information and updates about the 2070 visioning process.

Encouraging participation from summer residents

With the Coastal Advisory Commission, Scituate 2070 Coastal Vision designed and mailed a postcard in February to 979 property owners in Scituate who list alternative addresses as their primary properties. The list of property owners was shared by the Town of Scituate in an attempt to reach more seasonal residents for participation in this visioning process by going to the project website to share their vision for Scituate’s coast in 2070 and attend future public workshops (which later became virtual). The postcard also provided updates on the Scituate Master Plan process and the Scituate Harbor Resiliency Plan process.

Figure 16. Web Platform for the Project Image of the Scituate2070vision.org homepage.



Appendix C

Relevant Land Use Regulations From Other Municipalities

NEWBURYPORT, MA

Plum Island Zoning Overlay District — Section XXI

ZONING CODE PROVISION	NEWBURYPORT ZONING ORDINANCE	RELEVANCE TO SCITUATE
Definition of Flood Overlay Zone Boundaries	Boundaries not based on FEMA FIRM maps.	
Special Provisions For Overlay District	Overlay District. Underlying zoning remains in effect, except if overlay is more stringent then overlay supersedes.	
Application to Projects	By right and by special permit for nonconforming uses.	
Regulation of Uses	Allowed: Municipal buildings and single family residences. Forbidden: all other uses. No use variances allowed within Overlay.	
Nonconforming Uses	Cannot be enlarged, but the following is allowed with a special permit: <ul style="list-style-type: none"> • Change in use/alteration for new use. • Reconstruction or structural change. • Enlargement of lot coverage, FAR, height, open space or setbacks (without a variance). • Demolition or rebuilding after catastrophe same as prior structure, or with special permit may exceed prior FAR or height. 	Scituate can limit or prohibit changes to nonconforming uses. Note: changes to dimensions (lot, FAR, height, open space or setbacks) in Plum Island District is by Special Permit, not variance.
Dimensional Regulations for Buildings	Elevation: Not specified Height: Not defined Setbacks: Rear/front/side are all 20 feet Entrances/Egress: Not defined Mechanical Systems: Not addressed	
Resilience Incentives	None	

HULL, MA

Nantasket Beach Zoning Overlay District — Article 3 §39B

ZONING CODE PROVISION	HULL ZONING BYLAW	RELEVANCE TO SCITUATE
Definition of Flood Overlay Zone Boundaries	FEMA Special Flood Hazard Areas	
Special Provisions For Overlay District	<p>Can elect to comply with underlying district or overlay district.</p> <p>Special permit required for all uses if elect to develop under provisions of overlay district.³¹</p>	<p>Scituate Flood Plain and Watershed Protection District prohibits new construction of residential structures and non-water dependent commercial structures.</p> <p>Special permit required for improvements/ repairs to existing buildings within the Scituate Flood Plain overlay.</p> <p>Can require performance standards if special permit or variance is required.</p>
Design Guidelines	<p>Design standards related to historic architecture and streetscape.</p> <p>Consideration of storm and flood protection.</p>	<p>Scituate’s Zoning Bylaw currently includes some design guidelines (see, Village Center & Neighborhood District and Design Review). Additional design guidelines can encourage design and construction that is more protective than the State Building Code.</p>
Regulation of Uses	<p>Most prohibited uses in this district are not related to resilience, except, gas stations, and storage of chemicals or hazardous materials that pose a risk of pollution.</p>	<p>Regulating uses is a tool that Scituate can use to limit new development in the waterfront area. For example, the town could limit new uses to projects that are water dependent.</p>
Dimensional Regulations for Buildings	<p>Elevation: By special permit, elevation can be up to 4-feet above State Building Code Design Flood Elevation (DFE).</p> <p>Exception: Adaptive & Resilient Buildings Incentives (§§39B.7.2.3 and 12), elevation can be up to 6-feet above Building Code DFE.</p> <p>Height: Measured from grade to highest point of roof. Maximum 40 feet,</p> <p>Exceptions: (i) Special Permit may allow additional height for freeboard. (ii) Adaptive & Resilient Buildings Incentives (§39B.7.2.2) allows additional 4-feet for “flood proofing by meeting or exceeding flood elevation of building code.”</p> <p>Mechanical Systems: Can be on rooftop if screened or enclosed, excluded from measurement of height (§39B.7.2.2).</p>	<p>Scituate can establish dimensional requirements that will protect new development well into the future by requiring all new structures to be elevated above the future base flood elevation (for 2050 or 2070).</p> <p>Mechanical Systems: Scituate can require mechanical systems to be elevated above future base flood elevation instead of the current FEMA base flood elevation.</p>

Continued on next page

HULL, MA (CONT.)

Nantasket Beach Zoning Overlay District — Article 3 §39B

ZONING CODE PROVISION	HULL ZONING BYLAW	RELEVANCE TO SCITUATE
<p>Resilience Incentives</p>	<p>Adapted & Resilient Building Incentives:³²</p> <p>Purpose: “encourage construction that will withstand increased flood elevations and frequency and intensity of storm events for new buildings and those being substantially improved (costs equal or exceed 50% of the appraised market value).” (§39B.12.1)</p> <p>Incentives in floodplain districts:</p> <ul style="list-style-type: none"> • Rebate up to \$500 on building permit fees • NFIP insurance savings • Height increase if ground floor is non-habitable “Market Hall”: Base Flood Elevation (BFE) plus up to 6 ft freeboard, to maximum of additional 40 feet of habitable space above ground floor. <p>Requirements for incentives:</p> <ul style="list-style-type: none"> • Lowest floor cannot be habitable (can be “Market Hall,” art/performance space, beach visitors’ center, parking, or access to upper floors). • Mechanical systems and generators must be elevated to upper floors or roof. • To greatest extent possible, construct must use “the highest storm and flood resistant standards of the Building Code” for Construction in Coastal Dunes. • To greatest extent possible, incorporate green construction standards. • To greatest extent possible, landscaping should be designed function as storm and flood protection. 	<p>Incentives could be adopted to encourage greater resiliency or to address equity and financial concerns.</p> <p>Guidelines or incentives could be used to encourage temporary /movable uses at ground level.</p> <p>Incentives could be adopted to encourage non-water depend uses to move to safer locations within the town.</p> <p>The savings on building permit fees are not likely to be sufficient to cause property owners to alter their plans.</p>

MARSHFIELD, MA

Marshfield: Zoning Bylaw — Article 305

ZONING CODE PROVISION	MARSHFIELD ZONING BYLAW	RELEVANCE TO SCITUATE
Definition of Flood Overlay Zone Boundaries	FEMA Special Flood Hazard Areas	
Application to Projects	<p>Floodplain permit required for new development, substantial improvement, expansion of structure or alteration of topography within Floodplain District (§305-15.03)</p> <p>Special Permit required for nonresidential boat-houses, boat yards and structures for educational/ research uses. Must not exacerbate flood conditions and must be designed to minimize flood impacts. (§305-15.09)</p>	Can require performance standards if special permit or variance is required.
Regulation of Uses	<p>Coastal Wetlands District: no new structures for human occupancy can be constructed, altered, or enlarged. Existing structures may be repaired, altered, or enlarged. (§305-13.02C(1)).</p> <p>As a condition of special permit in Coastal Wetlands District, Board of appeals can require seller to provide notice to prospective purchasers of past flooding and flood protections measures taken. (§305-13.02F(2)).</p> <p>Alteration of coastal dunes within V zones is prohibited if alternation could increase flood damage. (§305-15.06.B).</p>	<p>Regulating uses is a tool the Scituate can use to limit new development. For example, development could be limited to projects that are water dependent.</p> <p>Scituate’s Wetland Regulations have a similar provision prohibiting new projects in coastal dune or dune buffer zone if project will have an adverse effect on the dune or dune buffer zone or interfere will movement of dune or increase the potential for storm or flood damage. (SWR 10.28)</p>
Dimensional Regulations for Buildings	<p>Height: Exception for floodproofing and for Brant Rock Village Overlay District. Changes height to be measured from BFE (instead of grade) to highest point of roof.</p> <p>For pre-existing nonconforming residences, a bump out on first floor (max.32 sf) is allowed to relocate mechanical systems and allowed to project into side or rear setback. (§305.6.08.M)</p>	<p>Scituate can establish dimensional requirements to protect new development well into the future by requiring all new structures to be elevated above the future base flood elevation (for 2050 or 2070).</p> <p>Mechanical Systems: Scituate can require mechanical systems to be elevated above future base flood elevation instead of the current FEMA base flood elevation.</p>
Resilience Incentives	<p>Brant Rock Village Overlay District (BRVO) – encourages (does not require) elevation above BFE to plan for projected sea level rise; other FEMA/building code design standards must be met. (§305-13.05.F).</p> <p>In BRVO, new construction, renovations, and additions that include floodproofing at or above BFE can be a mixed use building with commercial on first floor and residential on second floor. (§305-13.05D(2)).</p>	<p>Incentives could be adopted to encourage greater resiliency or to address equity and financial concerns.</p> <p>Incentives could be adopted to encourage non-water dependent uses to move to safer locations within the town.</p>

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MARSHFIELD, MA

Wetlands Bylaw — Article 505

WETLANDS REGULATION	MARSHFIELD WETLANDS BYLAW	RELEVANCE TO SCITUATE
<p>Definition of Flood Overlay Zone Boundaries</p>	<p>FEMA map and Special Flood Hazard Areas</p>	
<p>Special Provisions For Flood District</p>	<p>No habitable space is permitted if the top of any floor elevation is less than 11 feet above mean sea level or is below flood surge height as determined by most recent FEMA map. (§505-10.A)</p> <p>.....</p> <p>No utilities may be placed lower than 11 feet above mean sea level or below flood surge height. (§505-10.A)</p> <p>.....</p> <p>Land subject to tidal action, coastal storm flowage or flooding must provide adequate access and egress to individuals and emergency vehicles during a 100-year storm. (§505-10.J)</p>	<p>Scituate could consider using a combination of wetlands and zoning bylaws to achieve greater flood protection.</p> <p>Note that neither the zoning bylaw or the wetlands bylaw can more stringent or less stringent than the State Building Code.</p> <p>Note that the Scituate Wetlands Regulations has already been updated to address sea level rise and includes provisions for Land Subject to Coastal Storm Flowage.</p>



Marsh and wetlands near Scituate. Photo courtesy of Steve Steinmetz.

NORFOLK, VA

Article 3.9.7, Flood Plain / Coastal Hazard Overlay

Article 5, Development Standards, 5.12 Resilience Quotient

ZONING CODE PROVISION	NORFOLK ZONING ORDINANCE	RELEVANCE TO SCITUATE
Definition of Flood Overlay Zone Boundaries	<p>SFHA (1.0% annual chance of flood) and areas with 0.2% annual chance of flooding.</p> <p>Variance procedure when strict application would be a hardship must meet requirements of 3.9.7.P</p>	In lieu of using the 2070 flood boundaries, Scituate could consider using the 0.1% or 0.2% annual chance of flooding.
Special Provisions For Overlay District	<p>Projects must obtain an elevation certificate prepared by a surveyor, engineer, or architect, on a FEMA form verifying elevation of the structure relative to the ground level.</p> <p>Projects relying on flood proofing must obtain a flood proofing certificate prior to foundation inspection, final inspection and issuance of certificate of occupancy.</p> <p>Design professional and developer must demonstrate that the new construction will not increase the elevation of 1% flood.</p> <p>Includes an express disclaimer that the zoning overlay shall not create liability on the City of Norfolk, any officer or employee for flood damages that result from reliance on the terms of the overlay district or on a related administrative decision.</p>	
Application to Projects	<p>City has separate Procedures Manual explaining development review, variance, conditional use, and other procedures.</p> <p>All development in Coastal Hazard Overlay District must go through review procedure and obtain a Floodplain/Coastal Hazard Overlay District Permit.</p>	
Design Guidelines	<p>Coastal Character District Pattern Book – includes design guidelines for flood resilient coastal development.</p>	<p>Design guidelines can clarify how to design for flood protection or how to meet performance standards.</p> <p>Since guidelines are non-binding, they would not be in conflict with the State Building Code, even if suggested design examples are more stringent.</p>
Regulation of Uses	<p>No basement/below-grade habitable space in residential buildings.</p> <p>Below DFE can only be used for parking, access or storage and must be wet floodproofed.</p>	

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NORFOLK, VA (CONT.)

Article 3.9.7, Flood Plain / Coastal Hazard Overlay

Article 5, Development Standards, 5.12 Resilience Quotient

ZONING CODE PROVISION	NORFOLK ZONING ORDINANCE	RELEVANCE TO SCITUATE
<p>Nonconforming Uses</p>	<p>Generally grandfathered, except:</p> <ul style="list-style-type: none"> Existing structures with repetitive losses must be repaired in conformance with the State Building Code, and, if repairs involve structural elements, then must comply with the Overlay. Substantial Improvement requires conformance with Overlay and Building Code. Conversion of non-habitable to habitable space must comply with Overlay and Building Code. 	
<p>Dimensional Regulations for Buildings</p>	<p>Elevation: three feet above BFE; all new construction and substantial improvements in VE and A zones must be elevated to DFE.</p> <p>.....</p> <p>In 0.2% areas new construction must be elevated 1.5 feet above the 0.2% annual chance of flood level.</p> <p>.....</p> <p>Non-residential buildings may be flood proofed lieu of being elevated.</p> <p>.....</p> <p>Setback: 20 feet from mean high water for new residential construction or substantial improvement.</p> <p>.....</p> <p>Mechanical systems must be elevated above DFE or designed or located to prevent water infiltration, duct work must be > one foot above BFE.</p> <p>.....</p> <p>Water supply, sewage systems, and waste disposal systems must be designed to minimize or eliminate infiltration and discharge from and into flood waters.</p>	
<p>Existing Buildings</p>	<p>Substantial damage = >50% of market value.</p> <p>.....</p> <p>Substantial improvement = >50% of market value before start of construction.</p> <p>.....</p> <p>Rehabilitation, new electrical or mechanical systems or structural repairs costing <50% of FMV must have current elevation certificate.</p> <p>.....</p> <p>Conversion of non-habitable space to habitable space and new accessory structures must have elevation certificate and survey showing current improvements, BFE or flood depth and flood zones on the property.</p> <p>.....</p> <p>New construction or substantial improvement must have site plan with topo, grading, floor elevations, and flood zone stamped by design professional, elevation certificate, and non-residential structure must have flood proofing certificate based on proposed design.</p>	

NEW YORK CITY, NY

Executive Order No.230 (January 31, 2013)

Flood Resilience Zoning Amendment (2013) (“Current Zoning”)

Regulations for Neighborhood Recovery (2015)

Recommendations for Zoning for Coastal Flood Resiliency (“Proposed Zoning”) (May 2019)

ZONING CODE PROVISION	NYC ZONING ORDINANCE	RELEVANCE TO SCITUATE
Statement of Purpose	<p>Encourage flood resilient building practices for new and existing buildings to promote and protect public health, safety and general welfare.</p> <p>Facilitate development and alteration that:</p> <ul style="list-style-type: none"> • is consistent with latest federal and NYC flood resistant standards. • is with comparable amount of usable interior space to amount permitted in underlying zoning district. • mitigates effects of elevated & floodproofed buildings on streetscape. • promotes most desirable use of land and protect value of buildings. 	<p>NYC has its own building code, and, unlike any municipality in Massachusetts, NYC can modify the building code to impose more protective standards</p> <p>Scituate could allow property owners to maintain a comparable amount of usable space to prevent penalizing property owners for implementing flood protection measures.</p>
Definition of Flood Overlay Zone Boundaries	<p>SFHA (1-percent floodplain)</p> <p>NYC is in process of updating its flood maps. Until new maps are approved, NYC will use the 2007 FEMA maps currently in effect.</p> <p>Proposed Zoning would expand district to the 0.2-percent floodplain.</p>	<p>Updating Scituate FEMA map could expand scope of SFHA but would not overcome conflicts between State Building Code and areas outside SFHA.</p>
Special Provisions	<p>EO 230 and the Flood Resilience Zoning Amendments were adopted on a temporary, emergency basis to facilitate repair of buildings damaged by Hurricane Sandy.</p> <ul style="list-style-type: none"> • Allowed additional height so buildings could be elevated without losing usable space. • Suspended restrictions on nonconforming use for changes to height, dimensions, setback and other restrictions in conflict with flood resilience requirements <p>In May 2019 NYC proposed new zoning revisions for Coastal Flood Resiliency.</p>	
Application to Projects	<p>City has separate Procedures Manual explaining development review, variance, conditional use, and other procedures.</p> <p>All development in Coastal Hazard Overlay District must go through review procedure and obtain a Floodplain/Coastal Hazard Overlay District Permit.</p>	

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NEW YORK CITY, NY (CONT.)

Executive Order No.230 (January 31, 2013)

Flood Resilience Zoning Amendment (2013) (“Current Zoning”)

Regulations for Neighborhood Recovery (2015)

Recommendations for Zoning for Coastal Flood Resiliency (“Proposed Zoning”) (May 2019)

ZONING CODE PROVISION	NYC ZONING ORDINANCE	RELEVANCE TO SCITUATE
Design Guidelines	<p>Zoning Code includes design requirements for residential, commercial and manufacturing districts to mitigate visual connection and access between grade and elevated structure.</p> <ul style="list-style-type: none"> • Use of porches, stair direction change, raised front yard, and trees and shrubs. • 50% of street wall must be glazed with transparent materials in certain districts. 	<p>NYC has its own building code, and, unlike Scituate, it could modify the building code to impose more protective standards.</p> <p>Scituate’s Zoning Bylaw currently includes some design guidelines (see, Village Center & Neighborhood District and Design Review). Additional design guidelines can encourage design and construction that is more protective than the State Building Code.</p>
Regulation of Uses	No habitable space except parking & storage below flood resistant construction elevation.	
Nonconforming Uses	Noncomplying 1-2 family residences may be rebuilt and may be elevated beyond height allowance for underlying district.	
Dimensional Regulations for Buildings	<p>Building Elevation: At DFE. Proposed Zoning would allow option to use future floodplain reference points.</p> <p>Height: measured from flood resistant construction elevation (DFE or grade of flood protected building).³³</p> <p>Setback: Current Zoning allows noncompliance with setback to meet flood resistant construction standards.</p> <p>Proposed Zoning would allow reduced setback in lieu of extra height:</p> <p>Mechanical Systems: Proposed Zoning allows additional 500 sq. ft. to relocate mechanical systems above DFE.</p>	

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NEW YORK CITY, NY (CONT.)

Executive Order No.230 (January 31, 2013)

Flood Resilience Zoning Amendment (2013) (“Current Zoning”)

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Recommendations for Zoning for Coastal Flood Resiliency (“Proposed Zoning”) (May 2019)

ZONING CODE PROVISION	NYC ZONING ORDINANCE	RELEVANCE TO SCITUATE
<p>Resilience Incentives</p>	<p>Current Zoning: Floor area exemption for floodproofed ground floors if >50% of ground floor is below DFE.</p> <p>.....</p> <p>Proposed Zoning: Floor area exemption for first 30 feet of dry floodproofed ground floor at grade with ceiling height at least 13-feet.</p> <ul style="list-style-type: none"> • Enclosed entryways and mechanical systems may be excluded from definition of GFA. Maximum excluded space varies by use. • Current Zoning: Mechanical systems are a permitted obstruction in rear yards (not 1-2 family residences), may be relocated to roof. <p>.....</p> <p>Proposed Zoning: Additional flexibility for mechanical systems.</p> <ul style="list-style-type: none"> • Handicap lifts are permitted obstructions in 1-2 family residences. • Temporary flood barriers allowed. • Additional parking spaces are allowed beneath elevated 1-2 family residences. 	

Appendix D

Regulations and Considerations Regarding Seawall Repairs

Residents seeking to build, repair, or extend seawalls, revetment walls, bulkhead or other flood protection structures will be required to comply with wetlands regulations and potentially Chapter 91/Waterways, US Army Corps and MEPA regulations. Projects that will be entirely on land, above the high-water mark will have an easier regulatory pathway than projects that are seaward of high water.

Wetlands Requirements: Seawalls and other flood protection projects above the high-water line or within the FEMA AE, AO, or VE zones must comply with the state Wetlands Act and the Scituate Wetlands By-law. A Notice of Intent must be submitted to the Conservation Commission to obtain an Order of Conditions. The Order of Conditions must be recorded at the Registry of Deeds prior to commencing the project. New seawalls and enlargement of existing seawalls will have more stringent standards than repairs to existing seawalls.

- **Coastal Beach:** New construction or expansion of flood protection structures will need to demonstrate that the project will not have an adverse effect on any coastal beach by causing an increase in erosion, decrease in volume, or by changing the form of the coastal beach or adjacent or downdrift beaches.
- **Coastal Dune:** New construction or expansion of flood protection structures will need to demonstrate that the project will not have an adverse effect by affecting the ability of waves to remove sand from the dune, disturbing the vegetative cover so as to destabilize the dune, causing any modification of the dune form that would increase the potential for storm or flood damage, or interfering with the landward or lateral movement of the dune.
- **Coastal Bank:** New seawalls, revetments, or similar structures are not permitted on coastal banks unless required to protect an existing building constructed prior to 1978. If allowed, the seawall must minimize adverse effect on nearby coastal beaches due to wave action, and the applicant must

demonstrate that no other method of protecting the building is feasible.

C. 91/Waterways Requirements: If the seawalls, revetments, and other flood protection barrier is seaward of the high tide line, the project will also require a c. 91 license. The project may be able to proceed under the Simplified License procedures rather than the detailed c. 91 license process. Maintenance and repair activities can be carried out under an existing license, provided that the footprint of the seawall or structure is not expanded.

401 Water Quality Certification: Larger projects, involving dredging or placing fill material in the water will require Section 401 Water Quality Certification from MassDEP. Placement of beach nourishment material is exempt from requiring a 401 Water Quality Certification.

USACE Section 404: A Section 404 permit may be required if the project involves temporary or permanent fill in the water, such as a new seawall or repairs to existing seawall constructed all or partially in the water. These limited projects may be able to be permitted under USACE General Permit. The General Permit requirements include carrying out the work including protection of water resources, sediment, and erosion control during the work and measures for use of heavy equipment.

MEPA: MEPA review may be required for some projects but will not be required for repairs or maintenance that does not result in an expansion of the original seawall or structure. An Environmental Notification Form must be submitted for alterations to a coastal dune barrier beach or coastal bank or alternation of equal to or greater than 1,000 square feet of salt marsh and for any new structure places in a velocity zone or floodway. An Environmental Impact Report may also be required if, based on the review of the Environmental Notification Form, substantial environmental impacts are likely.

Appendix E

Endnotes

- ¹ “Report from FEMA’s Community Information System database, accessed August 5, 2020.”
- ² Ibid.
- ³ Applied Coastal Research and Engineering, 2016. “Coastal Erosion, Sediment Transport, and Prioritization Management Strategy Assessment for Shoreline Protection.” https://www.scituatema.gov/sites/g/files/vyhlf3781/f/file/file/scituateprioritization_finalreport_august2016_compress_main.pdf
- ⁴ Applied Coastal Research and Engineering, 2016. “Coastal Erosion, Sediment Transport, and Prioritization Management Strategy Assessment for Shoreline Protection.” <https://www.scituatema.gov/coastal-advisory-commission/pages/coastal-erosion-sediment-transport-and-prioritization-management>
- ⁵ National Oceanic and Atmospheric Administration: Tides and Currents, accessed 2020. https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=8443970
- ⁶ Applied Coastal Research and Engineering, 2016. “Coastal Erosion, Sediment Transport, and Prioritization Management Strategy Assessment for Shoreline Protection.” <https://www.scituatema.gov/coastal-advisory-commission/pages/coastal-erosion-sediment-transport-and-prioritization-management>
- ⁷ “Report from FEMA’s Community Information System database, accessed August 5, 2020.”
- ⁸ Ibid.
- ⁹ National Oceanic and Atmospheric Administration: Tides and Currents, accessed 2020. https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=8443970
- ¹⁰ Northeast Climate Science Center, 2018. https://eea-nescaum-dataservices-assets-prd.s3.us-east-1.amazonaws.com/resources/production/MA%20Statewide%20and%20MajorBasins%20Climate%20Projections_Guidebook%20Supplement_March2018.pdf
- ¹¹ 2016 Shoreline Protection Study. https://www.scituatema.gov/sites/g/files/vyhlf3781/f/file/file/scituateprioritization_finalreport_august2016_compress_main.pdf
- ¹² Applied Coastal Research and Engineering, 2016. “Coastal Erosion, Sediment Transport, and Prioritization Management Strategy Assessment for Shoreline Protection.” <https://www.scituatema.gov/coastal-advisory-commission/pages/coastal-erosion-sediment-transport-and-prioritization-management>
- ¹³ 2016 Shoreline Protection Study. https://www.scituatema.gov/sites/g/files/vyhlf3781/f/file/file/scituateprioritization_finalreport_august2016_compress_main.pdf
- ¹⁴ Applied Coastal Research and Engineering, 2016. “Coastal Erosion, Sediment Transport, and Prioritization Management Strategy Assessment for Shoreline Protection.” <https://www.scituatema.gov/coastal-advisory-commission/pages/coastal-erosion-sediment-transport-and-prioritization-management>
- ¹⁵ 2016 Shoreline Protection Study. https://www.scituatema.gov/sites/g/files/vyhlf3781/f/file/file/scituateprioritization_finalreport_august2016_compress_main.pdf
- ¹⁶ Applied Coastal Research and Engineering, 2016. “Coastal Erosion, Sediment Transport, and Prioritization Management Strategy Assessment for Shoreline Protection.” <https://www.scituatema.gov/coastal-advisory-commission/pages/coastal-erosion-sediment-transport-and-prioritization-management>
- ¹⁷ Ibid.
- ¹⁸ 2016 Shoreline Protection Study. https://www.scituatema.gov/sites/g/files/vyhlf3781/f/file/file/scituateprioritization_finalreport_august2016_compress_main.pdf
- ¹⁹ Applied Coastal Research and Engineering, 2016. “Coastal Erosion, Sediment Transport, and Prioritization Management Strategy Assessment for Shoreline Protection.” <https://www.scituatema.gov/coastal-advisory-commission/pages/coastal-erosion-sediment-transport-and-prioritization-management>
- ²⁰ 2016 Shoreline Protection Study. https://www.scituatema.gov/sites/g/files/vyhlf3781/f/file/file/scituateprioritization_finalreport_august2016_compress_main.pdf
- ²¹ Applied Coastal Research and Engineering, 2016. “Coastal Erosion, Sediment Transport, and Prioritization Management Strategy Assessment for Shoreline Protection.” <https://www.scituatema.gov/coastal-advisory-commission/pages/coastal-erosion-sediment-transport-and-prioritization-management>

Endnotes (cont.)

- ²² Peggotty Beach Retreat Feasibility Study. <https://www.scituatema.gov/coastal-advisory-commission/pages/peggotty-beach-managed-retreat-feasibility-study>
- ²³ Scituate Coastal Advisory Commission web page. <https://www.scituatema.gov/coastal-advisory-commission>
- ²⁴ 2016 Shoreline Protection Study. https://www.scituatema.gov/sites/g/files/vyhlf3781f/file/file/scituateprioritization_finalreport_august2016_compress_main.pdf
- ²⁵ Applied Coastal Research and Engineering, 2016. “Coastal Erosion, Sediment Transport, and Prioritization Management Strategy Assessment for Shoreline Protection.” <https://www.scituatema.gov/coastal-advisory-commission/pages/coastal-erosion-sediment-transport-and-prioritization-management>
- ²⁶ Scituate Harbor Sustainability and Resiliency Master Plan. <https://www.mapc.org/resource-library/resilient-scituate-harbor/>
- ²⁷ Ibid.
- ²⁸ Metropolitan Area Planning Council, 2020. “Scituate Harbor Sustainability and Resilience Master Plan.” <https://www.mapc.org/resource-library/resilient-scituate-harbor/>
- ²⁹ 2018 Coastal Community Assessment. https://www.scituatema.gov/sites/g/files/vyhlf3781f/pages/scituate_coastal_community_assessment_final.pdf
- ³⁰ Consensus Building Institute, 2018. “Town of Scituate Coastal Community Assessment.” https://www.scituatema.gov/sites/g/files/vyhlf3781f/pages/scituate_coastal_community_assessment_final.pdf
- ³¹ A zoning ordinance cannot uniformly require a special permit for all uses within a district. See SCIT, Inc. v. Planning Board of Braintree, 19 Mass. App. Ct. 101 (1984). Since an applicant can elect to develop under the underlying zoning or under the Nantasket Beach Overlay, the special permit requirements would not uniformly apply to all projects within the overlay district boundaries.
- ³² Art. 3 §39B (12)
- ³³ There are options for alternative height measurements for single- and two-family residences, other buildings in Residence Districts, and for buildings in Commercial and Manufacturing Districts.

