Town of Wareham

Community Resilience Building Workshop Summary of Findings

June 2018

Contents

Town of Wareham
Community Resilience Building Workshop
Summary of Findings

Overview:

The need for municipalities, local and regional planning organizations, states, and federal agencies to increase resilience and adapt to extreme weather events and natural hazards has become strikingly evident among coastal Massachusetts communities. Recent events, such as the successive March 2018 nor'easters the brought serious wind damage and flooding to the area, have reinforced this urgency and sparked communities like the Town of Wareham to proactively plan for and mitigate potential risks to the Town through a community driven process. Once implemented, resilience building actions developed through this process will reduce the vulnerability of Wareham's citizens, infrastructure, and ecosystems, and serve as a model for communities across the Buzzards Bay area, Massachusetts and the Nation.

In the winter of 2017-18, with funding from the Executive Office of Energy and Environmental Affairs Massachusetts Municipal Vulnerability Preparedness (MVP) Program, Wareham's Planning Department contracted with the Woods Hole Group and Stantec to implement the Community Resilience Building process. A municipal-based core team was established to organize and implement an 8-hour Community Resilience Building (CRB) Workshop on May 3, 2018. The goal of this effort was to engage community stakeholders to facilitate the education, planning, and implementation of priority adaptation actions. The list of workshop invitees and workshop content was guided by input from an interdisciplinary working group comprised of Town staff and consultants from Woods Hole Group and Stantec. The Workshop's central objectives were to:

- Define top local natural and climate-related hazards of concern;
- Identify existing and future strengths and vulnerabilities;
- Develop prioritized actions for the Community;
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

Figure 1: Small group participants discuss vulnerable features along the Wareham coast.

Twenty-one (21) participants from town departments/committees/boards, community organizations, and local businesses attended the workshop, which employed a community-driven workshop process following the CRB framework (www. CommunityResilienceBuilding.com). The CRB's Risk Matrix format, large-scale maps of Town (Appendix A & B), and various datasets on natural hazards (Appendix C & D) were integrated into the workshop process to provide both decision support and risk visualization for workshop participants. The workshop included a combination of large group presentations and small group discussions. The large group presentations were provided to outline the workshop process/goals, present relevant hazard and community data, share example actions, and provide an update on local planning efforts and non-profit initiatives. The small group discussions offered participants an opportunity to work together in teams of 7 people (each with different roles, responsibilities and expertise) to foster an exchange of ideas and perspectives. The first small group discussion focused on identifying infrastructural, societal, and environmental features within the Town, along with corresponding ownership. The afternoon small group discussion focused on prioritizing features, developing resilience building actions, designating priorities and timelines for each of the action, and determining the top actions for each group. After each small group discussion, spokespersons from the small groups then reported their findings back to the larger group.

This workshop process, rich with information, local experience, and dialogue from the participants produced the findings detailed in this summary report. This report provides an overview of the top hazards, current concerns and challenges, current strengths and vulnerabilities, and recommends actions to improve Wareham's resilience to natural and climate-related hazards today and in the future.

Workshop participants and other interested stakeholders are encouraged to provide comments, corrections, and updates on the summary of findings described in this report. The Town of Wareham's ongoing community resilience will benefit from the participation of all those concerned.

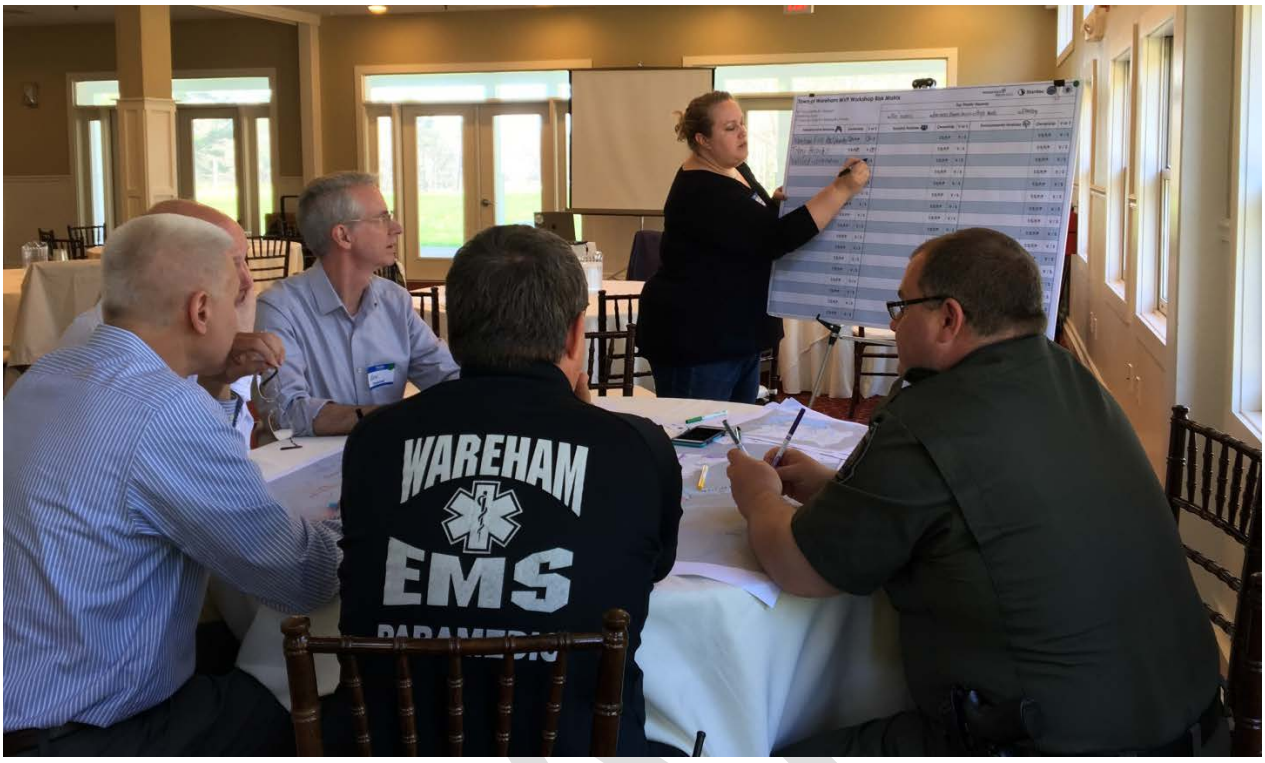


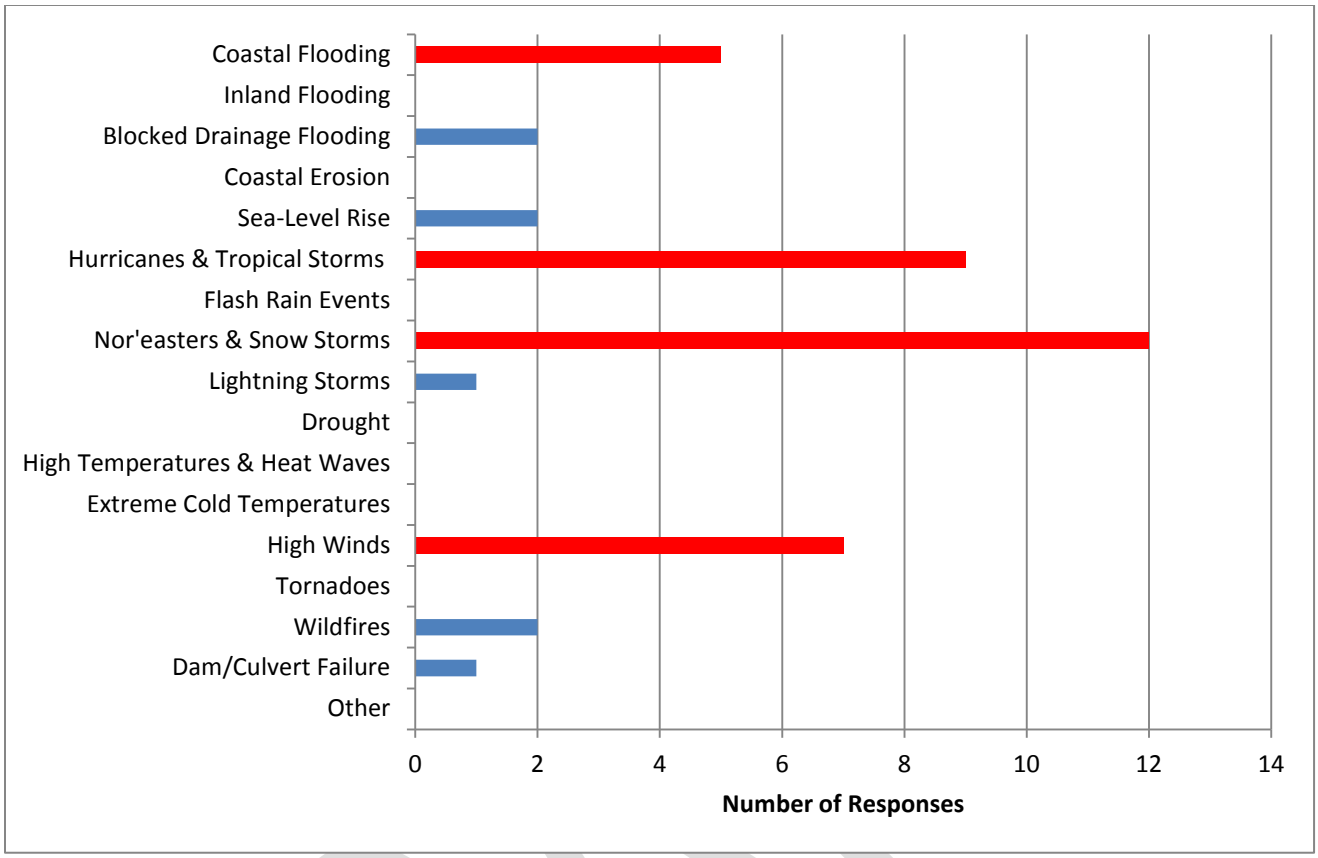
Figure 2: The Green Group included the Planning Department, the Massachusetts Office of Coastal Zone Management, the Water Department, the Harbor Master & emergency responders.

Top Hazards and Vulnerable Areas

Prior to the CRB Workshop in May 2018, invited workshop participants were asked to identify the top natural hazards for the Town of Wareham were selected from the list of hazards discussed in the Massachusetts State Hazard Mitigation Plan as part of a pre-workshop online survey. Major storms, such as nor'easters, snowstorms, hurricanes and tropical storms were identified as the hazards of greatest concern. High winds and the widespread damage they can cause through downed trees, power outages, washed up marine debris and damaged structures were also identified as a top hazard for the Town. Coastal flooding from intense storms and coastal storm surge, presently and in the future as exacerbated by sea-level rise, was also highlighted as major concern by the survey respondents.

Top Hazards

- Nor'easters & Snow Storms
- Hurricanes & Tropical Storms
- High Winds
- Coastal Flooding


Coastal Flooding
Inland Flooding
Blocked Drainage Flooding
Coastal Erosion
Sea-Level Rise
Hurricanes & Tropical Storms
Flash Rain Events
Nor'easters & Snow Storms
Lightning Storms
Drought
High Temperatures & Heat Waves
Extreme Cold Temperatures
High Winds
Tornadoes
Wildfires
Dam/Culvert Failure
Other
0
2
4
6
8
10
12
14
Number of Responses

Vulnerable Areas

Neighborhoods: Wareham business district (Main Street), Onset Village, Oakdale Neighborhood

Populations: Concentrations of elderly residences (nursing homes and residents living at home), low income housing and low income neighborhoods (especially the 17 trailer parks throughout Town, which also contain a large elderly population), homeless populations, seasonal residents, visitors and tourists, younger populations (especially elementary and high school children commuting to school).

Ecosystems: Coastal Beaches (Little Harbor, Swifts Beach, Onset Beach, Pinehurst), islands (Onset Island, Wickets Island), salt marshes (especially Weweantic River and Briarwood), eelgrass beds, shellfish habitat, cranberry bogs, large areas of forest (pine barrens)

Transportation: Marinas, roads blocked by wind-blown trees, regional bridges

Infrastructure: Bridges (Narrows Bridge, Stone Bridge on Onset Ave., "Dummy Bridge" on Main Ave., Ferring Hill Bridge), Cranberry Highway, septic systems, wastewater pollution control facility and various pump stations (East Blvd., Narrows, and Crosset Narrows pump stations), overhead electricity and utility wires, cell phone towers, dams (Parker Mills Dam, Mill Pond Dam, Tremont Dam, Tremont Nail Dam)

Facilities: Schools, nursing homes, churches, Tobey hospital, grocery stores, Rosebrook Dialysis Center, Main Street Fire Station, Tremont Nail

Figure 3: Cranberry Highway.

Current Concerns and Challenges Presented by Hazards

The Town of Wareham has many concerns and faces multiple challenges related to the impacts of natural hazards. In recent years, Wareham has experienced a series of highly disruptive and damaging weather events, including three successive nor'easters in March 2018, and >4 inches of rain that fell on a single day in July 2017. The damage from recent nor'easters included significant coastal flooding and erosion due to heavy surf and storm surge, and damaged structures and blocked roadways as a result of downed trees due to high winds. The frequency of these storms in March 2018 exacerbated the impacts, as the Town was still recovering from the last storm when the next one arrived. The magnitude and severity of the impacts of these storms produced a heightened level of awareness in Town and provided additional motivation to comprehensively improve resilience and reduce local vulnerabilities to natural hazards.

Figure 4: Boat storage facility on Cranberry Highway suffered irreparable damage from the March 2018 Storms.

This series of extreme weather events highlighted that impacts from hazards are felt differently across the Town from the low-lying coastal areas to the forested uplands to the more developed downtown area. The southern parts of Wareham border Buzzards Bay and are exposed to damage from coastal flooding, coastal erosion and storm surge. The forested inland areas experience the effects of tree damage from wind, snow and ice, and inland flooding along roads due to poor drainage. The combination of these issues presents a challenge to emergency preparedness and response, and requires comprehensive yet tailored actions for establishing mitigation priorities for different areas of Town.

The workshop participants were generally in agreement that the Town of Wareham is experiencing more intense and frequent storms. The impacts, particularly during the series of March 2018 nor'easters, affected the daily activities of every resident. Coastal areas are experiencing greater impact from major storms and increases in average tidal ranges are resulting in routine flooding events in certain low-lying places during lunar high tides. Additionally, there was a general concern that a long-range plan needed to be developed for how to manage a few key bridges in Town, in the face of ongoing storm damage and sea-level rise, as well as how to upgrade the wastewater pollution control facility and its management to be able to adequately handle large inflow events.

Specific Categories of Concerns and Challenges

Wastewater Pollution Control Facility

The Town of Wareham's Wastewater Pollution Control Facility serves 60% of the Town's population, as well as two sections of the Buzzards Bay area of neighboring Bourne. During the last nor'easter the system almost overtopped its capacity (1.5 million gallons per day), likely due to many residents connecting sump pumps directly into the sewer system to drain flooded basements rather than discharging the excess flood waters out into their yard. There is also a general concern about the structural integrity of some of the aging infrastructure in certain areas around Town. Specific areas of concern due to flooded areas, inaccessible manholes and/or aging infrastructure (e.g., clay pipes) include (Swifts Beach, Pinehurst, North Boulevard, Point Independence, Indian Mound Beach, Parkwood and Briarwood). The increasing population, especially as more and more seasonal residences transition to year-round homes, will put even more demand on the system in the future. Along with rising sea level, groundwater is also expected to rise over time. This could result in greater groundwater infiltration to the wastewater system, and a further draw on the finite capacity of the facility.

Evacuation Plan and Emergency Response

Currently, there is no consolidated emergency operations center or comprehensive evacuation and response plan. An emergency operations center is currently in planning stages, under the Town's new Emergency Medical Services Director. A designated location, with essential equipment, will assist the Community's organization and response in the event of an emergency and increase their overall emergency management capability. The Donovan School currently acts as a temporary shelter for the community – however, certain populations (ex: elderly residents, low income residents with no personal transportation, etc.) in Town were also identified as concerns with respect to their ability to be evacuated and to access emergency shelter locations. Seventeen trailer parks exist throughout the Town, and the residents in those areas are often unwilling to evacuate. Nursing homes (e.g. Minot Avenue, Indian Neck Road, and Main Street) would likely need additional assistance if evacuations were necessary. Finally, participants raised the concern about how and where to evacuate tourists in the event of a summer emergency.

Vulnerability of Road and Bridge Network

One of the primary concerns expressed by participants was the vulnerability of the Town's road network, specifically low-lying coastal roads and some of the bridges that cross over tidal rivers. These roadways and bridges are threatened by the increasing hazards presented by flooding, sea-level rise and coastal storm damage. Bridges, including Narrows Bridge, Stone Bridge, and the "Dummy Bridge" (i.e., Main Avenue Bridge in Onset) are regularly inundated during storm events and/or are repeatedly damaged by wave action and coastal erosion. Debris and sand are often washed up onto the roads and bridges, preventing travel as well as emergency management services from reaching impacted areas. Utilities that run along these roadways are also disrupted frequently. Low lying roads with poor drainage, such as portions of Cranberry Highway, were also identified as a concern. Workshop participants from all small working groups addressed these as important concerns.

Electrical Distribution Systems

Electric service outages can be caused by a number of different types of natural hazards, but most recently the Town's utility lines were impacted by high winds and heavy snow during the March 2018 nor'easters. The power distribution system was cited as one of the most critical pieces of infrastructure in Town and can impact all residents regardless of where they live. As identified by workshop participants, elderly and trailer park residents are particularly at risk during electric service outages. Mature trees and overhanging limbs along roadways are a primary culprit because they can bring down power lines if they are toppled by high winds. Power interruptions due to storms can cause disruption to heating or cooling systems, as well as vital communication networks. Workshop participants identified the communications tower (and other public infrastructure) as needing a generator to avoid these disruptions to service.

Flood Damage and Disruption

Flooding, whether caused by coastal storm surge or excessive rainfall, presents a major threat to the Town's infrastructure, facilities, neighborhoods, and individual homes and property. Recent flooding events have prompted participants to consider the future impact of coastal flooding events when exacerbated by sea-level rise. Of particular concern are the effects that coastal flooding has and will have on roads and coastal neighborhoods. These events inundate and isolate certain areas from the rest of Town and making it difficult for first responders and other services to access those areas during emergencies. In addition, several participants highlighted that hazardous materials stored at water front facilities (such as gas and oil storage at marinas and harbors,) could be dispersed into estuaries and drinking water resources by flood waters, creating a water pollution problem in addition to inundated areas. Part of downtown Wareham (Main St.) is also vulnerable to flooding during a major coastal storm event. Other major locations that experience flood damage and disruption are Onset village, the Parkwood neighborhood and other residential areas on peninsulas throughout Town. In addition to coastal flooding, sections of Town also experience disruptions due to flooded roads caused by excessive rainfall. Portions of Cranberry Highway actually flood regularly during "normal" rainfall events.

Beach and Coastal Erosion

Participants also identified ongoing erosion along Wareham's coastline as a point of concern. Town beaches of particular concern include Little Harbor Beach, Swifts Beach, Onset Beach, and Pinehurst Beach, as well as Onset Island and Wickets Island. Wareham's coastline is not only inherent to the character of the Town, but these beaches also provide valuable tourism and recreation benefits, vital habitat for wildlife, and provide the first line of defense against coastal storms, flooding, wave action and storm surge.

Aging Dam Infrastructure

There are more than 40 dams in the Town of Wareham, of which nine are classified as a "Significant" or "High" Hazard dam. Workshop participants in all small group discussions raised concerns about the aging infrastructure of many of these dams, and the potential damage they would cause if they failed.

Because some dams are privately owned, municipal employees felt there was nothing they could do directly address the problem. Specific dams of concern include Park Mills Pond Dam, Tremont Dam, and Mill Pond Dam.

Current Strengths and Assets

As a result of Wareham's recent experiences with extreme weather, the Town is well acquainted with its existing strengths. Reinforcing and expanding these supportive practices and assets will improve resilience against future storms, with greater frequencies and intensities. Additional planning will help the Town address anticipated increases in storm surge, sea-level rise, and precipitation.

- The Town of Wareham has strong transportation corridors, including Interstate 495 and 195, and Route 25, as well as the railroad line with a station along Main Street, and a series of GATRA bus lines.
- Responsive and committed Town leadership and staff are an important asset to Wareham, both in day-to-day operations, as well as during and immediately following a natural hazard or an emergency event. The communication and cooperation between departments was repeated cited as a major strength in Town. In addition, many of the emergency responders and Town personnel have been Wareham residents their whole life and have a strong commitment to the effective management and protection of the Town and its residents.
- Volunteerism and supportive social services provided by local churches and the YMCA were highlighted as important community assets. These services often provide vital support to elderly or vulnerable populations in Town, especially during a hazard. Local restaurants and business help feed emergency responders and sheltered residents during emergencies.
- Salt marshes and beaches along Wareham's coasts were recognized as an important buffer, offering the first line of defense against storms through storm surge attenuation and reduction of wave energy. Without these natural resources in place, the Town's coastal and inland infrastructure and homes would suffer greater damage during storm events.
- Key facilities in Town have proven to be important strengths. Tobey Hospital, for example, provides high-level medical service in Town, avoiding lengthy transport times to out-of-Town medical facilities. Additionally, schools, including the Donovan School, and the Multi-Service Center, which are centrally located and can function as emergency shelters, provides residents with vital amenities such as shelter, heat, and electricity during and following a hazard event.

Top Recommendations to Improve Resilience

A common thread throughout the Workshop discussions was the recognition that the Town and residents need to be better prepared through longer-term, community-based, contingency planning across key areas of concern. This and additional core highlights are addressed below. The following were the top five actions selected by workshop participants.

1. **Develop a comprehensive emergency evacuation and response plan**
   This plan would identify additional spaces to be utilized for shelters and establish them to ensure there's enough space for everyone, as well as address how to evacuate the Town if necessary, including homeless, children at home alone, low-income, and elderly residents who may not be able to evacuate on their own. This effort would also include additional public outreach and education on hazard preparedness and climate change impacts. This outreach could include a webpage that shows the best evacuation route depending on where you live, as well as which points are likely to be flooded.

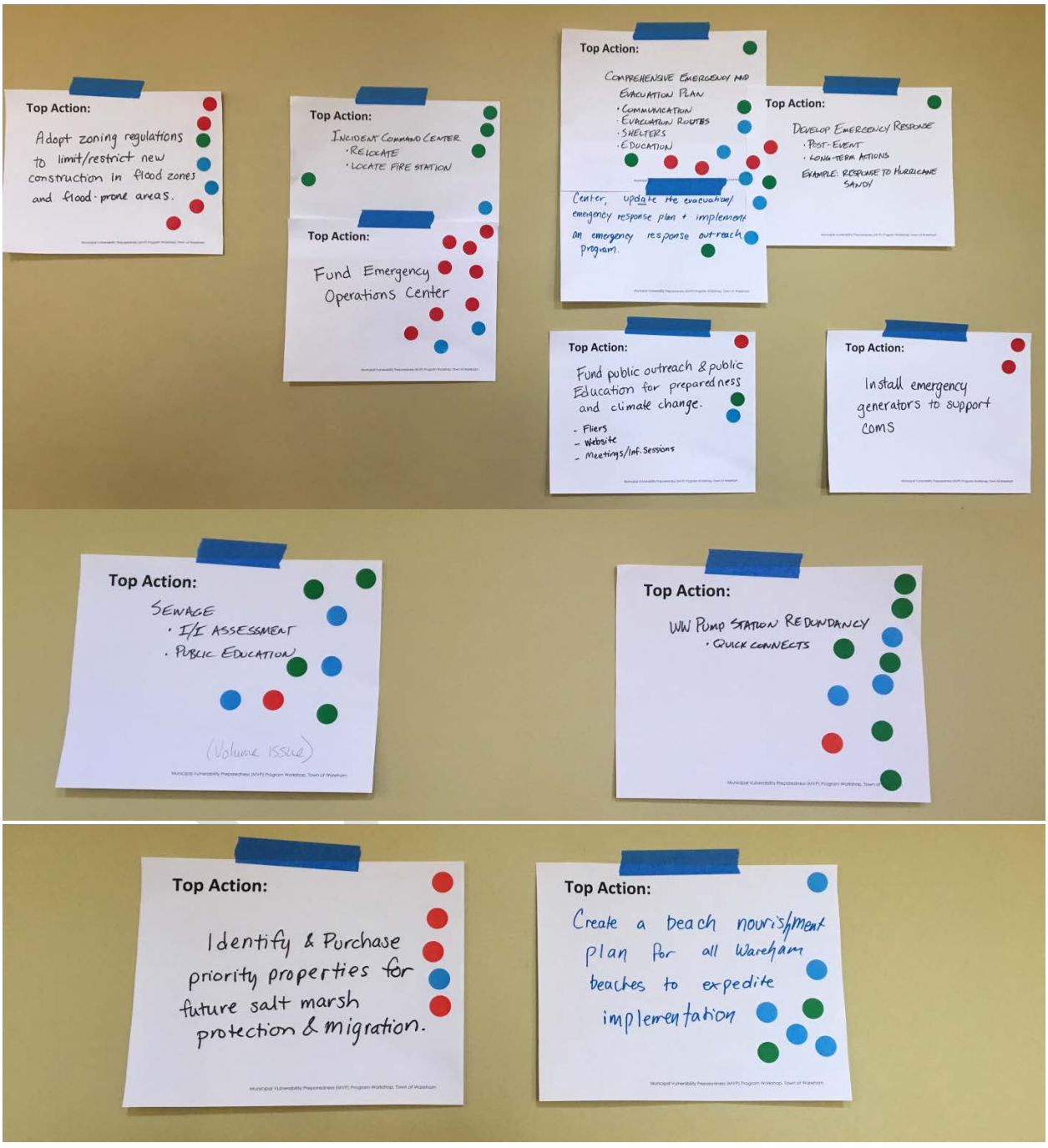
2. **Relocation of the Main St. Fire Station Headquarters and Develop Incident Command Center**
   The Main Street Fire Station Headquarters is currently located in the 100-year floodplain and its vulnerability will only increase with sea-level rise and increasing storm frequencies and intensities. Relocation of this facility could also be coupled with the development of an integrated Incident Command Center to strengthen coordination between emergency response departments and serve as a centralized emergency operations center.

3. **Install "quick connects" for Wastewater pump station redundancy**
   Installing "quick connects" will allow the system to continue to move wastewater in the event that a pump station is unable to function due to storm conditions. The "quick connects" serve as a bypass to connect an auxiliary pipeline to the effluent force main. A portable pump is then connected to the bypass connection, allowing service to continue. The Town has already undergone initial planning for the implementation of this action.

4. **Conduct an Inflow/Infiltration Assessment for Sewer System**
   In a March 2018 nor'easter, the wastewater system was overwhelmed with flow volume. There is therefore a need to better understand the potential volume of inflow and the amount of infiltration impacting the system, particularly during storm events. Results of the assessment could also identify ways to increase the capacity of the facility to adequately deal with times of high flow.

5. **Develop a beach management plan for nourishment**
   All small working groups identified coastal beaches as an important environmental feature within the Town. Participants recognized while these systems are a strength for the Town as an important buffer and vital economic resource, offering the first line of defense against storms through storm surge attenuation and reduction of wave energy, they are also vulnerable to ongoing erosion and storm impacts. A comprehensive beach management plan, with

predetermined nourishment templates and designs, along with the appropriate associated permits acquired in advance of necessary nourishment projects, would allow the Town to respond to storm damage on the beaches immediately. The small working groups also discussed the implications of public vs. private beach ownership, and the need to prioritize and purchase key coastal properties to facilitate effective beach management.



In addition to the top five priority actions chosen by the workshop participants, the participants also developed a larger series of recommended actions, which they prioritized into "high", "medium" and "low" priority actions:

Other High Priority Actions:

- Complete a flood risk assessment to identify municipal features vulnerable to flooding.
- Develop an acquisition plan for purchasing properties for protecting salt marsh and to allow for salt marsh migration as sea level rises. Coastal land acquisition could also protect water quality by limiting future development.
- Conduct a bridge and road vulnerability assessment.
- Adopt zoning regulations to limit or restrict new construction in flood zones and other flood prone areas.
- Establish a storm access route and public safety program for school accessibility.
- Develop a public outreach strategy for climate change and hazard preparedness.
- Identify existing and possible future shelter locations.
- Install emergency generators in vital locations.
- Confirm the ownership of Parker Mills Dam through legal process.
- Create a MOA with local businesses and grocery stores for storm response planning.
- Coordinate with community groups to develop a hazard mitigation educational program.
- Implement a snow removal plan.

Other Medium Priority Actions:

- Develop a pre-disaster infrastructure response plan
- Develop a disaster response plan for business districts.
- Explore alternative options for water department treatment stations and wells in the case of salt water intrusion.
- Update asset management plan to enhance structural integrity of roadways and other infrastructure.
- Identify stakeholders and conduct an Environmental Impact Assessment to see how dams are affects associated water bodies.

Other Low Priority Actions:

- Develop a Capital Improvement Plan to retrofit or construct to withstand hazards in the future.
- Create a reporting system for town employees and an educational component to the public regarding above ground electrical systems.
- Create a land acquisition program for properties adjacent to beaches.

CRB Workshop Participants

Below is a table of workshop participants.

Name	Department/Affiliation
Ken Buckland	Planning Department
Jasmin Campos	Planning Department
Alan Slavin	Board of Selectmen
Peter Teitelbaum	Board of Selectmen
Raymond Goodwin	Onset Fire District
David Evans	Emergency Management Services
David Pichette	Conservation Department
Kevin Bartsch	Buzzards Bay National Estuary Program
John Kelley	Wareham Fire District
Dave Janik	Massachusetts CZM
Jon Higgins	GATRA
Garry Buckminster	Harbormaster
Patrick McDonald	Health Department
John Gerard	Police
Dan LeFavor	School Department
Andy Reid	Water Department
James Andrews	School Department
John Walchek	Police
David Riquinha	Building Commissioner
Guy Campinha	Water Pollution Control Facility
Russ Kleekamp	GHD

Below is a table of additional entities that were invited but were unable to attend.

Department/Affiliation	Department/Affiliation
Town Administrator	Father Bill's & MainSpring
Municipal Maintenance Department	Cape Cod Canal Regional Chamber of Commerce
Conservation Commission	Onset Bay Association (OBA)
Planning Board	Wareham Village Association
Zoning Board of Appeals	Historical Commission
Council on Aging	Brit Realty
Decas Cranberry	Nemasket Kayak
A.D. Makepeace	State Representative
Wareham Land Trust	I-95 Visitors Center
Buzzards Bay Coalition	Gallery Consignment

Recommended Citation

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CRB Workshop Project Team

Town of Wareham:

Ken Buckland, Dir. of Planning & Community Development (Project Lead – Principal Contact)
Jasmin Campos, Planning Department (Core Team Member)
Guy Campinha, Director of the Wastewater Pollution Control Facility (Core Team Member)
David Pichette, Conservation Agent (Core Team Member)
Russ Kleekamp, GHD (Core Team Member)
Matthew Underhill, GIS (Core Team Member)

Woods Hole Group:

Elise Leduc (Lead Facilitator)
Brittany Hoffnagle (Small Group Facilitator)

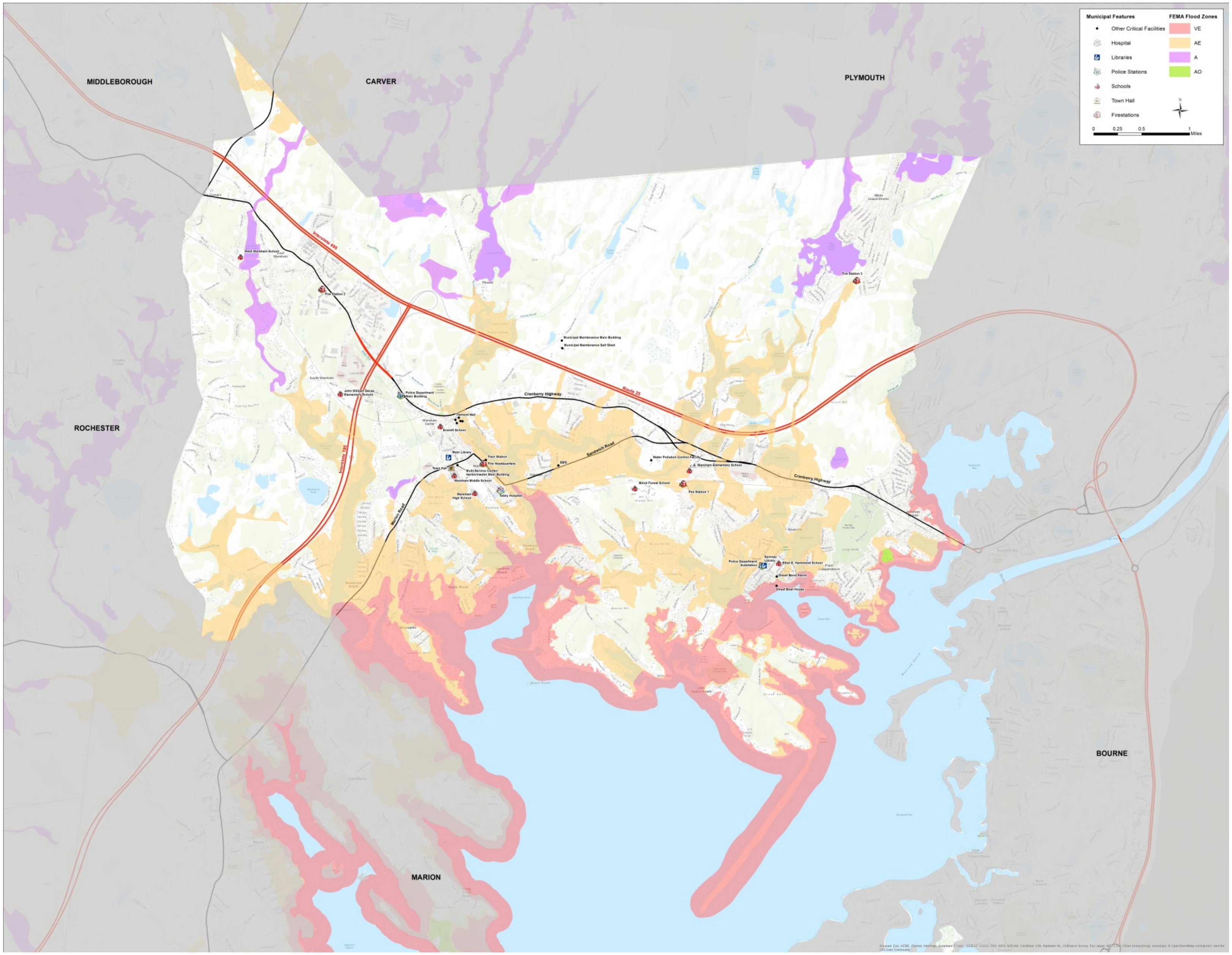
Stantec:

Hillary King (Small Group Facilitator)
Amelia Casey (Small Group Facilitator)

Acknowledgements

Special thanks to the Town of Wareham for their willingness to embrace this process and engage a good cross section of workshop participants, in particular Ken Buckland, Guy Campinha, Jasmin Campos and Matthew Underhill. This project was made possible through funding from the Executive Office of Energy and Environmental Affairs' Municipal Vulnerability Preparedness (MVP) Grant Program.

Appendix A: Workshop Base Map


MIDDLEBOROUGH
CARVER
PLYMOUTH
ROCHESTER
MARION
BOURNE
Municipal Features
Other Critical Facilities
Hospital
Libraries
Police Stations
Schools
Town Hall
Firestations
FEMA Flood Zones
VE
AE
A
AO
N
0
0.25
0.5
1
Miles

Appendix B: Participatory Mapping Results


MIDDLEBOROUGH
CARVER
PLYMOUTH
ROCHESTER
MARION
BOURNE
Flood
Narrows Bridge
Tree Damage
Water recharge
Coastal erosion
receding salt marsh


MIDDLEBOROUGH
CARVER
PLYMOUTH
ROCHESTER
BOURNE
MARION
Municipal Features
Other Critical Facilities
Hospital
Libraries
Police Stations
Schools
Town Hall
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VE
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MIDDLEBOROUGH
CARVER
PLYMOUTH
ROCHESTER
MARION
BOURNE
Municipal Features
Other Critical Facilities
Hospital
Libraries
Police Stations
Schools
Town Hall
Firestations
FEMA Flood Zones
VE
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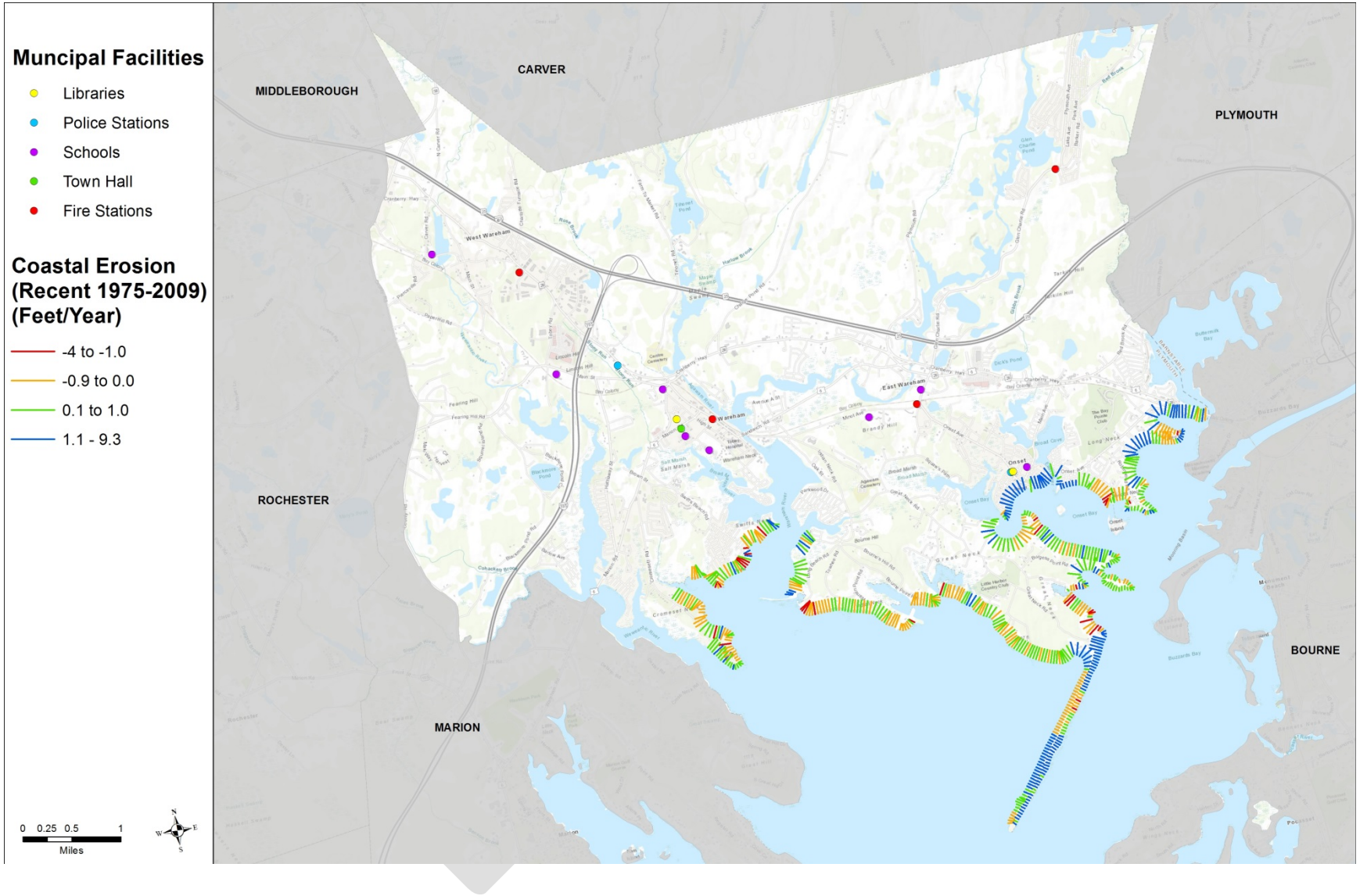
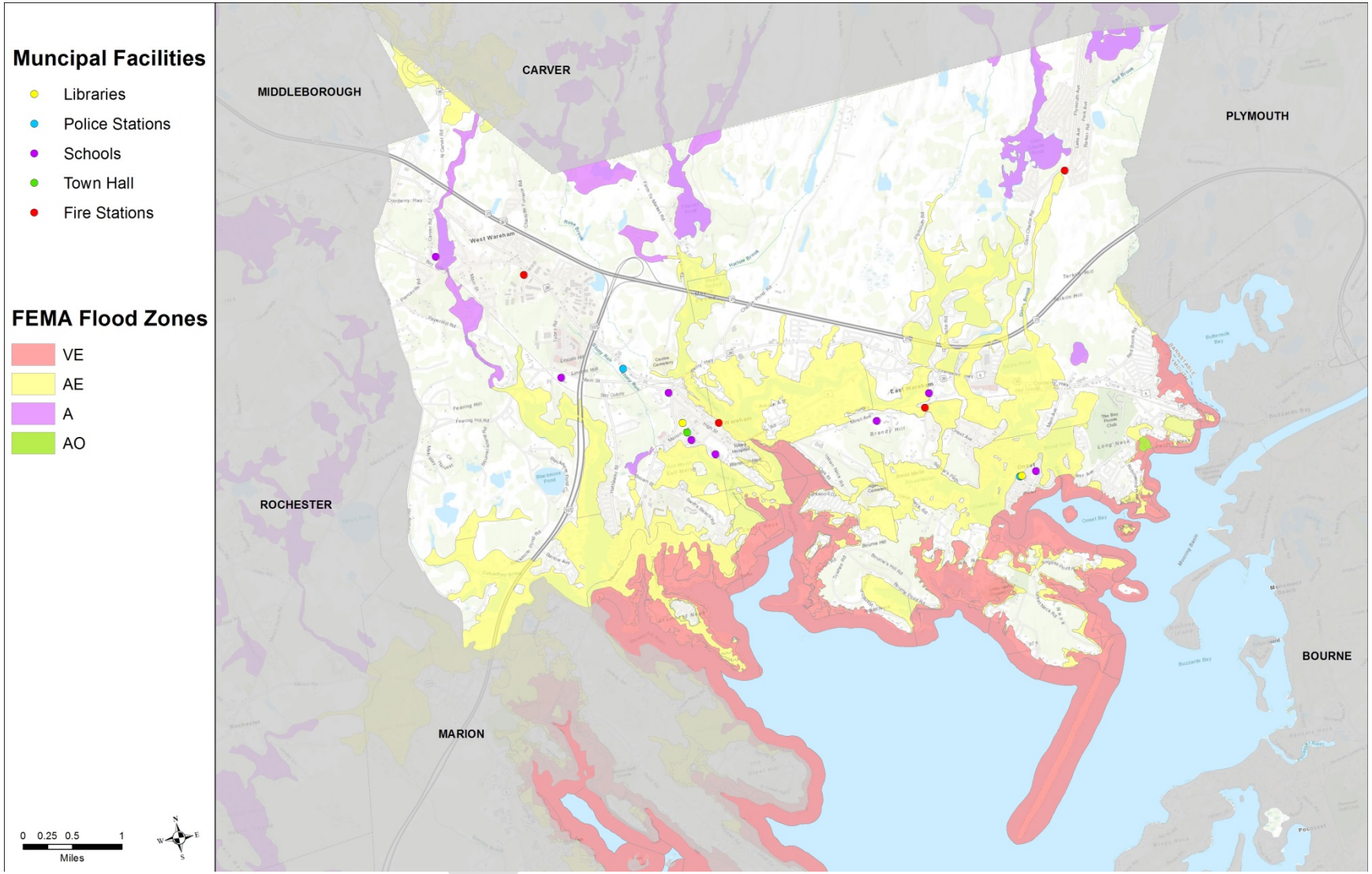
AO

Appendix C: Wareham Risk Maps Used During Workshop

(Given as workshop handouts)


Muncipal Facilities
Libraries
Police Stations
Schools
Town Hall
Fire Stations
Coastal Erosion (Recent 1975-2009) (Feet/Year)
-4 to -1.0
-0.9 to 0.0
0.1 to 1.0
1.1 - 9.3
0 0.25 0.5 1
Miles
MIDDLEBOROUGH
CARVER
PLYMOUTH
ROCHESTER
MARION
BOURNE
West Wareham
East Wareham
Wareham
Onset


Muncipal Facilities
Libraries
Police Stations
Schools
Town Hall
Fire Stations
FEMA Flood Zones
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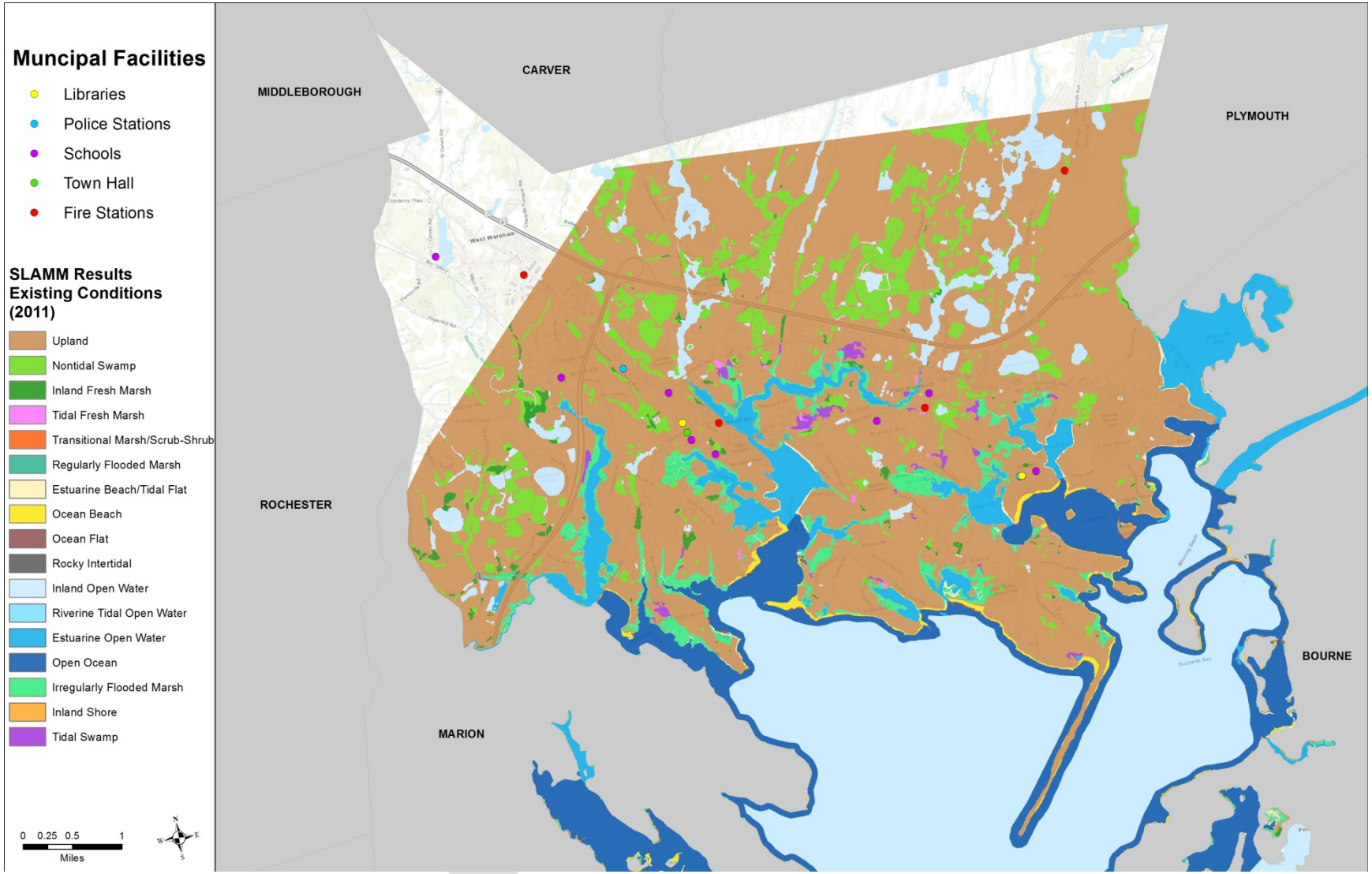
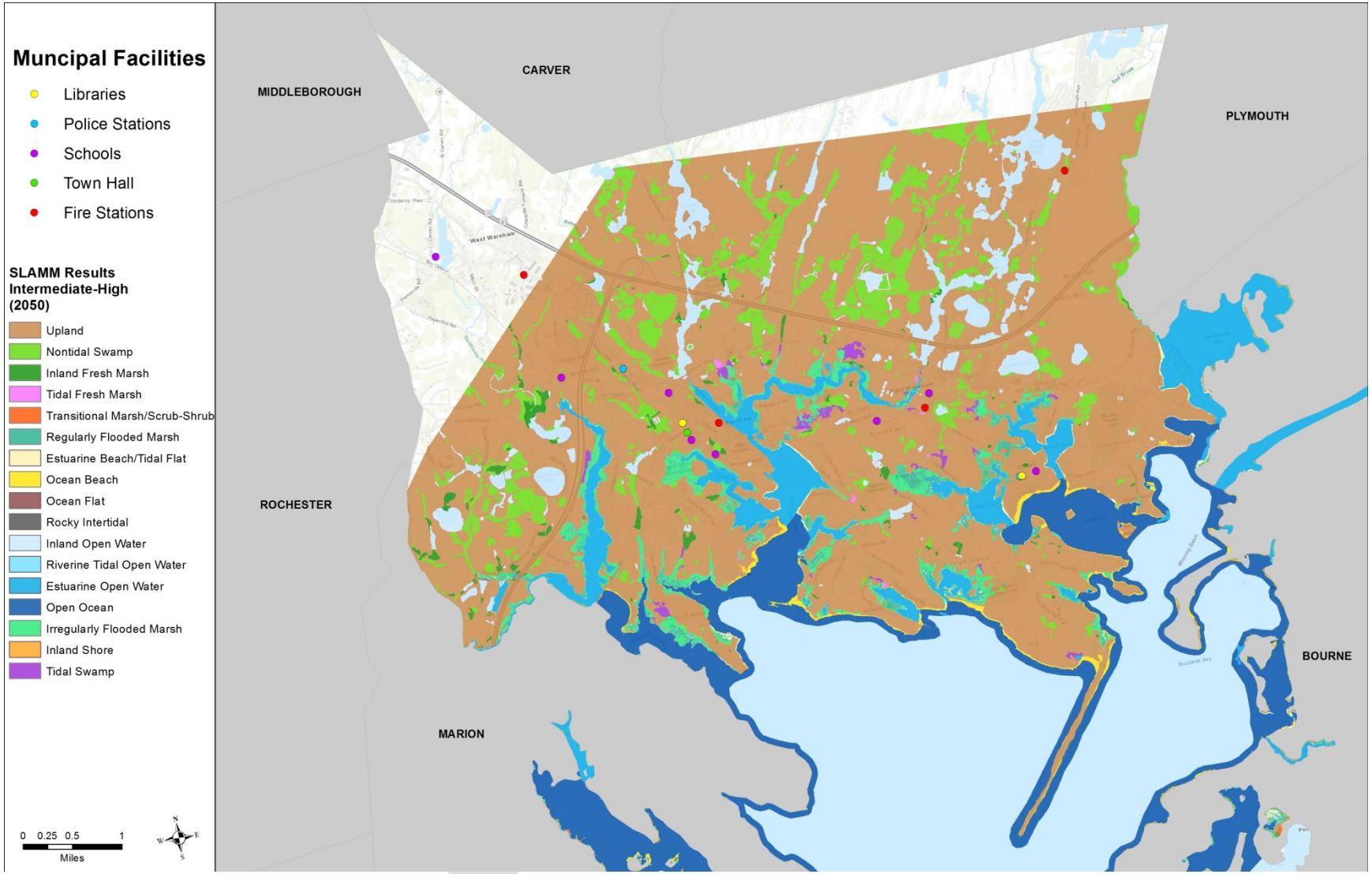
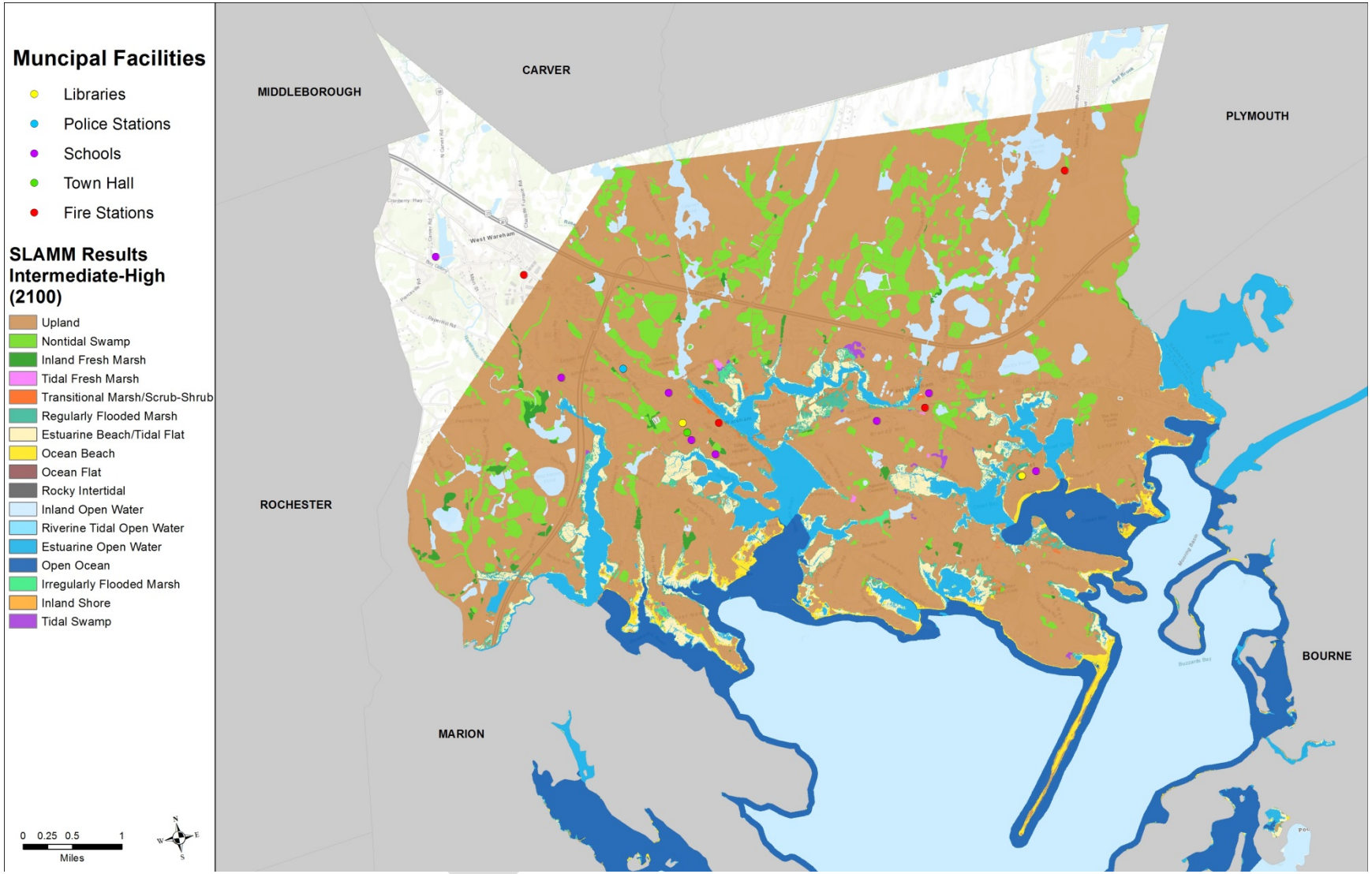
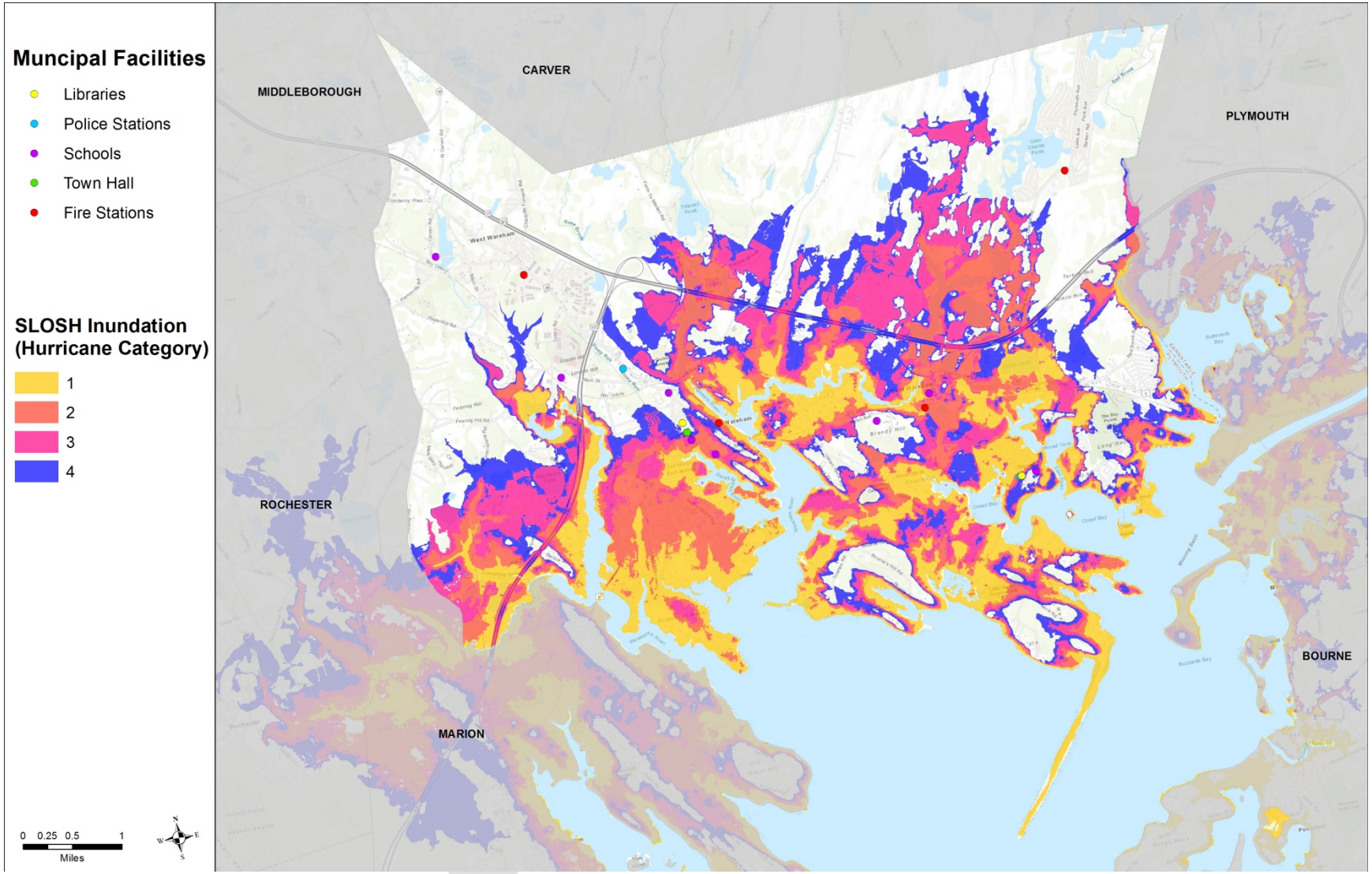
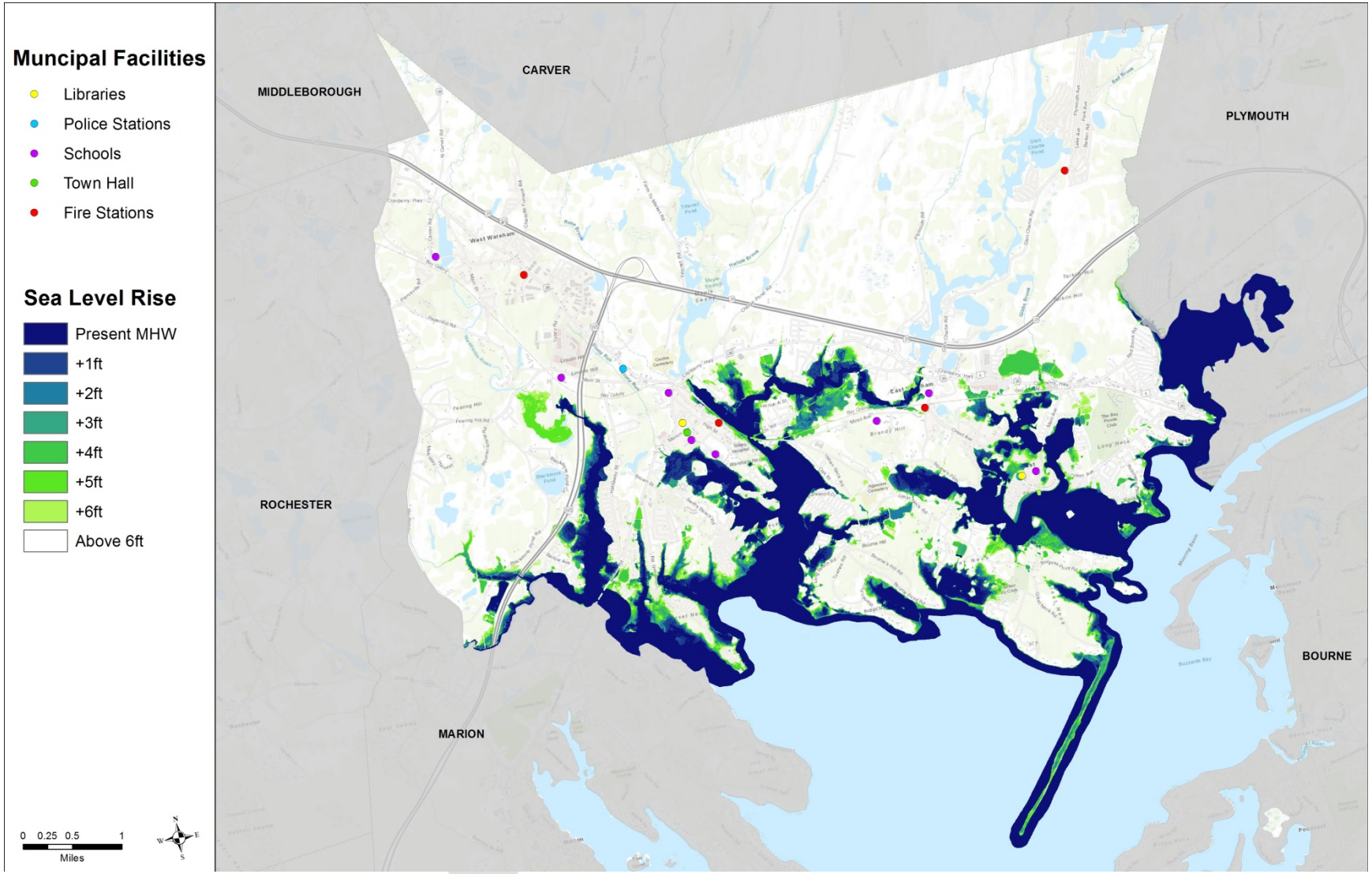
MIDDLEBOROUGH
CARVER
PLYMOUTH
ROCHESTER
MARION
BOURNE
West Wareham
East Wareham


Muncipal Facilities
Libraries
Police Stations
Schools
Town Hall
Fire Stations
SLAMM Results
Existing Conditions
(2011)
Upland
Nontidal Swamp
Inland Fresh Marsh
Tidal Fresh Marsh
Transitional Marsh/Scrub-Shrub
Regularly Flooded Marsh
Estuarine Beach/Tidal Flat
Ocean Beach
Ocean Flat
Rocky Intertidal
Inland Open Water
Riverine Tidal Open Water
Estuarine Open Water
Open Ocean
Irregularly Flooded Marsh
Inland Shore
Tidal Swamp
0 0.25 0.5 1
Miles
MIDDLEBOROUGH
CARVER
PLYMOUTH
ROCHESTER
MARION
BOURNE


Muncipal Facilities
Libraries
Police Stations
Schools
Town Hall
Fire Stations
SLAMM Results
Intermediate-High
(2050)
Upland
Nontidal Swamp
Inland Fresh Marsh
Tidal Fresh Marsh
Transitional Marsh/Scrub-Shrub
Regularly Flooded Marsh
Estuarine Beach/Tidal Flat
Ocean Beach
Ocean Flat
Rocky Intertidal
Inland Open Water
Riverine Tidal Open Water
Estuarine Open Water
Open Ocean
Irregularly Flooded Marsh
Inland Shore
Tidal Swamp
0 0.25 0.5 1
Miles
MIDDLEBOROUGH
CARVER
PLYMOUTH
ROCHESTER
MARION
BOURNE
West Wareham


Muncipal Facilities
Libraries
Police Stations
Schools
Town Hall
Fire Stations
SLAMM Results Intermediate-High (2100)
Upland
Nontidal Swamp
Inland Fresh Marsh
Tidal Fresh Marsh
Transitional Marsh/Scrub-Shrub
Regularly Flooded Marsh
Estuarine Beach/Tidal Flat
Ocean Beach
Ocean Flat
Rocky Intertidal
Inland Open Water
Riverine Tidal Open Water
Estuarine Open Water
Open Ocean
Irregularly Flooded Marsh
Inland Shore
Tidal Swamp
0 0.25 0.5 1
Miles
MIDDLEBOROUGH
CARVER
PLYMOUTH
ROCHESTER
MARION
BOURNE


Muncipal Facilities
Libraries
Police Stations
Schools
Town Hall
Fire Stations
SLOSH Inundation (Hurricane Category)
1
2
3
4
0 0.25 0.5 1
Miles
MIDDLEBOROUGH
CARVER
PLYMOUTH
ROCHESTER
MARION
BOURNE
West Wareham
Wareham


Muncipal Facilities
Libraries
Police Stations
Schools
Town Hall
Fire Stations
Sea Level Rise
Present MHW
+1ft
+2ft
+3ft
+4ft
+5ft
+6ft
Above 6ft
0 0.25 0.5 1
Miles
MIDDLEBOROUGH
CARVER
PLYMOUTH
ROCHESTER
MARION
BOURNE
West Wareham
East Wareham

Appendix D: Massachusetts Updated Climate Projections

(Given as workshop handouts)