

TOWN OF HINGHAM HAZARD MITIGATION PLAN 2022 UPDATE



Bare Cove Park

Hingham-ma.gov



Final Plan
Approved by FEMA
July 11, 2022

ACKNOWLEDGEMENTS & CREDITS

This plan was prepared for the Town of Hingham by the Metropolitan Area Planning Council (MAPC) under the direction of the Massachusetts Emergency Management Agency (MEMA) and the Massachusetts Department of Conservation and Recreation (DCR). The plan was funded by the Federal Emergency Management Agency's (FEMA) Building Resilient Infrastructure and Communities (BRIC) Grant Program.

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SECTION 1: EXECUTIVE SUMMARY

Hazard Mitigation planning is a proactive effort to identify actions that can be taken to reduce the dangers to life and property from natural hazard events. In the communities of the Boston region of Massachusetts, hazard mitigation planning tends to focus most on flooding, the most likely natural hazard to impact these communities. This plan considers how our warming climate will affect natural hazards. Warming temperatures will fuel changing precipitation patterns, sea level rise, and an increasing frequency and intensity of severe storms. The Federal Disaster Mitigation Act of 2000 requires all municipalities that wish to be eligible to receive FEMA funding for hazard mitigation grants, to adopt a local multi-hazard mitigation plan and update this plan in five-year intervals.

PLANNING PROCESS

Planning for the Hazard Mitigation Plan update was led by the Hingham Local Hazard Mitigation Planning Team, composed of staff from a number of different town departments. The team met on September 27, 2021, November 15, 2021, and March 7, 2022, and discussed where the impacts of natural hazards most affect the town, the effects of climate change, goals for addressing these impacts, updates to the Town's existing mitigation measures, and new or revised hazard mitigation measures that would benefit the town.

Public participation in this planning process is important for improving awareness of the potential impacts of natural hazards and to build support for the actions the Town takes to mitigate them. The Town's Local Hazard Mitigation Planning Team hosted two public meetings. The first meeting on January 10, 2022, was held via Zoom and rebroadcast over a dozen times on Hingham cable television. The second meeting was held before the Select Board on April 12, 2022, broadcast on local cable television, and the draft plan update was posted on the Town's website for public review. Key town stakeholders and neighboring communities were notified and invited to review the draft plan and to submit comments. See Public Comments for feedback.

RISK ASSESSMENT

The Hingham Hazard Mitigation Plan assesses the potential impacts to the town from flooding, high winds, winter storms, brush fire, geologic hazards, extreme temperatures, drought, and invasive species. For each risk, the assessment identifies the projected impacts of a warming climate. These are shown in the map series in Appendix B. The Hingham Local Hazard Mitigation Planning Team identified 155 Critical Facilities. These are also shown on the map series and listed in Table 32, identifying which facilities are located within the mapped hazard zones.

Hazards U.S. – Multihazards (HAZUS-MH) is a standardized methodology developed by FEMA that utilizes Geographic Information Systems (GIS) to estimate physical, economic, and social impacts of disasters. The HAZUS-MH analysis for Hingham estimates property damages from Hurricanes of category 2 and 4 (\$39 million to \$158 million), earthquakes of magnitudes 5 and 7 (\$510 million to \$3.8 billion), and the 1% and .2% chance of flooding (\$154 to \$266 million).

HAZARD MITIGATION GOALS

The Hingham Local Hazard Mitigation Planning Team endorsed the following eleven hazard mitigation goals at the November 15, 2021, team meeting. The team added the eleventh goal focused on incorporating future climate change projections.

- Ensure that critical infrastructure sites are protected from natural hazards.
- Protect existing residential and business areas from flooding.
- Maintain existing mitigation infrastructure in good condition.
- Continue to enforce existing zoning and building regulations.
- Educate the public about zoning and building regulations, particularly with regard to changes in regulations that may affect teardowns and new construction.
- Work with surrounding communities to ensure regional cooperation and solutions for hazards affecting multiple communities such as coastal erosion.
- Encourage future development in areas that are not prone to natural hazards.
- Educate the public about natural hazards and mitigation measures.
- Make efficient use of public funds for hazard mitigation.
- Prepare to respond to various natural hazard events.
- Consider the potential impacts of future climate change. Incorporate sustainability and resiliency in hazard mitigation planning.

HAZARD MITIGATION STRATEGY

The Hingham Local Hazard Mitigation Planning Team identified a number of mitigation measures that would serve to reduce the Town’s vulnerability to natural hazard events. Overall, the hazard mitigation strategy recognizes that mitigating hazards for Hingham will be an ongoing process as our understanding of natural hazards and the steps that can be taken to mitigate their damages changes over time. Global climate change and a variety of other factors will impact the Town’s vulnerability in the future, and local officials will need to work together across municipal lines and with state and federal agencies in order to understand and address these changes. The Hazard Mitigation Strategy will be incorporated into the Town’s other related plans and policies.

PLAN REVIEW & UPDATE PROCESS

The process for developing Hingham’s Hazard Mitigation Plan 2020 Update is summarized in Table 1.

Table 1: Plan Review and Update Process

Section	Reviews and Updates
Section 3: Public Participation	The Local Hazard Mitigation Planning Team placed an emphasis on public participation for the update of the Hazard Mitigation Plan, discussing strategies to enhance participation opportunities at the first local committee meeting. During plan development, the plan was discussed at two public meetings hosted by the Hazard Mitigation Team

	and the Select Board. The plan was also available on the Town’s website for public comment. See Public Comments for feedback.
Section 4: Risk Assessment	MAPC gathered the most recently available climate, hazard, and land use data and met with town staff to identify changes in local hazard areas and development trends. Town staff reviewed critical infrastructure with MAPC staff in order to create an up-to-date list. The Risk Assessment integrates projected climate impacts. MAPC also used the most recently available version of HAZUS and assessed the potential impacts of flooding using the latest data.
Section 5: Goals	The Hazard Mitigation Goals were reviewed and endorsed by the Hingham Local Hazard Mitigation Planning Team.
Section 6: Existing Mitigation Measures	The list of existing mitigation measures was updated to reflect current mitigation activities in the town.
Sections 7 and 8: Hazard Mitigation Strategy	Mitigation measures from the 2016 plan were reviewed and assessed as to whether they were completed, in progress, or deferred. The Local Hazard Mitigation Planning Team determined whether to carry forward measures into the 2022 Plan Update or modify or delete them. The Plan Update’s hazard mitigation strategy reflects both new measures and measures carried forward from the 2016 plan. The Local Hazard Mitigation Team prioritized all of these measures based on current conditions.
Section 9: Plan Adoption & Maintenance	This section of the plan was updated with a new on-going plan implementation review and five-year update process that will assist the Town in incorporating hazard mitigation issues and opportunities into other Town planning and regulatory review processes and better prepare the Town for the next comprehensive plan update.

As indicated in Table 37, Hingham made good progress implementing mitigation measures identified in the 2016 Hazard Mitigation Plan. Hingham completed significant planning for coastal impacts, including a Climate Change Vulnerability, Risk Assessment and Adaptation Study in 2015, and an additional community workshop and climate resilience report in 2019 through the state’s Municipal Vulnerability Preparedness program. Hingham’s new Master Plan, adopted in 2021, has extensive focus on climate change and the need to adapt to increasing coastal risks. Study of, and plans for, improved seawall protection were completed and the town is seeking funds for implementation. Bank stabilization along Route 3A and beach nourishment at the Hingham Bathing Beach was also completed. Mosquito ditching improved flow on the Weir River. The Town purchased a 56-acre parcel that provides flood storage, as well as gator units for wildfire management. Finally, the town updated its erosion control bylaw.

Moving forward into the next five-year plan implementation period there will be many more opportunities to incorporate hazard mitigation into the Town’s decision-making processes. As in the past, the Town will document any actions taken within this iteration of the Hazard Mitigation Plan on challenges met and actions successfully adopted as part of the ongoing plan maintenance to

be conducted by the Hingham Hazard Mitigation Implementation Team, as described in Section 9 Plan Adoption and Maintenance.

SECTION 2: INTRODUCTION

PLANNING REQUIREMENTS UNDER THE FEDERAL DISASTER MITIGATION ACT

The Federal Disaster Mitigation Act, passed in 2000, requires that after November 1, 2004, all municipalities that wish to continue to be eligible to receive FEMA funding for hazard mitigation grants, must adopt a local multi-hazard mitigation plan and update this plan in five-year intervals. This planning requirement does not affect disaster assistance funding.

Federal hazard mitigation planning and grant programs are administered by the Federal Emergency Management Agency (FEMA) in collaboration with the states. These programs are administered in Massachusetts by the Massachusetts Emergency Management Agency (MEMA) in partnership with the Department of Conservation and Recreation (DCR).

The Town of Hingham contracted with the Metropolitan Area Planning Council (MAPC), to assist the Town in updating its third local Hazard Mitigation Plan, which was first adopted in 2008 as a multijurisdictional plan and updated as a single municipality plan in 2016.

WHAT IS A HAZARD MITIGATION PLAN?

Natural hazard mitigation planning is the process of determining how to systematically reduce or eliminate the loss of life and property damage resulting from natural hazards such as floods, earthquakes, and hurricanes. Hazard mitigation means to permanently reduce or alleviate the losses of life, injuries, and property resulting from natural hazards through long-term strategies. These long-term strategies include planning, policy changes, programs, projects, and other activities. This plan incorporates consideration of future risks due to projections for the increased frequency and severity of extreme weather fueled by a warming planet.

PREVIOUS FEDERAL/STATE DISASTERS

Since 1991, there have been 23 natural hazard events that triggered federal or state disaster declarations that included Plymouth County. These are listed in Table **Error! Reference source not found.** 2 below. The majority of these events involved flooding, while others were due to hurricanes or nor'easters, and severe winter weather.

Table 2: Presidentially Declared Disasters, 1991-2018

Disaster Name	Date of Event	Declared Areas
Hurricane Bob	August 1991	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
Severe Coastal Storm No Name Storm	October 1991	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk

Disaster Name	Date of Event	Declared Areas
Winter Coastal Storm	December 1992	Counties of Barnstable, Dukes, Essex, Plymouth, Suffolk
Blizzard	March 1993	Statewide
Blizzard	January 1996	Statewide
Severe Storms, Flood	October 1996	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
Heavy Rain, Flood	June 1998	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
Severe Storms, Flood	March 2001	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
Snowstorm	February 2003	Statewide
Snowstorm	December 2003	Barnstable, Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, Worcester
Snow	January 2005	Statewide
Hurricane Katrina	August 2005	Statewide
Severe Storms, Flooding	October 2005	Statewide
Severe Storms, Flooding	May 2006	Statewide
Severe Storm, Inland, Coastal Flooding	April 2007	Statewide
Severe Storms, Flooding	December 2008	Statewide
Severe Storms, Flooding	March/April 2010	Bristol, Essex, Middlesex, Suffolk, Norfolk, Plymouth, Worcester
Tropical Storm Irene	August 2011	Barnstable, Berkshire, Bristol, Dukes, Franklin, Hampden, Hampshire, Norfolk, Plymouth
Hurricane Sandy	October/November 2012	Barnstable, Bristol, Dukes, Nantucket, Plymouth, Suffolk

Disaster Name	Date of Event	Declared Areas
Severe Winter Storm, Snowstorm and Flooding	February, 2013	Statewide
Severe winter storm, snowstorm, and flooding	April 2015	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester
Severe winter storm and flooding	March 2018	Barnstable, Bristol, Essex, Nantucket, Norfolk, Plymouth
COVID-19	January 2020	Statewide

Source: MA Hazard Mitigation and Climate Adaptation Plan, 2018 and updated

FEMA FUNDED MITIGATION PROJECTS

Over the last 20 years the Town of Hingham has received funding from FEMA for one mitigation project under the Hazard Mitigation Grant Program (HMGP). This project totaled \$209,800 with \$157,350 covered by FEMA grants and \$52,450 by local funding. The project is summarized in Table 3 below.

Table 3: FEMA-Funded Mitigation Projects

Project Title	Scope of Work	Total Cost	Federal Funding	Local Funding
Foundry Pond Dam Improvements	Removal of dam components & appurtenant structures; reconstruction of masonry wall; construction of low level outlet and new spillway	\$209,800	\$157,350	\$52,450

(Source: database provided by MEMA)

COMMUNITY PROFILE

Hingham is located 15 miles southeast of Boston and is served by Route 3A in the northern section of Town and Route 3 in the south. The Town values its village character and scenic vistas, and its land use is predominantly residential with commercial development located adjacent to Route 3, along Route 3A and in the Downtown. Hingham has a 21-mile shoreline along the Boston Harbor and numerous open spaces including Bare Cove Park, World’s End conservation and recreation area, and Wompatuck State Park. The Town operates under a Select Board and has an Open Town Meeting form of governance.

Hingham is in the Boston Harbor watershed, entirely within the Weymouth and Weir River sub-basin, which discharges into the coastal waters of Hingham Harbor and Hingham Bay. The Town’s physical geography is part of the Boston Basin, which consists of a low coastal plain with generally gently sloping terrain.

Hingham enjoys commuter rail access to Boston on the Greenbush Line and Ferry Service from the Hingham Shipyard at Hewitt's Cove; both services are part of the Massachusetts Bay Transit System (MBTA). The population in 2020 was 24,284; Hingham has a land area of approximately 26 square miles. Hingham is bordered by the Boston Harbor to the north, the Towns of Hull, Cohasset and Scituate to the east, Norwell and Rockland to the south, and Weymouth to the west.

The Town maintains a website at <http://www.hingham-ma.gov>.

Table 4: Hingham Population Characteristics

Population: 24,284 people
<ul style="list-style-type: none">• 6% are under age 5• 26% are under age 18• 21% are over age 65• 95% of the population is White• .5% of the population is Black• 2% of the population is Asian• 1% of the population is Hispanic or Latino

Source: 2020 Census

The Town of Hingham has several unique characteristics to keep in mind while planning for natural hazards:

- Hingham has been proactive in addressing the impact of climate on natural hazards. The community is certified by the state as a Municipal Vulnerability Preparedness community. Hingham completed a detailed climate vulnerability analysis in 2015.
- Records from flooding in 2010 highlight that flood damage was widespread across the town. Flooding in 2010 resulted in 128 disaster claims; 94% of the claims were *outside* the Special Flood Hazard Zone.
- Hingham is subject to both coastal and inland flooding.
- Drought is a concern as the town relies on surface and groundwater sources for drinking water, and due to its impact on natural resources.

SECTION 3: PLANNING PROCESS & PUBLIC PARTICIPATION

MAPC employs a six-step planning process based on FEMA’s hazard mitigation planning guidance focusing on local needs and priorities but maintaining a regional perspective matched to the scale and nature of natural hazard events and regional climate change. Public participation is a central component of this process, providing critical information about the local occurrence of hazards while also serving as a means to build a base of support for hazard mitigation activities. MAPC supports participation by the general public and other plan stakeholders through two public meetings, posting of the plan to the Town’s website, and invitations sent to neighboring communities, town boards and commissions, and other local or regional entities to review the plan and provide comment.

PLANNING PROCESS SUMMARY

The six-step planning process outlined below is based on the guidance provided by FEMA’s Local Multi-Hazard Mitigation Planning Guidance. Public participation is a central element of this process, which attempts to focus on local problem areas and identify needed mitigation measures based on where gaps occur in the existing mitigation efforts of the municipality. In plan updates, the process described below allows staff to bring the most recent hazard information into the plan, including new hazard occurrence data, changes to a municipality’s existing mitigation measures, and progress made on actions identified in previous plans.

Figure 1: Six-Step Planning Process



1. **Map the Hazards** – MAPC relies on data from a number of different federal, state, and local sources in order to map the areas with the potential to experience natural hazards. This mapping represents a multi-hazard assessment of the municipality and is used as a set of base maps for the remainder of the planning process. A particularly important source of

information is the knowledge drawn from local municipal staff on where natural hazard impacts have occurred. These maps can be found in Appendix B.

- 2. Assess the Risks & Potential Damages** – Working with local staff, critical facilities, infrastructure, vulnerable populations, and other features are mapped and contrasted with the hazard data from the first step to identify those that might represent particular vulnerabilities to these hazards. Land use data and development trends are also incorporated into this analysis. In addition, MAPC develops estimates of the potential impacts of certain hazard events on the community. MAPC drew on the following resources to complete the plan:

- Hingham Zoning Bylaw
- Town of Hingham Community Resilience Building Workshop Summary of Findings 2019
- Town of Hingham Open Space and Recreation Plan 2016-2023
- Town of Hingham Climate Change Vulnerability, Risk Assessment and Adaptation Study, 2015
- Blue Hill Observatory
- Boston HIRA
- FEMA Flood Insurance Rate Maps for Hingham, MA 7/6/2021
- FEMA, Hazards U.S. Multi-Hazard
- FEMA, Local Mitigation Plan Review Guide, October 2011
- Fourth National Climate Assessment, 2018
- Massachusetts Flood Hazard Management Program
- Massachusetts Office of Coastal Zone Management Shoreline Change Data
- Massachusetts Office of Dam Safety, Inventory of Massachusetts Dams 2018
- Massachusetts State Hazard Mitigation Plan, 2013
- Massachusetts State Hazard Mitigation and Climate Adaptation Plan, 2018
- Metropolitan Area Planning Council, GIS Lab, Regional Plans and Data
- National Weather Service
- Nevada Seismological Library
- New England Seismic Network, Boston College Weston Observatory, <http://aki.bc.edu/index.htm>
- NOAA National Climatic Data Center, <http://www.ncdc.noaa.gov/>
- Northeast Climate Adaptation Science Center
- Northeast States Emergency Consortium, <http://www.nesec.org/>
- Tornado History Project
- US Census, 2010 and American Community Survey 2017 5-Year Estimates
- USGS, National Water Information System, <http://nwis.waterdata.usgs.gov/usa/nwis>

- 3. Review Existing Mitigation** – Municipalities in the Boston Metropolitan Region have an active history in hazard mitigation as most have adopted floodplain zoning districts, wetlands protection programs, and other measures as well as enforcing the State building code, which has strong provisions related to hazard resistant building requirements. Many communities have started adopting regulations designed to promote climate resilience. All current municipal mitigation measures must be documented.

4. **Develop Mitigation Strategies** – MAPC works with the local municipal staff to identify new mitigation measures, utilizing information gathered from the hazard identification, vulnerability assessments, and the community’s existing mitigation efforts to determine where additional work is necessary to reduce the potential damages from hazard events. Additional information on the development of hazard mitigation strategies can be found in Section 7.
5. **Plan Approval & Adoption** – Once a final draft of the plan is complete it is sent to MEMA for the state level review and, following that, to FEMA for approval. Typically, once FEMA has approved the plan the agency issues a conditional approval (Approval Pending Adoption), with the condition being adoption of the plan by the municipality. More information on plan adoption can be found in Section 9 and documentation of plan adoption can be found in Appendix D.
6. **Implement & Update the Plan** – Implementation is the final and most important part of any planning process. Hazard Mitigation Plans must also be updated on a five-year basis making preparation for the next plan update an important on-going activity. Section 9 includes more detailed information on plan implementation.

2016 PLAN IMPLEMENTATION & MAINTENANCE

The 2016 Town of Hingham Hazard Mitigation Plan contained a risk assessment of identified hazards for the town and mitigation measures to address the risk and vulnerability from these hazards. Since adoption of the 2016 plan, Hingham made good progress implementing mitigation measures identified in the 2016 Hazard Mitigation Plan. Hingham completed significant planning for coastal impacts, including the Climate Change Vulnerability, Risk Assessment and Adaptation Study in 2015, and an additional community workshop and climate resilience report in 2019. Hingham’s new Master Plan, adopted in 2021, has extensive focus on climate change and the need to adapt to increasing coastal risks. Study and plans for improved seawall protection were completed and the town is seeking funds for implementation. Bank stabilization along Route 3A and beach nourishment at the Hingham Bathing Beach were completed. Mosquito ditching improved flow on the Weir River. The Town purchased a 56-acre parcel that provides flood storage and gator units for wildfire management. Finally, the town updated its erosion control bylaw.

THE LOCAL HAZARD MITIGATION PLANNING TEAM

MAPC worked with the local community representatives to organize a Local Hazard Mitigation Planning Team for Hingham. MAPC briefed the local representatives as to the desired composition of that team as well as the need for public participation in the local planning process.

The Local Hazard Mitigation Planning Team is central to the planning process as it is the primary body tasked with developing a mitigation strategy for the community. The local team was tasked with working with MAPC to set plan goals, provide information on the hazards that impact the town, existing mitigation measures, and helping to develop new mitigation measures for this plan update. The Local Hazard Mitigation Planning Team membership is listed below.

Louis LaChance	Deputy Fire Chief
Steve Murphy	Fire Chief
Dave Petitti	Police Lieutenant
Emily Sullivan	Conservation Officer
Emily Wentworth	Community Planning Director
Loni Fournier	GIS Coordinator
Michael Silveira	Senior Planner
Randy Sylvester	Public Works Superintendent
Matt Cahill	Public Works
Ken Corson	Harbormaster
J.R. Frey	Town Engineer
Susan Sarni	Executive Health Officer
Michael Clancy	Building Commissioner

The Hingham Planning Board and Conservation Commission are the primary entities responsible for regulating development in town. Feedback was assured through the participation of the Conservation Administrator, and two members of the Community Planning Department. In addition, MAPC, the State-designated regional planning authority for Hingham, works with all agencies that regulate development in the region, including the listed municipal entities and state agencies, such as the Department of Transportation and the Department of Conservation and Recreation.

The Local Hazard Mitigation Planning Team met on the following dates: September 27, 2021, November 15, 2021 and March 7, 2022. The purpose of the meetings was to introduce the Hazard Mitigation planning program, consider climate impacts, review, and update hazard mitigation goals, and to gather information on local hazard mitigation issues and sites or areas related to these. Later meetings focused on verifying information gathered by MAPC staff and discussion of existing mitigation practices, the status of mitigation measures identified in the 2016 hazard mitigation plan, and potential new or revised mitigation measures. The agendas for these meetings are included in Appendix A.

PUBLIC MEETINGS

Public participation in the hazard mitigation planning process is important, both for plan development and for later implementation of the plan. Residents, business owners, and other community members are an excellent source for information on the historic and potential impacts of natural hazard events and particular vulnerabilities the community may face from these hazards. Their participation in this planning process also builds understanding of the concept of hazard mitigation and climate impacts, potentially creating support for mitigation actions taken in the future to implement the plan. To gather this information and educate residents on hazard mitigation, the Town hosted two public meetings, one during the planning process and one after a complete draft plan was available for review.

The public had an opportunity to provide input to the Hingham hazard mitigation planning process during a public meeting held on January 10, 2022, on Zoom. The Zoom presentation was rebroadcast more than a dozen times by Hingham’s local cable television provider, Harbor Media. The draft plan update was presented at a Select Board meeting on April 12, 2022. The Select Board meeting was broadcast on local cable television and available for viewing after the meeting. Both meetings were publicized in accordance with the Massachusetts Public Meeting Law. The attendance list for each meeting can be found in Table 5. See public meeting notices in Appendix C.

Table 5: Hingham Public Meetings

Meeting #1 January 10, 2022 (virtual)
Total Attendance: 24
Meeting #2 April 12, 2022
Total Attendance: 25, including 3 Select Board members

LOCAL STAKEHOLDER INVOLVEMENT

The local Hazard Mitigation Planning Team was encouraged to reach out to local stakeholders that might have an interest in the Hazard Mitigation Plan including neighboring communities, agencies, businesses, nonprofits, and other interested parties. Notice was sent to the following organizations and neighboring municipalities inviting them to review the Hazard Mitigation Plan and submit comments to the Town:

- Town of Cohasset
- Town of Scituate
- Town Norwell
- Town of Rockland
- Town of Weymouth
- Town of Hull
- Bare Cove Marina
- Weir River Estuary Park Committee
- The Friends of Wompatuck Park
- North and South Rivers Watershed Association
- South Shore Chamber of Commerce
- Hingham Downtown Association
- League of Women Voters – Hingham
- Weir River Watershed Association
- Hingham Land Trust
- Hingham Maritime Association
- Samuels Associates
- Kimball Beach Association
- Bare Cove Park Committee
- Cleaner Greener Hingham
- Climate Action Planning Committee
- Community Preservation Committee
- Harbor Development Committee
- Planning Board
- Conservation Commission
- Tree Preservation Committee
- Trustees of the Bathing Beach

See Appendix C for public meeting notices. The draft Hingham Hazard Mitigation Plan 2022 Update was posted on the Town’s website for the second public meeting. Members of the public could access the draft document and submit comments or questions to the Town.

PUBLIC COMMENT

Comments from the first public meeting focused on sewer system infrastructure and flooding due to coastal storms. A participant suggested the need for regulations to assure that owners of private sewer pumping stations take steps to protect their infrastructure. The potential for a sewer spill at Stodder’s Neck was raised. Concerns specific to infiltration and inflow issues and the need to coordinate with the MA Department of Conservation and Recreation were raised. Similarly noted, was the need to coordinate with the Town of Hull sewage treatment plant to avoid a spill at West Corner in the case of a plant failure. Rockland Street was identified as a road that flooded during the 2018 coastal storm. Concern was also expressed about the status of the bridge over the Weir River on Rockland Street. A participant asked about the risk of tsunami and whether the town has evacuation plans. Town officials responded that due to Hingham’s orientation, it is largely protected from direct tsunami impacts, although the West Corner area could be vulnerable to overwash at Straits Pond. Finally, a participant expressed concern about the state of Hingham’s power lines and their vulnerability to damage during storms. Comments after the second public meetings consisted of minor editorial corrections.

CONTINUING PUBLIC PARTICIPATION

Following the adoption of the plan update, the planning team will continue to provide residents, businesses, and other stakeholders the opportunity to learn about the hazard mitigation planning process and to contribute information that will update the town’s understanding of local hazards. As updates and a review of the plan are conducted by the Hazard Mitigation Implementation Team, these will be placed on the Town’s website, and any meetings of the Hazard Mitigation Implementation Team will be publicly noticed in accordance with town and state open meeting laws.

PLANNING TIMELINE

September 27, 2021	Meeting of the Hingham Local Hazard Mitigation Team
November 15, 2021	Meeting of the Hingham Local Hazard Mitigation Team
January 10, 2022	First Public Meeting held virtually
March 7, 2022	Meeting of the Hingham Local Hazard Mitigation Team
April, 12, 2022	Second Public Meeting with the Hingham Select Board

April 20, 2022	Draft Plan Update submitted to MEMA
April 27, 2022	Draft Plan Update submitted to FEMA
June 16, 2022	Notice of Approvable Pending Adoption sent by FEMA
June 28, 2022	Plan Adopted by the Town of Hingham
July 11, 2022	FEMA final approval of the plan for 5 years

POST-APPROVAL IMPLEMENTATION AND PLAN UPDATE TIMELINE

Late-2024	Conduct Mid-Term Plan Survey on Progress Seek FEMA grant to prepare next plan update
2026	Begin process to update the plan
2027	Submit Draft 2026 Plan Update to MEMA and FEMA
2027	FEMA approval of 2026 Plan Update

SECTION 4: RISK ASSESSMENT

The risk assessment analyzes the potential natural hazards that could occur within the Town of Hingham as well as the relationship between those hazards and current land uses, potential future development, and critical infrastructure. This section also includes a vulnerability assessment that estimates the potential damages that could result from certain large-scale natural hazard events. In order to update Hingham's risk assessment, MAPC gathered the most recently available hazard and land use data and met with Town staff to identify changes in local hazard areas and development trends. MAPC also used FEMA's damage estimation software, HAZUS.

With the adoption of the Hazard Mitigation and Climate Adaptation Plan 2018 (SHMCAP), Massachusetts became the first state to integrate climate projections in a state hazard mitigation plan. Following the state model, the projected impacts of our warming climate on natural hazards are integrated throughout the risk assessment. Key impacts include rising temperatures, which in turn affect precipitation patterns, sea level, and extreme weather.

"Global climate is changing rapidly compared to the pace of natural variations in climate that have occurred throughout Earth's history. Global average temperature has increased by about 1.8°F from 1901 to 2016, and observational evidence does not support any credible natural explanations for this amount of warming; instead, the evidence consistently points to human activities, especially emissions of greenhouse or heat-trapping gases, as the dominant cause."

Fourth National Climate Assessment, 2018 (Chapter 2-1)

CLIMATE CHANGE OBSERVATIONS AND PROJECTIONS

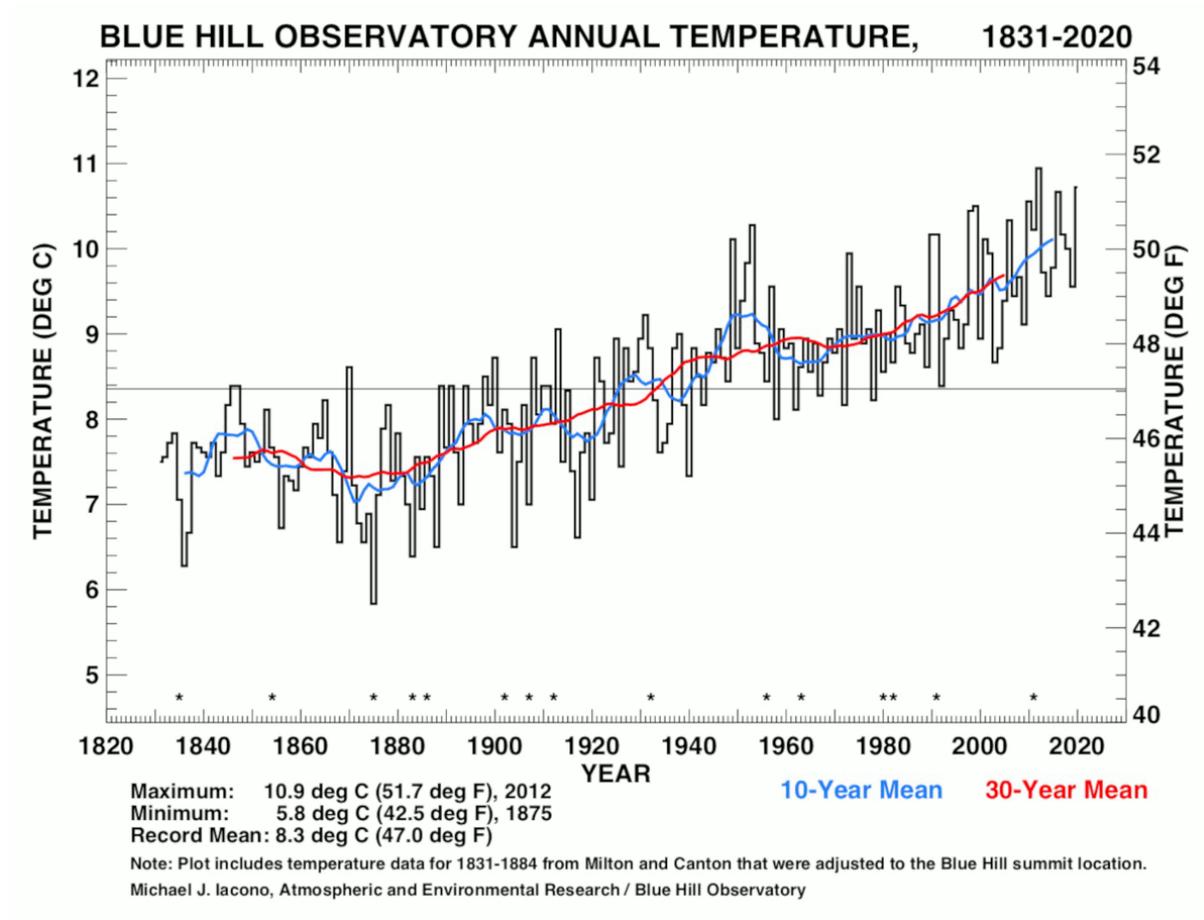
Climate change observations come from a variety of data sources that have measured and recorded changes in recent decades and centuries. Climate change projections, however, predict future climate impacts and, by their nature, cannot be observed or measured. As a result of the inherent uncertainty in predicting future conditions, climate projections are generally expressed as a range of possible impacts.

Temperature

Our climate has always been regulated by gases, including carbon dioxide, methane, and nitrous oxide, which blanket the earth. These gases trap heat that would otherwise be reflected out to space; without them our planet would be too cold to support life. We refer to these gases as "greenhouse gases" (GHGs) for their heat trapping capacity. The combustion of fossil fuels, our primary energy source in the age of industrialization, releases GHGs into the atmosphere. In the past century, human activity associated with industrialization has contributed to a growing concentration of GHGs in our atmosphere.

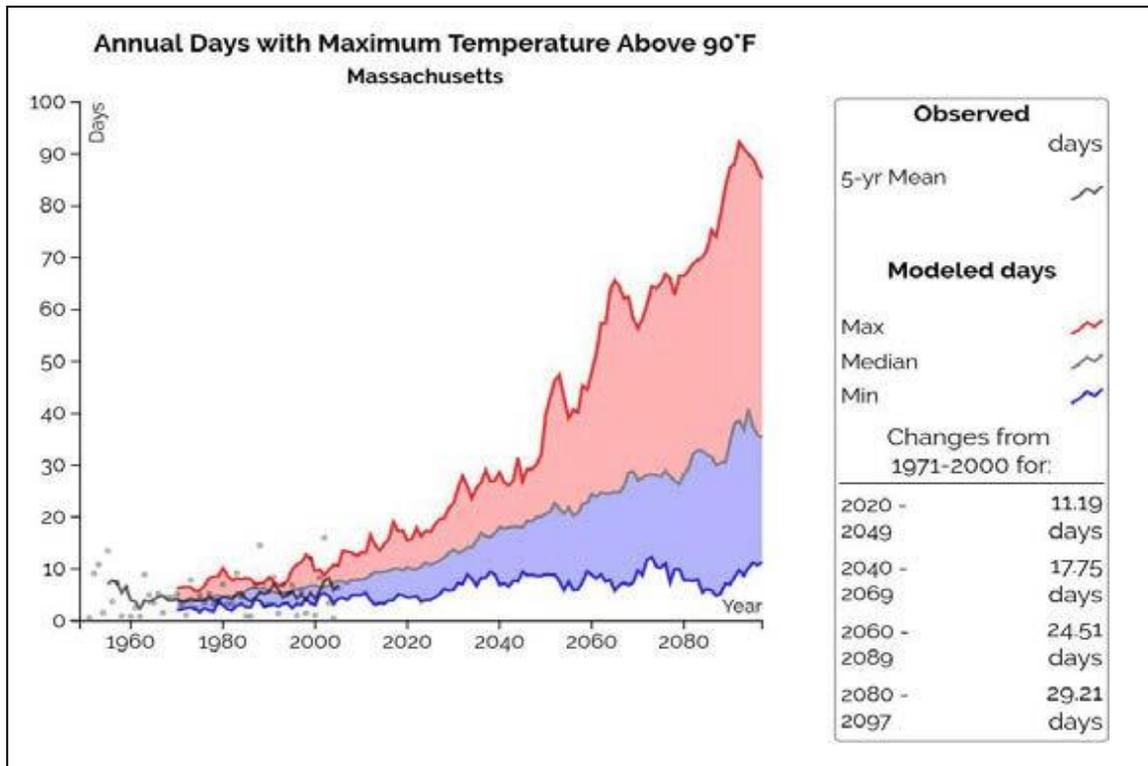
Records from the Blue Hill Observatory in Milton, MA show that average temperatures (30-year mean) have risen approximately 3 degrees (F) in the almost 200 years since record keeping began in 1831.

Figure 2: Observed Increase in Temperature



Climate projections include an increase in average temperature and in the number of extreme heat days. Extreme cold days are projected to decrease in number. The Northeast Climate Adaptation Science Center (NECASC) projects average temperatures in Massachusetts will increase by 5 degrees F by mid-century and nearly 7 degrees F by the end of the century. Figure 3 shows the NECASC range of projections for increases in the number of days over 90 degrees annually.

Figure 3: Projected Increase in Annual Days Over 90 Degrees F



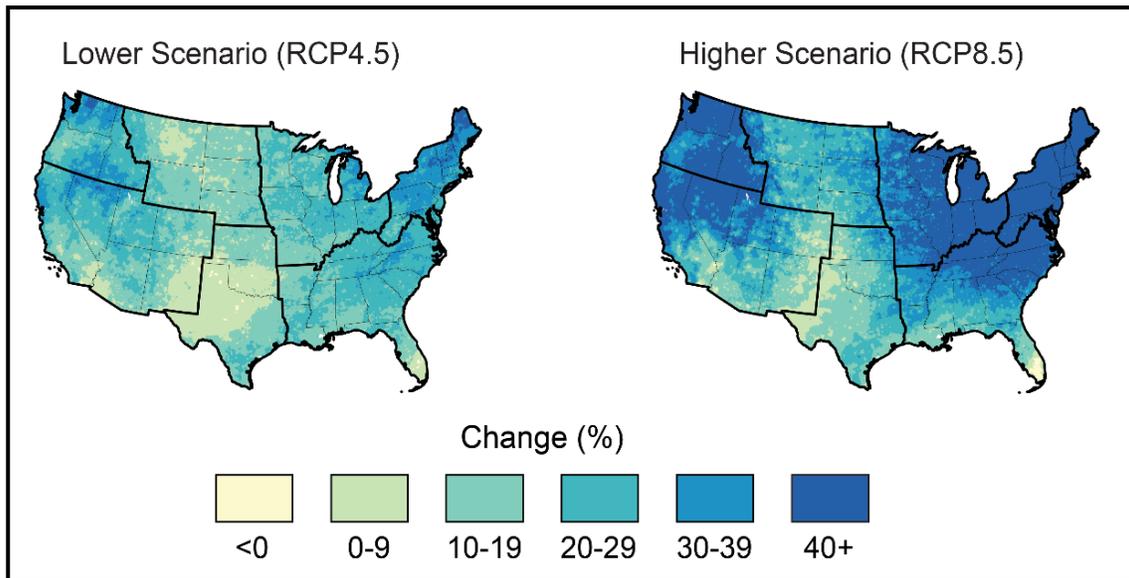
Source: Northeast Climate Adaptation Science Center

Precipitation Patterns

Annual precipitation in Massachusetts has increased by approximately 10% in the fifty-year period from 1960 to 2010 (MA Climate Adaptation Report, 2011). Moreover, there has been a significant increase in the frequency and intensity of large rain events. For the Northeast US, according to the Fourth National Climate Assessment 2018, in the past sixty years there has been a 55% increase in the amount of annual precipitation that falls in the top 1% of storm events (Figure 4). Changes in precipitation are fueled by warming temperatures which increase evaporation and, therefore, the amount of water vapor in the air.

Total annual precipitation in Massachusetts is projected to increase by 1 to 6 inches by mid-century, and by 1.2 to 7.3 inches by the end of this century (SHMCAP p. 2-22). The Fourth National Climate Assessment predicts that the pattern of increasing frequency and intensity of extreme rain events will continue. By 2070 to 2099, (relative to 1986 to 2015) they project a 30-40% increase in total annual precipitation falling in the heaviest 1% of rain events (Figure 5).

Figure 5: Projected Change in Total Annual Precipitation Falling in the Heaviest of 1% of Events for 2070-2099

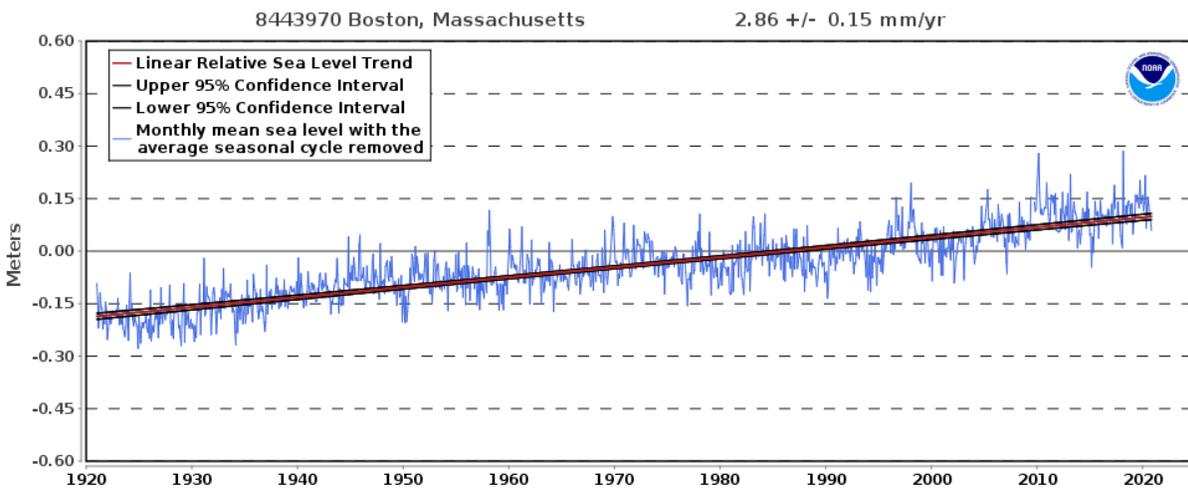


Source: Fourth National Climate Assessment, 2018

Sea Level Rise

Records from the Boston Tide Station show nearly one foot of sea level rise in the past century (Figure 6). Warming temperatures contribute to sea level rise in two ways. First, warm water expands to take up more space. Second, rising temperatures are melting land-based ice which enters the oceans as melt water. A third, quite minor, contributor to sea level rise in New England is not related to climate change. New England is still experiencing a small amount of land subsidence (drop in elevation) in response to the last glacial period.

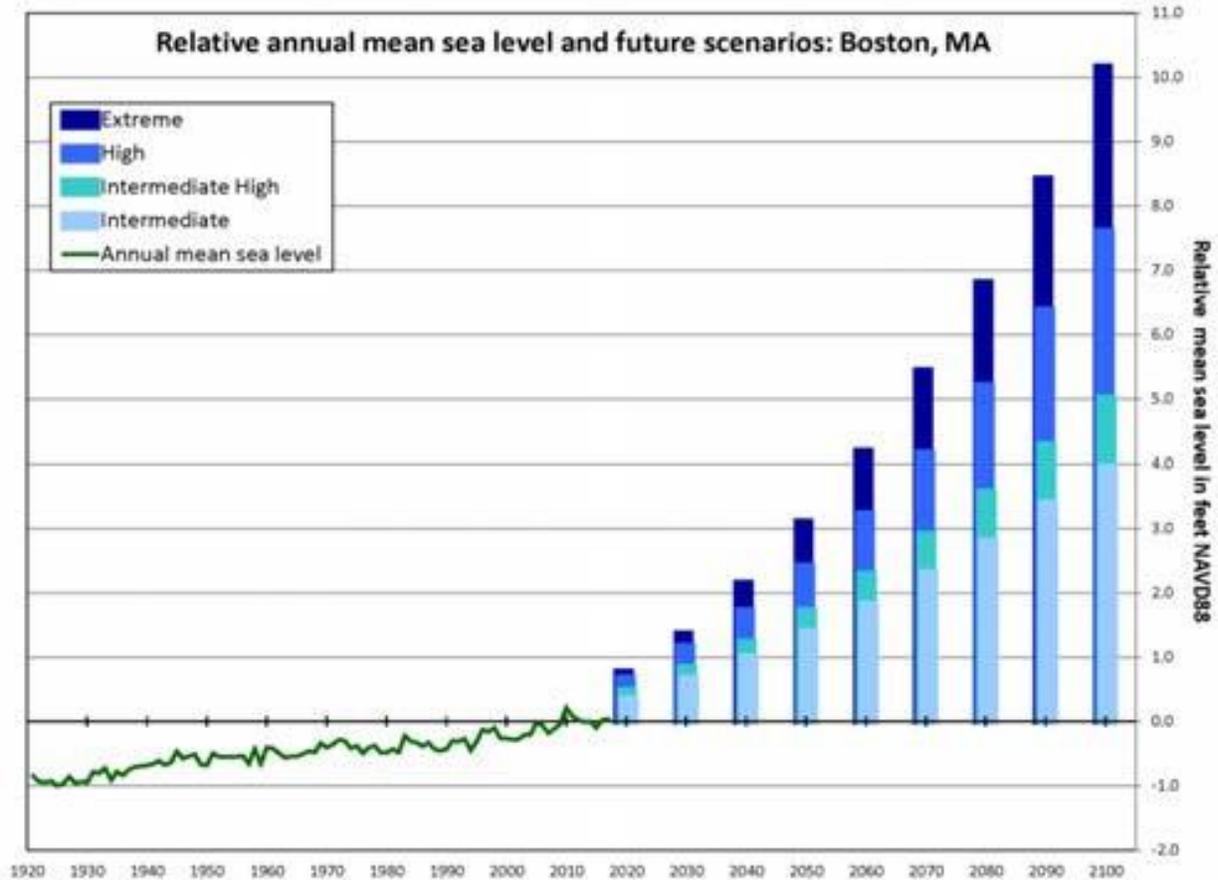
Figure 6: Observed Increase in Sea Level Rise



Source: NOAA

Projections of sea level rise through 2100 vary significantly depending on future greenhouse gas emissions and melting of land-based glaciers. Currently sea level is rising at an increasing rate. Figure 7 shows the recent rate of sea level rise, and a range of sea level rise scenarios. Projections for 2100 range from 4 feet to 10 feet. With ten feet representing the most extreme scenario. For 2050, the projections range approximately 1.5 to 3 feet.

Figure 7: Recent and Projected Increase in Sea Level Rise



Source: SHMCAP

Following the outline of the Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), this local hazard mitigation plan organizes consideration of natural hazards based on their relationship to projected climate changes. Table 6 below, from the SHMCAP, summarizes the natural hazards reviewed in this plan, climate interactions, and expected impacts.

It should be noted that ice jams are an unlikely natural hazard; with only two occurrences in Plymouth County in 1970 and 1971. There was no damage reported as a result of these ice jams and Hingham has chosen not to profile ice jams since they are a secondary hazard.

Table 6: Climate Change and Natural Hazards

Primary Climate Change Interaction	Natural Hazard	Other Climate Change Interactions	Representative Climate Change Impacts
 <p>Changes in Precipitation</p>	Inland Flooding	Extreme Weather	Flash flooding, urban flooding, drainage system impacts (natural and human-made), lack of groundwater recharge, impacts to drinking water supply, public health impacts from mold and worsened indoor air quality, vector-borne diseases from stagnant water, episodic drought, changes in snow-rain ratios, changes in extent and duration of snow cover, degradation of stream channels and wetland
	Drought	Rising Temperatures, Extreme Weather	
	Landslide	Rising Temperatures, Extreme Weather	
 <p>Sea Level Rise</p>	Coastal Flooding	Extreme Weather	Increase in tidal and coastal floods, storm surge, coastal erosion, marsh migration, inundation of coastal and marine ecosystems, loss and subsidence of wetlands
	Coastal Erosion	Changes in Precipitation, Extreme Precipitation	
	Tsunami	Rising Temperatures	
 <p>Rising Temperatures</p>	Average/Extreme Temperatures	N/A	Shifting in seasons (longer summer, early spring, including earlier timing of spring peak flow), increase in length of growing season, increase of invasive species, ecosystem stress, energy brownouts from higher energy demands, more intense heat waves, public health impacts from high heat exposure and poor outdoor air quality, drying of streams and wetlands, eutrophication of lakes and ponds
	Wildfires	Changes in Precipitation	
	Invasive Species	Changes in Precipitation, Extreme Weather	
 <p>Extreme Weather</p>	Hurricanes/Tropical Storms	Rising Temperatures, Changes in Precipitation	Increase in frequency and intensity of extreme weather events, resulting in greater damage to natural resources, property, and infrastructure, as well as increased potential for loss of life
	Severe Winter Storm / Nor'easter	Rising Temperatures, Changes in Precipitation	
	Tornadoes	Rising Temperatures, Changes in Precipitation	
	Other Severe Weather (Including Strong Wind and Extreme Precipitation)	Rising Temperatures, Changes in Precipitation	
Non-Climate-Influenced Hazards	Earthquake	Not Applicable	There is no established correlation between climate change and this hazard

OVERVIEW OF HAZARDS AND IMPACTS

Table 7 summarizes the frequency and severity of hazard risks for Massachusetts and Hingham. The Massachusetts frequency assessment is based on data in the SHMCAP. The Hingham frequency assessment reflects data from the National Climatic Data Center (NOAA) for Plymouth County*, from the SHMCAP** and, from the local Hazard Mitigation Team***.

Table 7: Hazards Risk Summary

Hazard	Frequency	
	Massachusetts	Hingham
Inland Flooding	43 floods per year	2.6 floods per year*
Drought	2% chance of drought warning in any given month	2% chance of drought warning in any given month**
Landslides	1 notable event every other year	None recorded***
Coastal Flooding	6 floods per year	3.6 floods per year*
Coastal Erosion	Highly variable (frequency can't be measured)	Mostly stable***
Tsunami	1 in 39 years	1 in 39 years**
Extreme Temperatures	2 heat events and 1.5 cold events yearly	1 heat event every 2.5 years and 1 cold event every five years*
Brush Fires	One notable event per year	Annual occurrences of minor events***
Invasives	Increasing	Increasing***
Hurricane/Tropical Storm	One storm every two years	2 tropical storms since 1888
Severe Winter Storms/Nor'easters	One notable winter storm and one nor'easter per year	1.6 per year*
Tornadoes	1.7 per year	None recorded
Other Severe Weather (Thunderstorms/High Winds)	20-30 thunderstorms annually; 43.5 high wind events annually	3.6 thunderstorms per year*
Earthquake	10 - 15% chance of Mag 5 in a 10-year period	10 - 15% chance of Mag 5 in a 10-year period ***

CHANGING PRECIPITATION PATTERNS

INLAND FLOODING

Inland flooding can be associated with overflowing rivers and streams, stormwater flooding associated with impervious surfaces and stormwater infrastructure, and in more rare cases ice jams, ground failures (erosion), and in some communities beaver dams. Inland flooding is generally caused by hurricanes, nor'easters, severe rainstorms, and thunderstorms. Nor'easters can occur at any time of the year, but they are most common in winter. Hurricanes are most common in the summer and early fall. Large rainstorms or snowfalls can also lead to inland flooding. Climate change has the potential to exacerbate these issues over time due to increasing extreme rainfall events. Increase in average annual rainfall may also lead to more incidents of basement flooding caused by high seasonal groundwater levels.

Flooding was the most prevalent serious natural hazard identified by local officials in Hingham. The Town of Hingham is subject to two kinds of flooding; coastal flooding (discussed further under Sea Level Rise) where wind and tide leads to flooding along the shore and tidal waterways and inland flooding where the rate of precipitation or amount of water overwhelms the capacity of natural and structured drainage systems to convey water causing it to overflow the system. Inland flooding is significant and widespread across Hingham.

The March 2010 rainstorms fit the profile of a type of event expected to increase in frequency as the climate warms. That is, significant precipitation, falling in late winter as rain rather than snow, on ground saturated with snow melt, and while vegetation is still dormant. The Blue Hill Observatory in Milton recorded 17.7 inches of rain from three storms in the 19 days from March 13 to 31. The USGS gage for the Weir River at Leavitt Street in Hingham does not have flow records for 2010. However, the gage records for Whitman's Pond Dam in nearby Weymouth showed the highest surge since data were available in 2008 on March 15, 2010 (Figure 8). The March 2010 storms were a federally declared disaster making federal assistance available to residents who did not carry flood insurance. Based on the claims, Hingham experienced significant flood damage with eight flood insurance claims and 128 disaster claims, 94% of which were located *outside* of FEMA Special Flood Hazard Areas. The claims are widespread across Hingham as shown in Figure 9 below.

Figure 8: March 2010 USGS Whitman's Pond

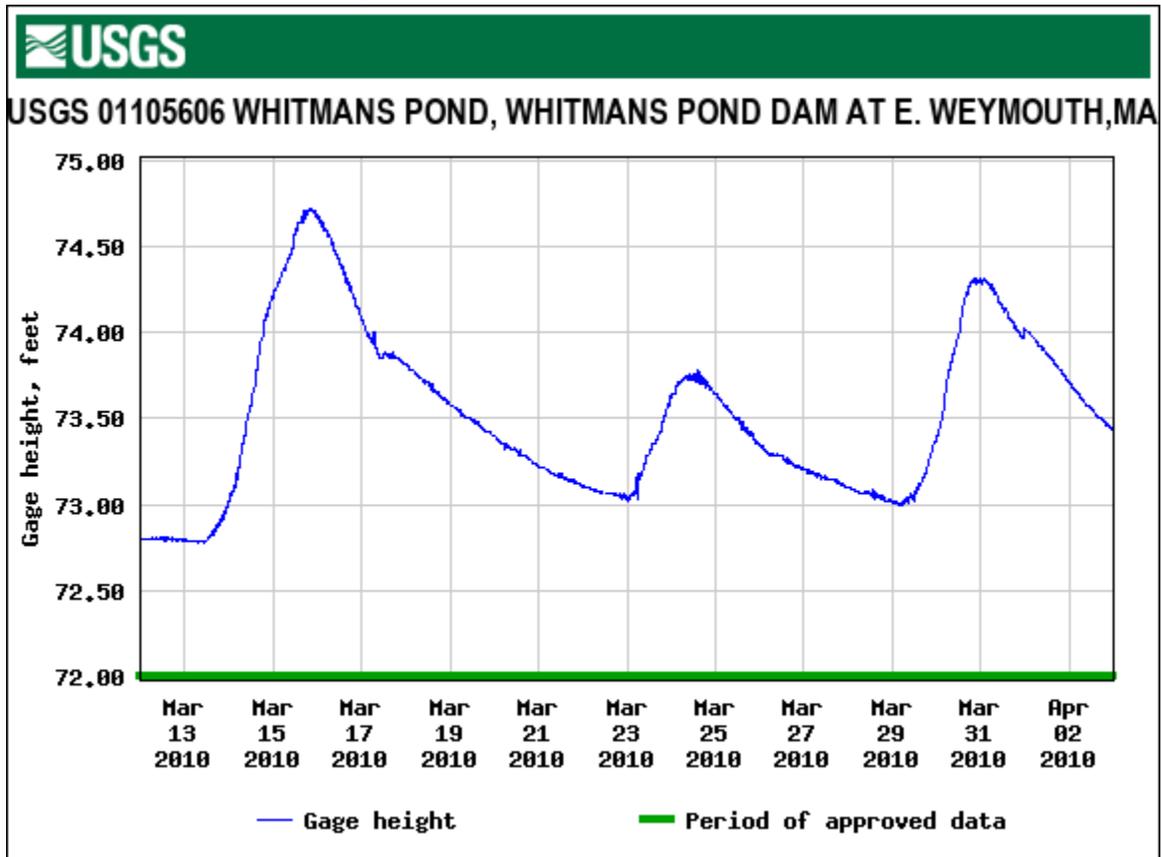
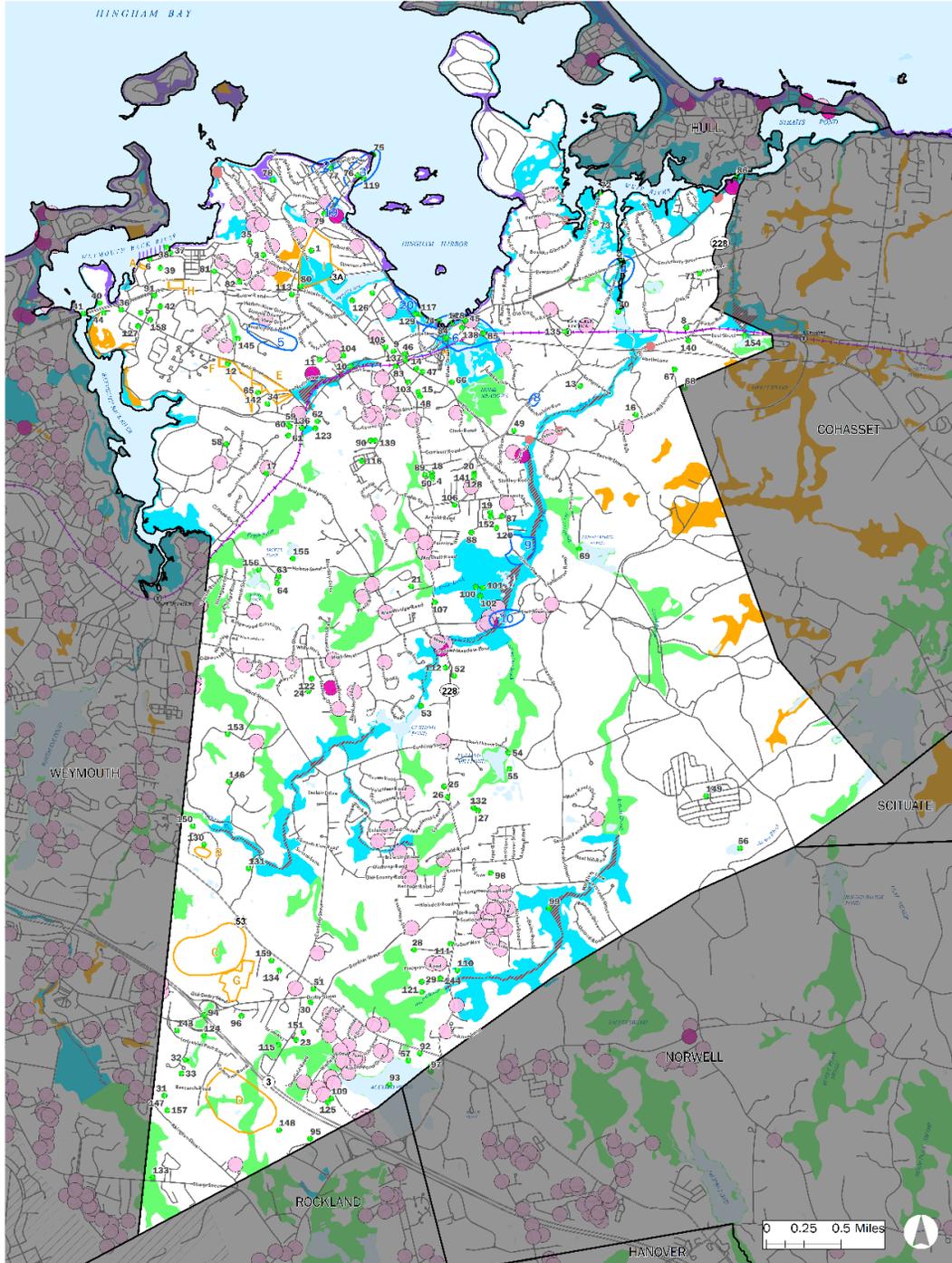
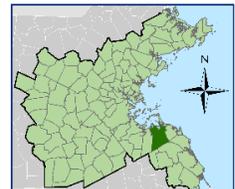


Figure 9: March 2010 Disaster Claims



Map 3: Flood Zones
 MAPC dcr
 FEMA Hazard Mitigation Planning Grant
 HINGHAM

- Sites**
- Critical Infrastructure Sites*
 - Repetitive Loss Sites
 - * See details in separate table
- Flood Zones, 2017 (Annual Chance)**
- A: 1% Annual Chance of Flooding, w/ BFE
 - AE: 1% Annual Chance of Flooding, with BFE
 - AE: Regulatory
 - VE: High Risk Coastal
 - X: 0.2% Annual
- March 2010 Flood Claims**
- Disaster Assistance
 - Flood Insurance
- Locally Identified Hazard Areas***
- Flooding
 - See Section 7 Risk Assessment
 - Development Areas*
 - * See details in separate table
- Train Stations
 — Computer
 — Rail Lines
 — Trains



The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis.

Produced by:
 Metropolitan Area Planning Council
 60 Temple Place, Boston, MA 02111 | (617) 933-0700

Data Sources:
 Metropolitan Area Planning Council (MAPC)
 Massachusetts Geographic Information System (MassGIS)
 Massachusetts Department of Transportation (MassDOT)
 Massachusetts Emergency Management Agency (MEMA)
 Massachusetts Department of Conservation and Recreation (DCR)

March 2022

Local data for previous flooding occurrences are not collected by the Town of Hingham. The best available local data is for Plymouth County through the National Climatic Data Center. Plymouth County, which includes the Town of Hingham, experienced 29 flood events from 2010 to 2021. No deaths or injuries were reported and the total reported property damage in the county was \$24.3 million dollars. Nearly all of the damage is attributed to the events in March 2010. This is an average of 2.6 flood events each year. Measures of flooding severity include river forecasts of minor, moderate, or severe flooding.

Table 8: Plymouth County Flood Events, 2010 through 2019

Date	Deaths	Injuries	Property Damage
3/14/2010	0	0	16.2M
3/29/2010	0	0	8M
4/1/2010	0	0	0
7/13/2011	0	0	5K
8/10/2012	0	0	3K
5/11/2013	0	0	0
5/11/2013	0	0	0
6/7/2013	0	0	0
9/3/2013	0	0	0
3/30/2014	0	0	0
10/22/2014	0	0	0
11/17/2014	0	0	0
05/31/2015	0	0	0
07/28/2015	0	0	15K
09/10/2015	0	0	0
10/29/2015	0	0	0
05/30/2016	0	0	0
04/01/2017	0	0	5K
04/06/2017	0	0	5K
6/24/2017	0	0	1K
10/25/2017	0	0	0
10/29/2017	0	0	0
1/12/2018	0	0	0
11/3/2018	0	0	1K
4/15/2019	0	0	0
7/12/2019	0	0	0
7/22/2019	0	0	0
9/2/2019	0	0	2K
7/12/2021	0	0	0
	0	0	24.3 M

Source: NOAA, National Climatic Data Center

ICE JAMS

Ice jams occur in cold weather when normally flowing water begins to freeze effectively damming the waterway and causing localized flooding in the area. Flooding may also occur when ice jams break up and ice may pile up at culverts or around bridges. There is no recent history of ice jams leading to flooding in Hingham and Town staff did not identify this hazard as an issue for the town.

DAM FAILURE OR OVERTOPPING

Dams can fail because of structural problems or age, independent of any storm event. Earthquakes can be a cause of dam failure by causing structural damage. Dams can also fail structurally because of flooding arising from a storm, or they can overspill due to flooding. In the event of a dam failure, the energy of the water stored behind even a small dam can cause loss of life and property damage if there are people or buildings downstream. The number of fatalities from a dam failure depends on the amount of warning provided to the population and the number of people in the path of the dam's floodwaters.

A concern for dams in Massachusetts is that many were built in the 19th century without the benefits of modern engineering or construction oversight. In addition, some dams have not been properly maintained. The increasing intensity of precipitation is the primary climate concern related to dams, as they were most likely designed based on historic weather patterns. The SHMCAP indicates that changing precipitation patterns may increase the likelihood of overflow events. Dam failure is a highly infrequent occurrence, but a severe incident could result in loss of lives and significant property damage. According to the Association of State Dam Safety Officials, three dams have failed in Massachusetts since 1984, one of which resulted in a death.

Data in this chart from August 2018 were provided by the DCR Office of Dam Safety.

Table 9: Status of Dams in Hingham

Dam Name	River	Owner	Hazard Classification
Fulling Mill Pond Dam	Fulling Mill Brook	Town of Hingham	Significant
Cushing Pond Dam	Crooked Meadow River	Private	Significant
Triphammer Pond Dam	Tributary of Weir River	Town of Hingham	Low
Accord Pond Dam	Accord Brook	Town of Hingham	Significant
Foundry Pond Dam	Weir River	Town of Hingham	Low
Skating Club Pond Dam	Turkey Hill Run	Town of Hingham	N/A
Holly Pond Dam	Aaron River	Department of Conservation and Recreation	N/A

Woodpecker Pond Dam		Department of Conservation and Recreation	Low
Patterson Pond Dam		Not available (unregulated)	N/A

Source: DCR Office of Dam Safety

DCR Dam Hazard Classification

High: Dams located where failure or mis-operation will likely cause loss of life and serious damage to homes(s), industrial or commercial facilities, important public utilities, main highways(s) or railroad(s).

Significant: Dams located where failure or mis-operation may cause loss of life and damage home(s), industrial or commercial facilities, secondary highway(s), or railroad(s)

Low: Dams located where failure or mis-operation may cause minimal property damage to others. Loss of life is not expected.

There are two additional dams in Hingham that are not listed in the DCR inventory of dams.

Hobart Street Dam – This dam is an impoundment on Brewer Pond and is a publicly-owned structure.

Cranberry Pond - This dam is an impoundment on Cranberry Pond and is a publicly-owned structure.

The Town of Hingham owns and operates four dams listed on the Massachusetts inventory of dams: the Accord Pond Dam, Foundry Pond Dam, Fulling Mill Pond Dam, and Triphammer Pond Dam. The Weir River Water System manages the Accord and Fulling Mill Dams, and the Conservation Commission manages the Foundry and Triphammer Dams. The Accord and Fulling Mill Dams are managed for water supply purposes, and the Foundry and Triphammer Dams are managed for recreational purposes, as well as wildlife and fish habitat. According to a 2019 assessment, Accord Dam is in fair condition and is classified as a significant hazard potential due to its proximity to Route 53 and commercial areas. According to a 2016 assessment, Foundry Dam is in satisfactory condition and is classified as a low hazard potential due to its minimal storage capacity and proximity to open space and low density residential areas. According to a 2019 assessment, Fulling Mill Dam is in fair condition and is classified as a significant hazard potential due to its high storage capacity and location upstream of residential areas. According to a 2016 assessment, Triphammer Dam is in poor condition and is classified as a low hazard potential due to its minimal storage capacity and proximity to residential areas.

LOCALLY IDENTIFIED AREAS OF INLAND FLOODING

Information on potential flood hazard areas was taken from two sources. The first is the National Flood Insurance Rate Maps (FIRM). The FIRM flood zones are shown on Map 3 in Appendix B. The “Locally Identified Areas of Flooding” described below were identified by Town staff as areas where flooding is known to occur. These areas do not necessarily coincide with the flood zones on

the FIRMs. Flood sources include inadequate drainage systems, high groundwater, coastal storms, or other local conditions that may not be within a Special Flood Hazard Area. The numbers correspond to the numbers on Map 8, “Local Hazard Areas.”

Table 10: Locally Identified Areas of Flooding

Map ID	Name
2	North Beach
3	Yacht Club
4	Kilby Street and Rockland Street
5	Bradley Park Drive
6	North Street/Water Street/Summer Street
8	East Street/Joy Lane
9	Fountainbleau Drive
19	Downer Avenue at Walton Cove
20	Hingham Bathing Beach

REPETITIVE LOSS STRUCTURES

As defined by FEMA, a repetitive loss property is a NFIP-insured structure that has had two or more paid flood losses of \$1,000 or more in any given 10-year period since 1978. There are 16 repetitive loss properties in Hingham. The properties are shown on the maps in Appendix A.

****FEMA was only able to provide partial information for the repetitive loss properties. We did not receive updated locations for the repetitive loss properties; the maps include repetitive loss properties from the previous plan. MAPC submitted a request for the data to FEMA in August 2021. https://www.fema.gov/txt/rebuild/repetitive_loss_faqs.txt and <https://www.fema.gov/repetitive-flood-claims-grant-program-fact-sheet>.**

Table 11 summarizes the number and location of repetitive loss structures located within Hingham and the number of losses and total claims associated with them. The 16 repetitive loss properties had a total of 50 losses from 1978 to 2020, totaling \$901,431 in paid claim. **FEMA was not able to provide updated information on the location of claims. Repetitive loss information will be updated upon receipt from FEMA.**

Table 11: Summary of Repetitive Losses and Claims

	A, AE, AO, AH Zones	VE Zone	X Zones	Total
Number of Properties	NA	NA	NA	16
Number of Losses	NA	NA	NA	50
Total Payments	NA	NA	NA	\$901,431

Source: FEMA Repetitive Loss data

DROUGHT

Drought is a temporary irregularity in precipitation and differs from aridity since the latter is restricted to low rainfall regions and is a permanent feature of climate. Drought is a period characterized by long durations of below normal precipitation. Drought conditions occur in virtually all climatic zones, yet its characteristics vary significantly from one region to another since it is relative to the normal precipitation in that region. Drought can affect agriculture, water supply, aquatic ecology, wildlife, and plant life.

Droughts are projected to increase in frequency and intensity in the summer and fall as weather patterns change. Factors contributing to this include increasing evaporation as a result of warmer weather, earlier snow melt, and more extreme weather patterns. Drought impacts can include reduced groundwater and surface water levels, affecting water quality and quantity, and the organisms that rely on aquatic resources. Drought also increases stress on plant communities and, the likelihood of forest and brush fires. Communities may be affected by water use restrictions, affecting drinking water supply and outdoor water use. Economic sectors impacted could include recreation, agriculture, and forestry.

Five levels of drought have been developed to characterize drought severity: Normal, Advisory, Watch, Warning, and Emergency. These drought levels are based on the conditions of natural resources and are intended to provide information on the current status of water resources. The levels provide a basic framework from which to take actions to assess, communicate, and respond to drought conditions.

Hingham does not collect data relative to drought events. Because drought tends to be a regional natural hazard, this plan references state data as the best available data for drought. Drought is a townwide hazard in Hingham. The SHMCAP using data collected since 1850, calculates that statewide there is a 1% chance of being in a drought emergency in any given month. For drought warning and watch levels, the chance is 2% and 8% respectively in any given month (Table 12).

Table 12: Frequency of Massachusetts Drought Levels

Drought Level	Frequency Since 1850	Probability of Occurrence in a Given Month
Drought Emergency	5 occurrences	1% chance
Drought Warning	5 occurrences	2% chance
Drought Watch	46 occurrences	8% chance

Source: SHMCAP

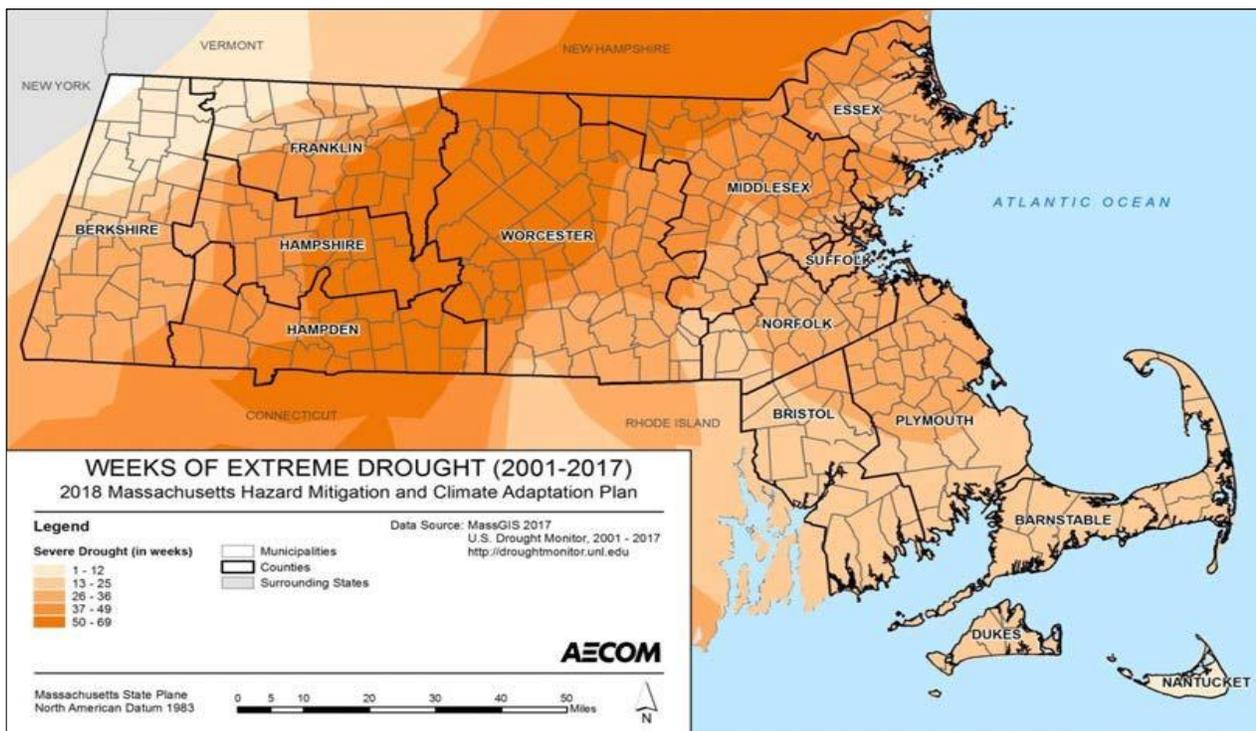
Drought emergencies have been reached infrequently, with five events occurring between 1850 and 2012: 1883, 1911, 1941, 1957, and 1965 to 1966. Due to its long duration, the drought from 1965 to 1966 is viewed as the most severe drought to have occurred in Massachusetts in modern times. The drought that extended from July 2016 to April 2017 reached the Drought Warning level. Determinations regarding the end of a drought or reduction of the drought level

focus on two key drought indicators: precipitation and groundwater levels. These two factors have the greatest long-term impact on stream flow, water supply, reservoir levels, soil moisture, and the potential for forest fires.

The U.S. Drought Monitor characterizes droughts as moderate, severe, extreme, or exceptional. Severe drought is characterized by likely crop and pasture losses, water shortages, and water restrictions. As shown in Figure 9 below, Hingham experienced between 26 and 36 weeks of severe drought between 2001 and 2017.

Drought is an important issue because Hingham relies on surface and groundwater sources for its public drinking water supply. Potential impacts to private wells was also identified as a concern. In addition, the team noted concerns for impact on natural resources including low flow in streams and an increased potential for brushfires.

Figure 10: Weeks of Severe Drought (2001-2017)



Source: SHMCAP

LANDSLIDES

According to the U.S. Geological Survey, “The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other contributing factors.” Among the contributing factors are erosion by rivers or ocean waves over steepened slopes; rock and soil slopes weakened through saturation by snowmelt or heavy rains; earthquake created stresses that make weak slopes fail; excess weight from accumulation of rain

or snow; and stockpiling of rock or ore from waste piles or man-made structures. In Massachusetts, according to the SHMCAP, the most common cause of landslides are geologic conditions combined with steep slopes and/or heavy rains. Landslides associated with heavy rains typically occur on steep slopes with permeable soils underlain by till or bedrock.

Landslides can result from human activities that destabilize an area or can occur as a secondary impact from another natural hazard, such as flooding. In addition to structural damage to buildings and the blockage of transportation corridors, landslides can lead to sedimentation of water bodies. Typically, a landslide occurs when the condition of a slope changes from stable to unstable. Natural precipitation such as heavy snow accumulation, torrential rain, and run-off may saturate soil, creating instability enough to contribute to a landslide. More frequent extreme rain events may increase the chance of landslides as saturated soils are conducive to landslides. Drought may also increase the likelihood of landslides if loss of vegetation decreases soil stability. The most current available data from the 2108 SHMCAP, utilizes data from the MA Department of Transportation from 1986 to 2006 to estimates that, on average, roughly one to three known landslides have occurred each year. Further, the SHMCAP noted that eight noteworthy events occurred from 1996 to 2012. There is no other available database that tracks landslide events. A slope stability map published by the MA Geological Survey and UMass-Amherst indicates that the most significant risk of landslide is in western Massachusetts. According to the SHMCAP, factors that influence landslide severity include soil properties, topographic position and slope, and historical incidence.

The southwest corner of Hingham is classified as having a low incidence of landslides. The rest of Hingham is classified as having moderate susceptibility and low incidence (see Map 4, Appendix B). Should a landslide occur in the future, the type and degree of impacts would be highly localized. The town's vulnerabilities could include damage to structures, damage to transportation and other infrastructure, and localized road closures. Injuries and casualties, while possible, would be unlikely given the low extent and impact of landslides in Hingham.

SEA LEVEL RISE

COASTAL FLOODING

Coastal flooding is most often associated with severe coastal storms that, through the combination of winds and tides, drive tidal waters to higher levels than normally experienced, leading to the inundation of low-lying land areas and the overtopping of sea walls. In low-lying areas coastal flooding can also be associated with routine tidal flooding or higher astronomic tides. Fueled by the warming climate, coastal flooding will become more frequent and severe due to the combination of sea level rise and more frequent and intense storms.

Although Hingham is sheltered from direct ocean impacts of coastal storms, coastal flooding and sea level rise are critical concerns. Hingham is investing significant capital funds in repairing and elevating seawalls and buttressing natural protection. Projections of future sea level rise identify locations that will be subject to flooding in future years. While those areas do expand with

increasing sea level, the more significant impact will be frequent and deeper flooding in the locations already subject to coastal flooding.

Map 10 in Appendix B identifies areas predicted to be inundated at mean high water for sea level rise scenarios of one, three, six, and ten feet. It should be noted that the maps reflect static sea level rise and do not take into account storm surge.

Local data for previous coastal flooding occurrences are not collected by the Town of Hingham. The best available local data is for Plymouth County through the National Climatic Data Center. Plymouth County, which includes the Town of Hingham, experienced 36 coastal flood events from 2011 through 2021 (see Table 13). No deaths and two injuries were reported and the total reported property damage in the county was \$12.83 million dollars. This is an average of 3.6 coastal floods each year. Measure of the severity of coastal flooding include water level elevation and duration of the event. The National Weather Service issues minor, moderate, and major coastal flood warnings.

Table 13: Plymouth County Coastal Floods, 2011 – 2021

DATE	DEATHS	INJURIES	PROPERTY DAMAGE
10/30/2011	0	0	10,000
11/23/2011	0	0	0
6/3/2012	0	1	35,000
6/4/2012	0	0	0
6/4/2012	0	0	40,000
10/29/2012	0	0	645,000
10/29/2012	0	0	322,000
12/27/2012	0	0	0
12/27/2012	0	0	0
2/9/2013	0	0	9,200,000
3/7/2013	0	0	500,000
12/15/2013	0	0	0
1/2/2014	0	0	0
1/2/2014	0	0	0
1/3/2014	0	0	0
3/26/2014	0	0	0
10/22/2014	0	0	75,000
10/23/2014	0	0	0
11/2/2014	0	0	0
1/27/2015	0	1	1,500,000
2/15/2015	0	0	0
10/2/2015	0	0	0
1/23/2016	0	0	0
1/24/2016	0	0	3,000
2/8/2016	0	0	0

1/4/2018	0	0	500,000
1/30/2018	0	0	0
3/2/2018	0	0	0
3/8/2018	0	0	0
10/27/2018	0	0	0
11/25/2018	0	0	0
1/20/2019	0	0	0
4/3/2020	0	0	2,000
9/22/2020	0	0	0
12/17/2020	0	0	0
2/2/2021	0	0	0
	0	2	12.83 M

Source: NOAA, National Climatic Data Center

COASTAL EROSION

Coastal shorelines change constantly in response to storms, seasons, sea level, and human alterations. Coastal erosion is measured as a rate of change over time. According to the SHMCAP frequency of erosion cannot be measured. Rising seas and more frequent and intense storms will tend to increase erosion, although some areas may actually accrete material. Erosion may be exacerbated by efforts to protect shorelines as when engineered hard structures reduce sediment sources to downdrift areas or increase erosion seaward of structures due to interaction with waves. The severity of erosion is related to such factors as exposure to high energy waves, sediment size, sea level rise, near-shore bathymetry, and human interference with sediment supply.

Massachusetts Coastal Zone Management (MA CZM) in cooperation with the U. S. Geological Survey (USGS) provides shoreline change data for the Massachusetts coast. The most recently available data provide long-term (1800's – 2014) and short-term (1970-2014) data. Likely reflecting Hingham's relatively protected shoreline, the analysis for Hingham mostly shows no statistical change in the shoreline from 1892 to 2013. Hingham did, however, complete a bank stabilization and beach nourishment project at the Hingham bathing beach. [Massachusetts Coastal Erosion Viewer \(arcgis.com\)](#)

Figure 11: Coastal Erosion



TSUNAMI

A tsunami is a surge of water typically caused by an offshore earthquake. Other cause may include volcanos and landslides. Tsunamis can cause wave heights of 100 feet or more. According to the SHMCAP, Massachusetts has never experienced a significant tsunami, although two tsunamis have occurred with no deaths or damages recorded. Damage from a tsunami could be very significant, but it is a low likelihood event, having occurred approximately once every 39 years along the entire east coast. No tsunami has impacted Massachusetts since 1950. According to the SHMCAP, collapse of glaciers resulting from our warming climate could cause landslides that could generate tsunamis more powerful than those caused by earthquakes. The severity of a tsunami is related to its wave height at the shore, and the extent of runup. Areas most at risk would be the locations that currently experience flooding during storm tides. Hingham would likely be less impacted than other coastal communities as it is not directly exposed to open ocean.

RISING TEMPERATURES

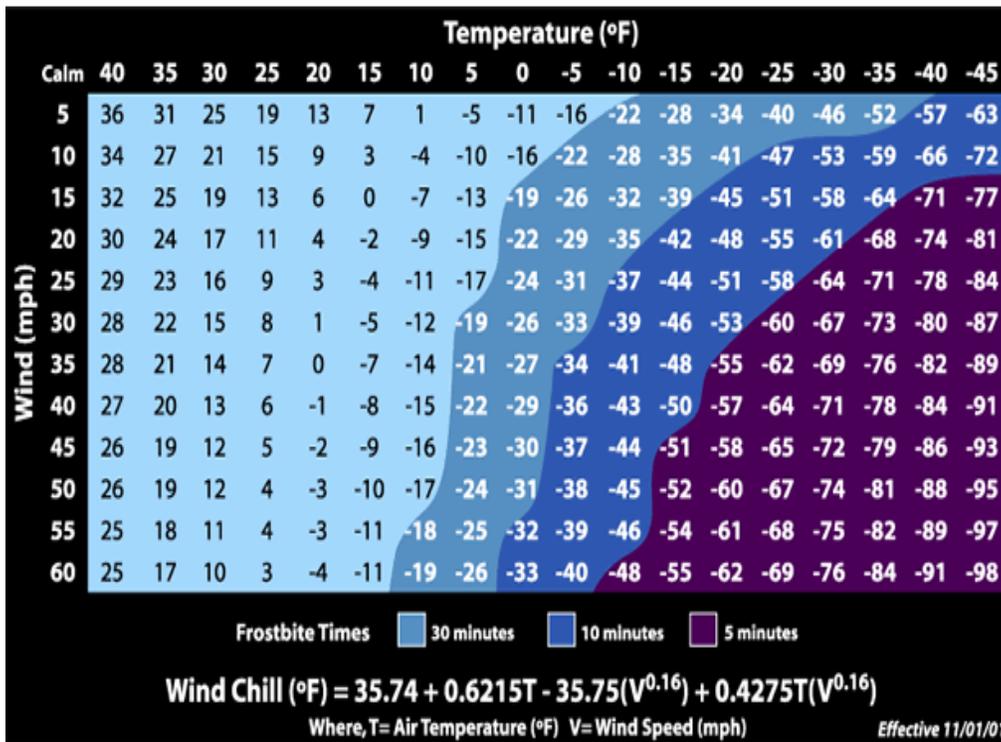
AVERAGE AND EXTREME TEMPERATURES

Extreme temperatures occur when either high temperatures or low temperatures relative to average local temperatures occur. These can occur for brief periods of time and be acute, or they can occur over long periods of time where there is a long stretch of excessively hot or cold weather. Hingham has four well-defined seasons. The seasons have several defining factors, with temperature one of the most significant. Extreme temperatures can be defined as those that are far outside of the normal seasonal ranges for Massachusetts.

EXTREME COLD

The severity of extreme cold temperature is typically measured using the Wind Chill Temperature Index, which is provided by the National Weather Service (NWS). The wind chill is the apparent temperature felt on exposed skin due to the combination of air temperature and wind speed. The index is provided in Figure 10 below. A Wind Chill warning is issued when the Wind Chill Index is forecast to fall below -25 degrees F for at least 3 hours. Extreme cold is a dangerous situation that can result in health emergencies for vulnerable people, such as those without shelter, those who are stranded, or those who live in homes that are poorly insulated or without heat.

Figure 12: Wind Chill Temperature Index and Frostbite Risk



Source: National Weather Service

The Town of Hingham does not collect data for previous occurrences of extreme cold. The best available local data are for Plymouth County, through the National Climatic Data Center (NCDC). There have been two extreme cold events in the past ten years, which caused no deaths, no injuries, or property damage. This is an average of one event every 5 years. Extreme cold is a townwide hazard for Hingham.

Table 14: Plymouth County Extreme Cold and Wind Chill Occurrences 2011-2021

Date	Deaths	Injuries	Damages
2/16/2015	0	0	0
2/14/2016	0	0	0

Source: NOAA, National Climatic Data Center

EXTREME HEAT

A heat wave in Massachusetts is defined as three or more consecutive days above 90°F. Another measure used for identifying extreme heat events relies on the Heat Index. According to the National Weather Service (NWS), the Heat Index is a measure of how hot it really feels relative humidity is factored in with the actual air temperature. The NWS issues an advisory when the heat index (Figure 11) is forecast to exceed 100°F for two or more hours; an excessive heat advisory is issued if the forecast predicts the temperature will rise above 105°F.

Figure 13: Heat Index Chart

		Temperature (°F)															
		80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
Relative Humidity (%)	40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
	45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
	50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
	55	81	84	86	89	93	97	101	106	112	117	124	130	137			
	60	82	84	88	91	95	100	105	110	116	123	129	137				
	65	82	85	89	93	98	103	108	114	121	128	136					
	70	83	86	90	95	100	105	112	119	126	134						
	75	84	88	92	97	103	109	116	124	132							
	80	84	89	94	100	106	113	121	129								
	85	85	90	96	102	110	117	126	135								
	90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127											
100	87	95	103	112	121	132											
Category		Heat Index			Health Hazards												
Extreme Danger		130 °F – Higher			Heat Stroke or Sunstroke is likely with continued exposure.												
Danger		105 °F – 129 °F			Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.												
Extreme Caution		90 °F – 105 °F			Sunstroke, muscle cramps, and/or heat exhaustions possible with prolonged exposure and/or physical activity.												
Caution		80 °F – 90 °F			Fatigue possible with prolonged exposure and/or physical activity.												

The Town of Hingham does not collect data on excessive heat occurrences. The best available local data are for Plymouth County, through the National Climatic Data Center. In the past ten years there have been two excessive heat days and no deaths, injuries, or property damage (see Table 15). This is an average of one extreme heat occurrence every 5 years.

Table 15: Plymouth County Extreme Heat Occurrences 2011-2021

Date	Deaths	Injuries	Damage
7/22/2011	0	0	0
7/3/2018	0	0	0

Source: NOAA, National Climatic Data Center

Extreme cold events are predicted to decrease in the future, while extreme heat days, as well as average temperatures are projected to increase. The projected increase in extreme heat and heat waves is the source of one of the key health concerns related to climate change. Prolonged exposure to high temperatures can cause heat-related illnesses, such as heat cramps, heat

exhaustion, heat stroke, and death. Heat exhaustion is the most common heat-related illness and if untreated, it may progress to heat stroke. People who perform manual labor, particularly those who work outdoors, are at increased risk for heat-related illnesses. Prolonged heat exposure and the poor air quality and high humidity that often accompany heat waves can also exacerbate pre-existing conditions, including respiratory illnesses, cardiovascular disease, and mental illnesses.

Older adults are often at elevated risk due to a high prevalence of pre-existing and chronic conditions. People who live in older housing stock and in housing without air conditioning have increased vulnerability to heat-related illnesses. Power failures are more likely to occur during heat waves, affecting the ability of residents to remain cool during extreme heat. Individuals with pre-existing conditions and those who require electric medical equipment may be at increased risk during a power outage.

Due to what is termed the “heat island effect,” areas with less shade and more dark surfaces (pavement and roofs) will experience even hotter temperatures; these surfaces absorb heat during the day and release it in the evening, keeping nighttime temperatures warmer as well. Map 10 in Appendix B displays areas that are among the hottest 5% of land in the MAPC region based on land surface temperature derived from satellite imagery on July 13, 2016, when the high temperature at Logan Airport was 92°F. Commercial areas, particularly along Routes 3 at the Derby Street Shops, and Route 3A at the Hingham Shipyard and Stop and Shop, show up as “hot spots” on Map 10. Hingham High School and Notre Dame Academy are in hot spots, again due to the prevalence of pavement and buildings. It is worth noting however, that aside from hot spots, heat impacts are more likely to be felt by residents without air conditioning, by those who work outdoors, and those with underlying health conditions.

Average temperatures in Massachusetts are projected to increase by 3.8 to 10.8 degrees by the end of the century (SHMCAP). Over time our climate will become more similar to areas south of New England. Impacts on natural resources include a longer growing season and northern migration of plants and animals, including invasive species. The SHMCAP identifies ecosystems that are expected to be particularly vulnerable to warming temperatures. These include coldwater fisheries, vernal pools, spruce-fir forests, northern hardwood forests (Maple, Beach, Birch), Hemlock forests, and urban forests (due to heat island impacts).

WILDFIRE

A wildfire is a non-structure fire occurring in a forested, shrub or grassland areas. In the Boston Metro region these fires rarely grow to the size of a wildfire, as seen more typically in the western U.S. A more likely occurrence is brush fires that typically burn no more than the underbrush of a forested area. There are three different classes of wildfires:

- Surface fires are the most common type and burn along the floor of a forest, moving slowly and killing or damaging trees

- Ground fires are usually started by lightning and burn on or below the forest floor
- Crown fires spread rapidly by wind, jumping along the tops of trees

A wildfire differs greatly from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to unexpectedly change direction, and its ability to jump gaps such as roads, rivers, and fire breaks. Wildfire season can begin in March and usually ends in late November. The majority of wildfires typically occur in April and May, when most vegetation is void of any appreciable moisture, making them highly flammable. Once "green-up" takes place in late May to early June, the fire danger usually is reduced somewhat. As the climate warms, drought and warmer temperatures may increase the risk of wildfire as vegetation dries out and becomes more flammable. The National Wildfire Coordinating Group classifies the severity of wildfires based on their acreage.

Fires can present a hazard where there is the potential to spread into developed or inhabited areas, particularly residential areas where sufficient fuel materials might exist to allow the fire the spread into homes. Protecting structures from fire poses special problems and can stretch firefighting resources to the limit. If heavy rains follow a fire, other natural disasters can occur, including landslides, mudflows, and floods. If the wildfire destroys the ground cover, then erosion becomes one of several potential problems.

POTENTIAL BRUSHFIRE HAZARD AREAS

The SCHMCAP includes a graphic that depicts statewide fire risk incorporating three risk components: fuel, wildland-urban interface, and topography (Figure 12). The wildland-urban interface reflects communities where housing and vegetation intermingle, and fire can spread from structures to vegetated areas. The most susceptible fuels are pitch pine, scrub oak and oak forests. Topography can affect the behavior of fires, as fire spreads more easily uphill. Hingham is shown in a no risk zone. Fire officials indicate that fires occur periodically in Hingham’s wooded areas. In the past 5 years there have been no significant brushfires, but the Fire Chief indicated that he is concerned that the combination of warming temperatures and abundant fuel on the ground means there is an increased potential for significant fires in the future. The most common cause of wildfires is the careless disposal of smoking materials and untended campfires.

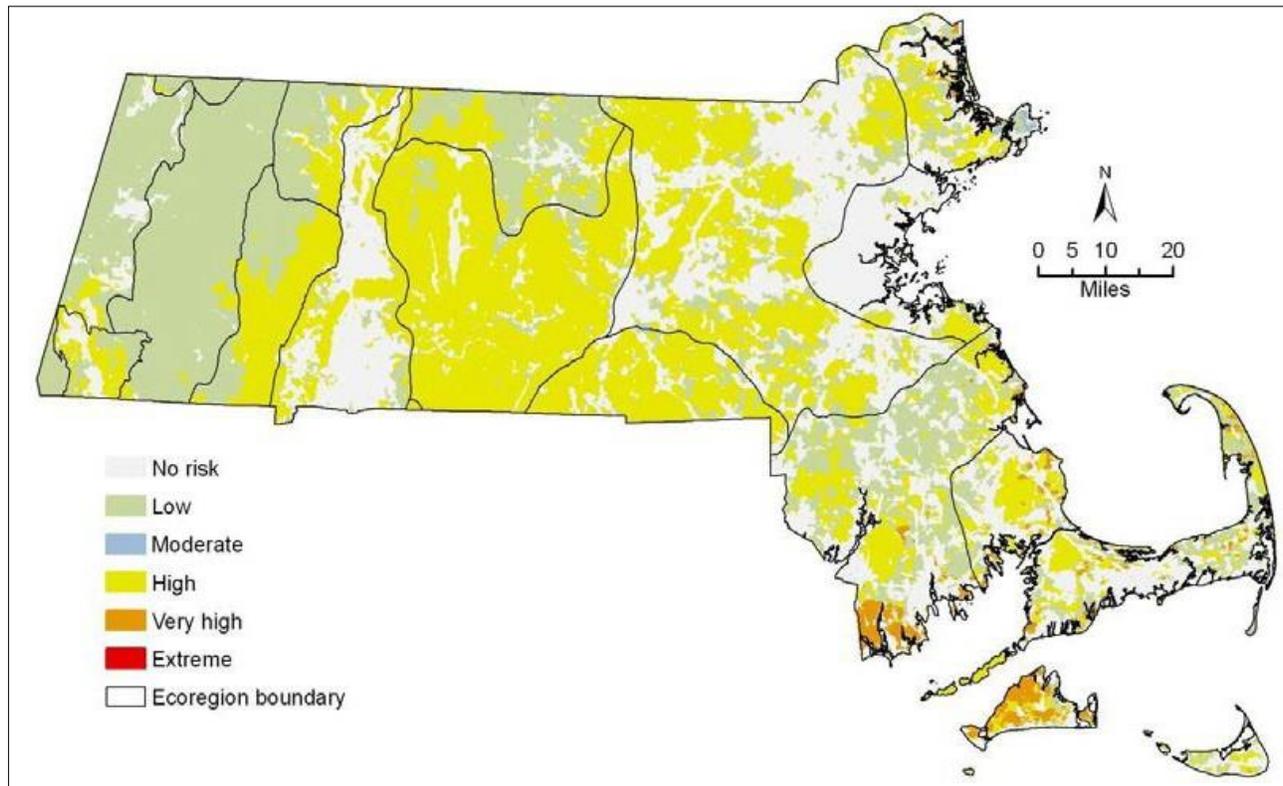
The following areas of town were identified as having the highest potential for brush fires. The numbers correspond to the numbers on Map 8, “Hazard Areas”:

Table 16: Locally Identified Areas of Brushfire Risk

Map ID	Name	Description
13	Bare Cove Park	Forested
14	Brewer and More Brewer Park (Hobart St.)	Forested
15	Water St./Eldridge Court	Phragmites
16	Town Forest	Forested
17	Wompatuck State Park/Whitney Woods	Forested

18	Blackrock Country Club	Kids
21	Hingham Home Meadows	Phragmites

Figure 14: Wildfire Risk Areas



Source: SHMCAP

While there are substantial areas of fire risk, town officials indicate that significant brush fires are not a common occurrence.

INVASIVE SPECIES

The 2018 SHMCAP includes invasive species as a natural hazard for the first time. They are defined as “non-native species that cause or are likely to cause harm to ecosystems, economies, and/or public health.” In new habitats invasive species displace native species if they have competitive advantages including that they are not subject to biological controls from their native habitat. Some of the more recognizable invasive plant species noted in the SHMCAP include Norway maple, garlic mustard, Japanese barberry, black swallow-wort, buckthorn, purple loosestrife, water milfoil, Japanese knotweed, and phragmites. Invasive pests include gypsy moth, hemlock wooly adelgid, and the Asian long-horned beetle. Green crabs are a notable marine invasive. The Massachusetts Invasive Plant Advisory Group categorizes invasive severity as either limited prevalence in Massachusetts, partial containment potential, or public health threat.

Invasive species concerns identified for Hingham include vines in trees, garlic mustard, and phragmites. In the Town Forest there has been insect damage to red pines. Milfoil is present and expanding in conservation ponds.

EXTREME WEATHER

HURRICANES AND TROPICAL STORMS

A hurricane is a violent wind and rainstorm with wind speeds of 74 to 200 miles per hour. A hurricane is strongest as it travels over the ocean and is particularly destructive to coastal property as the storm hits land. A tropical storm has similar characteristics, but wind speeds are between 34 and 73 miles per hour. Climate models suggest that hurricanes and tropical storms will become more intense as warmer ocean waters provide more fuel for the storms. In addition, rainfall amounts associated with hurricanes are predicted to increase because warmer air can hold more water vapor. Since 1900, 39 tropical storms have impacted New England (NESEC). Massachusetts has experienced approximately 32 tropical storms, nine Category 1 hurricanes, five Category 2 hurricanes and one Category 3 hurricane.

Although uncommon, the Town of Hingham’s entire area is vulnerable to hurricanes, which occur between June and November. As shown on Map 5 in Appendix B, tropical storms tracked through Hingham in 1888 and 1923 and a tropical depression tracked through Hingham in 1876. A hurricane or storm track is the line that delineates the path of the eye of a hurricane or tropical storm. The town also experiences the impacts of the wind and rain from hurricanes and tropical storms regardless of whether the storm track passed through the town. The hazard mapping indicates that the 100-year wind speed in Hingham is 100 miles per hour along the western border and 110 miles per hour for the rest of the town.

Table 17: Hurricane Records for Massachusetts, 1938 to 2018

Hurricane Event	Date
Great New England Hurricane*	September 21, 1938
Great Atlantic Hurricane*	September 14-15, 1944
Hurricane Doug	September 11-12, 1950
Hurricane Carol*	August 31, 1954
Hurricane Edna*	September 11, 1954
Hurricane Diane	August 17-19, 1955
Hurricane Donna	September 12, 1960
Hurricane Gloria	September 27, 1985
Hurricane Bob	August 19, 1991
Hurricane Earl	September 4, 2010
Tropical Storm Irene	August 28, 2011
Hurricane Sandy	October 29-30, 2012

*Category 3

Source: National Oceanic and Atmospheric Administration

Hurricane intensity is measured according to the Saffir/Simpson scale, which categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential. These are combined to estimate potential damage. The following gives an overview of the wind speeds, surges, and range of damage caused by different hurricane categories:

Table 18: Saffir/Simpson Scale

Scale No. (Category)	Winds (mph)	Surge (ft)	Potential Damage
1	74 – 95	4 - 5	Minimal
2	96 – 110	6 - 8	Moderate
3	111 – 130	9 - 12	Extensive
4	131 – 155	13 - 18	Extreme
5	> 155	>18	Catastrophic

Source: NOAA

Hurricanes typically have regional impacts beyond their immediate tracks. Falling trees and branches are a significant problem because they can result in power outages when they fall on power lines or block traffic and emergency routes. Hurricanes are a town-wide hazard in Hingham. Potential hurricane damages to Hingham have been estimated using HAZUS-MH. Total damages are estimated at almost \$40 million for a Category 2 hurricane and \$148 million for a Category 4 hurricane. Hurricanes and tropical storms are an infrequent event having passed directly through Hingham only three times.

SEVERE WINTER STORM/NOR’EASTER

A northeast storm, known as a nor’easter, is typically a large counterclockwise wind circulation around a low-pressure center. Featuring strong northeasterly winds blowing in from the ocean over coastal areas, nor’easters are relatively common in the winter months in New England occurring one to two times a year. The storm radius of a nor’easter can be as much as 1,000 miles and these storms feature sustained winds of 10 to 40 mph with gusts of up to 70 mph. These storms are accompanied by heavy rain or snow, depending on temperatures. Many of the historic flood events identified in the previous section were precipitated by nor’easters, including the “Perfect Storm” event in 1991. More recently, blizzards in February 2013, January 2015, March 2018, and January 2022, were large nor’easters that caused significant snowfall amounts.

Hingham is vulnerable to both the wind and precipitation that accompany nor’easters. High winds can cause damage to structures, fallen trees, and downed power lines leading to power outages. Intense rainfall can overwhelm drainage systems causing localized flooding of rivers and streams as well as urban stormwater ponding and localized flooding. Fallen tree limbs as well as heavy snow accumulation and intense rainfall can impede local transportation corridors, and block access for emergency vehicles. Nor’easters are also a cause of coastal flooding.

A blizzard is a winter snow storm with sustained or frequent wind gusts to 35 mph or more, accompanied by falling or blowing snow which reduces visibility to or below ¼ mile. These

conditions must be the predominant condition over a three-hour period. Extremely cold temperatures are often associated with blizzard conditions but are not a formal part of the definition. The hazard related to the combination of snow, wind, and low visibility significantly increases when temperatures drop below 20 degrees.

The Regional Snowfall Index (RSI) characterizes and ranks the severity of northeast snowstorms. RSI has five categories: Extreme, Crippling, Major, Significant, and Notable. RSI scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. The largest RSI values result from storms producing heavy snowfall over large areas that include major metropolitan centers. The RSI categories are summarized below:

Table 19: Regional Snowfall Index

Category	RSI	Value Description
1	1 – 3	Notable
2	3-6	Significant
3	6-10	Major
4	10-18	Crippling
5	18+	Extreme

Source: SHMCAP

The most significant winter storm in recent history was the “Blizzard of 1978,” which resulted in over three feet of snowfall and multiple day closures of roadways, businesses, and schools. In Hingham, blizzards and severe winter storms have occurred in the following years:

Table 20: Severe Weather Major Disaster Declarations in Eastern MA

Storm Event	Date
Severe Winter Storm and Snowstorm	March 2018
Severe Winter Storm, Snowstorm, and Flooding	January 2015
Severe Winter Storm, Snowstorm, and Flooding	February 2013
Hurricane Sandy	October/November 2012
Severe Storm and Snowstorm	October 2011
Tropical Storm Irene	August 2011
Severe Winter Storm and Snowstorm	January 2011
Severe Winter Storm and Flooding	December 2008
Severe Storms and Inland and Coastal Flooding	April 2007
Severe Storm and Flooding	October 2005
Severe Storms & Flooding	March 2001

Blizzard	January 1966
Winter Coastal Storm	December 1992
Severe Coastal Storm	October 1991
Hurricane Bob	August 1991
Hurricane Gloria	September 1985
Coastal Storm, Flood, Ice, Snow	February 1978
Hurricane, floods	August 1955
Hurricanes	September 1954

Source: FEMA

Winter storms, including heavy snow, blizzards, and ice storms, are the most common and most familiar of the region’s hazards that affect large geographic areas. The majority of blizzards and ice storms in the region cause more inconvenience than they do serious property damage, injuries, or deaths. However, periodically, a storm will occur which is a true disaster, and necessitates intense large-scale emergency response. The impacts of winter storms are often related to the weight of snow and ice, which can cause roof collapses and also causes tree limbs to fall. This in turn can cause property damage and potential injuries. Power outages may also result from fallen trees and utility lines.

Winter storms are a potential town-wide hazard in Hingham. Map 6 in Appendix A indicates that the average annual average snowfall in most of Hingham is between 48 and 72 inches. The most northerly and southerly extremes of Hingham have average snowfall of 26 to 48 inches. A number of public safety issues can arise during snow storms. Impassible streets are a challenge for emergency vehicles and affect residents and employers. Snow-covered sidewalks force people to walk in streets, which are already less safe due to snow, slush, puddles, and ice. Large piles of snow can also block sight lines for drivers, particularly at intersections. Refreezing of melting snow can cause dangerous roadway conditions. In addition, transit operations may be impacted, as they were in the 2015 blizzards which caused the closure of the MBTA system for one day and limited services on the commuter rail for several weeks.

As with hurricanes, warmer ocean water and air will provide more fuel for winter storms. According to the SHMCAP it appears that Atlantic coast nor’easters are increasing in frequency and intensity. Further, the SHMCAP notes that research suggests that warmer weather in the Arctic is producing changes to atmospheric circulation patterns that favor the development of winter storms in the Eastern United States.

The Town of Hingham does not keep local records of winter storms. Data for Plymouth County is the best available data to help understand previous occurrences and impacts of heavy snow events. According to National Climate Data Center (NCDC) records from 2011 to 2021, Plymouth County experienced 16 heavy snowfall events, resulting in no injuries, no deaths, and limited

property damage. Heavy snow is considered to be high frequency events based on past occurrences, as there have been 16 events in the past ten years, for an average of 1.6 events each winter.

Table 21: Heavy Snow Events and Impacts in Plymouth County, 2011 to 2021

DATE	DEATHS	INJURIES	PROPERTY DAMAGE
1/26/2011	0	0	0
1/21/2012	0	0	0
2/8/2013	0	0	0
3/7/2013	0	0	0
1/2/2014	0	0	0
1/21/2014	0	0	0
2/5/2014	0	0	0
2/15/2014	0	0	5,000
2/2/2015	0	0	0
2/8/2015	0	0	0
3/5/2015	0	0	0
2/5/2016	0	0	100,000
4/4/2016	0	0	0
12/19/2019	0	0	0
12/16/2020	0	0	0
2/7/2021	0	0	0
Total	0	0	105,000

Source: NOAA, National Climatic Data Center

ICE STORMS

The ice storm category covers a range of different weather phenomena that collectively involve rain or snow being converted to ice in the lower atmosphere leading to potentially hazardous conditions on the ground. Hail size typically refers to the diameter of the hailstones. Warnings and reports may report hail size through comparisons with real-world objects that correspond to certain diameters:

Table 22: Hail Size Comparisons

Description	Diameter (inches)
Pea	0.25
Marble or mothball	0.50
Penny or dime	0.75
Nickel	0.88
Quarter	1.00
Half dollar	1.25
Walnut or ping pong ball	1.50

Golf ball	1.75
Hen's egg	2.00
Tennis ball	2.50
Baseball	2.75
Teacup	3.00
Grapefruit	4.00
Softball	4.50

Source: NOAA

While ice pellets and sleet are examples of these, the greatest hazard is created by freezing rain conditions, which is rain that freezes on contact with hard surfaces leading to a layer of ice on roads, walkways, trees, and other surfaces. The conditions created by freezing rain can make driving particularly dangerous and emergency response more difficult. The weight of ice on tree branches can also lead to falling branches damaging electric lines.

Town-specific data for previous ice storm occurrences are not collected by the Town of Hingham. The best available local data is for Plymouth County through the National Climatic Data Center. Plymouth County experienced ten events from 2010 to 2020. That is an average of 1 each year. On June 13, 2017, dime sized hail was reported in Hingham. There is some indication that if winters warm, temperatures may be more likely to produce icing conditions.

Table 23: Plymouth County Hail Events, 2011 to 2021

DATE	MAGNITUDE	DEATHS	INJURIES	PROPERTY DAMAGE
6/1/2011	1	0	0	0
9/15/2011	0.75	0	0	0
7/24/2012	1.75	0	0	0
8/7/2014	1	0	0	0
7/17/2016	0.88	0	0	0
6/13/2017	0.75	0	0	0
6/22/2019	0.75	0	0	0
6/30/2019	1	0	0	0
8/22/2020	1	0	0	0
7/23/2021	.75	0	0	0
TOTAL		0	0	0

Source: NOAA, National Climatic Data Center

*Magnitude refers to diameter of hail stones in inches

TORNADOES

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. These events are spawned by thunderstorms and occasionally by hurricanes and may occur singularly or in multiples. They develop when cool air overrides a layer of warm air, causing the warm air to rise

rapidly. Most vortices remain suspended in the atmosphere. Should they touch down, they become a force of destruction. Some ingredients for tornado formation include:

- Very strong winds in the mid and upper levels of the atmosphere
- Clockwise turning of the wind with height (from southeast at the surface to west aloft)
- Increasing wind speed with altitude in the lowest 10,000 feet of the atmosphere (i.e., 20 mph at the surface and 50 mph at 7,000 feet)
- Very warm, moist air near the ground with unusually cooler air aloft
- A forcing mechanism such as a cold front or leftover weather boundary from previous shower or thunderstorm activity

Tornado damage severity is measured by the Enhanced Fujita scale, which is based on the amount of damage created. As of February 1, 2007, the National Weather Service began rating tornados using the Enhanced Fujita-scale (EF-scale), which allows surveyors to create more precise assessments of tornado severity. The EF-scale is summarized below:

Table 24: Enhanced Fujita Scale

Scale	Wind speed		Relative frequency	Potential damage	
	mph	km/h			
EF0	65–85	105–137	53.5%	Minor damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.	
EF1	86–110	138–178	31.6%	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.	
EF2	111–135	179–218	10.7%	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.	
EF3	136–165	219–266	3.4%	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.	
EF4	166–200	267–322	0.7%	Extreme damage to near-total destruction. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.	
EF5	>200	>322	<0.1%	Massive Damage. Strong frame houses leveled off foundations and swept away; steel-reinforced concrete structures critically damaged; high-rise buildings have severe structural deformation. Incredible phenomena will occur.	

Source: SHMCAP 2018

The frequency of tornadoes in eastern Massachusetts is low; on average, there are six tornadoes that touchdown somewhere in the Northeast region every year. The strongest tornado in Massachusetts history was the Worcester Tornado in 1953 (NESEC). Recent tornado events in Massachusetts were in Springfield in 2011 and in Revere in 2014. The Springfield tornado caused significant damage and resulted in four deaths in June of 2011. The Revere tornado touched down in Chelsea just south of Route 16, moved north into Revere’s business district along Broadway, and ended near the intersection of Routes 1 and 60. The path was approximately two miles long and 3/8 mile wide, with wind speeds up to 120 miles per hour. Approximately 65 homes had substantial damages and 13 homes and businesses were rendered uninhabitable.

Since 1950, there have been eleven tornadoes in Plymouth County recorded by the Tornado History Project. There have been one F3 and one F2, and three F1 tornados. These eleven tornadoes resulted in a total of one fatality and 23 injuries and \$4.1 million in damages, as summarized in Table 25. This an average of one tornado every 6 years.

Table 25: Tornado Records for Plymouth County

Date	Fujita	Fatalities	Injuries	Width	Length	Damage
June 1953	3	0	17	667	28	\$500K – 5M
11/21/1956	2	0	0	17	0.1	\$500-\$5000
8/9/1972	1	1	6	30	4.9	\$5K-\$50K
9/6/1973	1	0	0	10	1.1	\$5K-\$50K
7/10/1989	0	0	0	23	0.1	\$500-\$5000
5/18/1990	0	0	0	10	0.2	\$500-\$5000
5/18/1990	0	0	0	10	0.2	\$500-\$5000
6/30/2001	0	0	0	80	0.1	-
8/21/2004	1	0	0	40	6	\$1,500,000
5/9/2013	0	0	0	50	0.38	\$20,000
06/23/2015	0	0	0	200	0.48	-

Source: The Tornado History Project

Buildings constructed prior to current building codes may be more vulnerable to damages caused by tornadoes. Evacuation of impacted areas may be required on short notice. Sheltering and mass feeding efforts may be required along with debris clearance, search and rescue, and emergency fire and medical services. Key routes may be blocked by downed trees and other debris, and widespread power outages are also typically associated with tornadoes.

Although tornadoes are a potential town-wide hazard in Hingham, tornado impacts are relatively localized compared to severe storms and hurricanes. Damages from any tornado in Hingham would greatly depend on the track of the tornado. Based on the record of previous occurrences since 1956, Tornado events in Hingham are a low frequency event as there have been no instances of tornado activity in Hingham. According to the SHMCAP, it is possible that severe thunderstorms which can include tornadoes may increase in frequency and intensity as the climate

warms. However, scientists have less confidence in the models that seek to project future changes in tornado activity.

OTHER SEVERE WEATHER

SEVERE THUNDERSTORMS

While less severe than the other types of storms discussed, thunderstorms can lead to localized damage and represent a hazard risk for communities. A thunderstorm typically features lightning, strong winds, rain, and/or hail. Thunderstorms sometime give rise to tornados. On average, these storms are only around 15 miles in diameter and last for about 30 minutes. A severe thunderstorm can include winds of close to 60 mph and rain sufficient to produce flooding. The severity of thunderstorms ranges from commonplace and of short duration to intense storms that cause damage due to high winds, flooding, or lightning strikes.

The best available data on previous occurrences of thunderstorms in Hingham is for is for Plymouth County through the National Climatic Data Center (NCDC). For the years 2011 to 2021, NCDC records show 36 thunderstorm events in Plymouth County (Table 26). These storms resulted in a total of \$719,000 in property damage. There were no injuries or deaths reported. This is an average of 3.6 events per year.

Table 26: Plymouth County Thunderstorm Events, 2010 to 2020

DATE	DEATHS	INJURIES	PROPERTY DAMAGE
7/13/2011	0	0	15,000
7/18/2011	0	0	45,000
7/23/2011	0	0	96,000
6/23/2012	0	0	35,000
7/1/2012	0	0	10,000
7/18/2012	0	0	25,000
8/10/2012	0	0	15,500
10/30/2012	0	0	125,000
6/17/2013	0	0	3,000
7/20/2013	0	0	10,000
8/4/2015	0	0	40,000
2/25/2016	0	0	50,000
7/17/2016	0	0	30,000
7/18/2016	0	0	53,000
7/22/2016	0	0	5,000
7/23/2016	0	0	19,000
9/11/2016	0	0	1,000
6/13/2017	0	0	2,000
7/6/2018	0	0	1,000
7/17/2018	0	0	10,000

4/15/2019	0	0	4,000
6/29/2019	0	0	3,000
7/17/2019	0	0	4,000
7/31/2019	0	0	0
8/8/2019	0	0	300
8/19/2019	0	0	300
6/6/2020	0	0	3,000
6/28/2020	0	0	9,200
7/23/2020	0	0	500
8/22/2020	0	0	95,300
10/7/2020	0	0	0
6/22/2021	0	0	500
6/30/2021	0	0	5,600
7/7/2021	0	0	1,000
7/23/2021	0	0	300
7/27/2021	0	0	500
TOTAL	0	0	719,000

Source: NOAA, National Climatic Data Center

*Magnitude refers to maximum wind speed

Severe thunderstorms are a town-wide hazard for Hingham. The town's vulnerability to severe thunderstorms is similar to that of nor'easters. High winds can cause falling trees and power outages, as well as obstruction of key routes and emergency access. Heavy precipitation may also cause localized flooding, both riverine and urban drainage related.

Based on the record of previous occurrences, thunderstorms in Hingham are high frequency events as this hazard has occurred an average of 3.6 times per year in the past ten years. As noted previously, the intensity of rainfall events has increased significantly, and those trends are expected to continue. The SHMCAP does not specifically address whether climate will affect the intensity or frequency of thunderstorms.

NON-CLIMATE INFLUENCED HAZARDS

EARTHQUAKES

Earthquakes are the sole natural hazard for which there is no established correlation with climate impacts. Damage in an earthquake stems from ground motion, surface faulting, and ground failure in which weak or unstable soils, such as those composed primarily of saturated sand or silts, liquefy. The effects of an earthquake are mitigated by distance and ground materials between the epicenter and a given location. An earthquake in New England affects a much wider area than a similar earthquake in California due to New England's solid bedrock geology (NESEC).

Seismologists use a magnitude scale known as the Richter scale to express the seismic energy released by each earthquake. The typical effects of earthquakes in various ranges are summarized below:

Table 27: Richter Scale and Effects

Richter Magnitudes	Earthquake Effects
Less than 3.5	Generally, not felt, but recorded
3.5- 5.4	Often felt, but rarely causes damage
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas up to about 100 km. across where people live.
7.0- 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred meters across.

Source: Nevada Seismological Library (NSL), 2005

From 1668 to 2016, 408 earthquakes were recorded in Massachusetts (NESEC). No more current information is available, however as reported in the SHMCAP an average of six earthquakes are felt in New England annually. Most have originated from the La Malbaie fault in Quebec or from the Cape Anne fault located off the coast of Rockport. The region has experienced larger earthquakes in the distant past, including a magnitude 5.0 earthquake in 1727 and a 6.0 earthquake that struck in 1755 off the coast of Cape Anne. More recently, a pair of damaging earthquakes occurred near Ossipee, NH in 1940. A 4.0 earthquake centered in Hollis, Maine in October 2012 was felt in the Boston area. Historic records of some of the more significant earthquakes in the region are shown in Table 28.

Table 28: Historic Earthquakes in Massachusetts or Surrounding Area

Location	Date	Magnitude
MA - Cape Ann	11/10/1727	5
MA - Cape Ann	12/29/1727	NA
MA - Cape Ann	2/10/1728	NA
MA - Cape Ann	3/30/1729	NA
MA - Cape Ann	12/9/1729	NA
MA - Cape Ann	2/20/1730	NA
MA - Cape Ann	3/9/1730	NA
MA - Boston	6/24/1741	NA
MA - Cape Ann	6/14/1744	4.7
MA - Salem	7/1/1744	NA
MA - Off Cape Ann	11/18/1755	6
MA - Off Cape Cod	11/23/1755	NA
MA - Boston	3/12/1761	4.6

Location	Date	Magnitude
MA - Off Cape Cod	2/2/1766	NA
MA - Offshore	1/2/1785	5.4
MA - Wareham/Taunton	12/25/1800	NA
MA - Woburn	10/5/1817	4.3
MA - Marblehead	8/25/1846	4.3
MA - Brewster	8/8/1847	4.2
MA - Boxford	5/12/1880	NA
MA - Newbury	11/7/1907	NA
MA - Wareham	4/25/1924	NA
MA - Cape Ann	1/7/1925	4
MA - Nantucket	10/25/1965	NA
MA - Boston	12/27/74	2.3
MA - Nantucket	4/12/12	4.5
ME - Hollis	10/17/12	4.0

Source: Boston HIRA

One measure of earthquake risk is ground motion, which is measured as maximum peak horizontal acceleration, expressed as a percentage of gravity (%g). The range of peak ground acceleration in Massachusetts is from 10 %g to 20 %g, with a 2% probability of exceedance in 50 years. Hingham is in the middle part of the range for Massachusetts, at 14 %g to 16 %g, making it a relatively moderate area of earthquake risk within the state, although the state as a whole is considered to have a low risk of earthquakes compared to the rest of the country. There have been no recorded earthquake epicenters within Hingham.

Although New England has not experienced a damaging earthquake since 1755, seismologists state that a serious earthquake occurrence is possible. There are five seismological faults in Massachusetts, but there is no discernible pattern of previous earthquakes along these fault lines. Earthquakes occur without warning and may be followed by aftershocks. The majority of older buildings and infrastructure were constructed without specific earthquake resistant design features.

residential categories are aggregated, residential uses make up 38.7% of the area of the town. Commercial and industrial uses combined make up 7.6% of the town. Agriculture and Open Land total 19.4% of the land. The tax-exempt category represents 23.7% of Hingham’s land. Over 80% of the tax-exempt land is forest and forested wetlands.

Table 29: Town of Hingham, MA 2016 Land Use

Land Use Type	Acres	Percentage
Residential - single family	4,732	32.6
Residential - multi-family	490	3.4
Mixed use – primarily residential	387	2.7
Mixed use – other	49	0.3
Commercial	835	5.7
Water	608	4.2
Industrial	213	1.9
Agriculture	30	0.2
Open land	2,786	19.2
Forest	10	0.1
Recreation	387	2.7
Unknown	56	0.4
Right-of-way	965	6.6
Tax exempt	3,444	23.7
Total	14,520	100.0

For more information on how the land use statistics were developed and the definitions of the categories, please go to <https://docs.digital.mass.gov/dataset/massgis-data-land-use-2005>.

Economic Elements

From an economic perspective, Hingham’s most important assets are the Hingham Shipyard, Hingham Downtown and South Hingham by Route 3, which is home to the Derby Street Shops and the South Shore Industrial Park. The Shipyard is the site that most directly interfaces with a FEMA identified flood zone (VE Zone), although the South Shore Industrial Park does include an identified A Zone. No experiences with flooding were reported for either location.

NATURAL, CULTURAL, AND HISTORICAL RESOURCE AREAS

There are six historic districts in Hingham. The districts are located primarily in three areas of Town: the Hingham Downtown (Lincoln, South, North, Central and Main Streets), Hingham Center (Main, Leavitt, Middle and Pleasant Streets) and South Hingham (High, Free and Main Streets). Most of the historic districts are outside a FEMA identified flood zone, although the districts in South Hingham are near Zone A locations near the Weir River and the Hingham Center districts abut Zone A locations at the Home Meadows Pond and marsh area.

Wompatuck State Park is a former ammunition depot for the U.S. military which has been converted into a 3,602-acre park that is managed by the Massachusetts Department of Conservation and Recreation and spans the Towns of Hingham, Cohasset, Scituate, and Norwell. A majority of the park is located in Hingham (1,540 acres) and it is heavily wooded and interspersed with wetland systems. The park provides space for natural flood management due to its undeveloped lands and is interspersed with FEMA identified flood zones.

The Weir River Area of Critical Environmental Concern (ACEC) is located along Hingham’s border with the Town of Hull. The ACEC is an area designated due to its ecological diversity – it contains one of the most extensive salt marsh systems in the greater Boston metropolitan area – and natural scenic beauty. The entire ACEC is in FEMA flood zones. The Weymouth Back River ACEC is located along Hingham’s border with the Town of Weymouth.

DEVELOPMENT TRENDS

Development trends throughout the metropolitan region are tracked by MassBuilds, MAPC’s Development Database, which provides an inventory of new development over the last decade. The database tracks both completed developments and those currently under construction. The database includes seven completed projects in the Town of Hingham since 2016.

The database also includes several attributes of the new development, including housing units, and commercial space. The seven developments in Hingham include a total of 741 housing units and 244,000 square feet of commercial space. While there was development activity in FEMA flood zones, compliance with state floodplain building standards ensures limited vulnerability. As noted below, future development should consider changing climate conditions.

Table 30: Summary of Hingham Developments, 2016-2021

Name	Status	Year	Housing Units	Commercial Square Feet	Project Type
Hewitt’s Landing Townhomes	Complete	2016	150		Residential
Brio Hingham	Complete	2019	77		Residential
Hingham Shipyard	Complete	2020	94	240,000	Mixed Use
Avalon Hingham Shipyard II	Complete	2020	190		Residential
Broadstone Bare Cove Alliance	Complete	2020	220		Residential
6 Station Street	Complete	2020	4		Residential
Lincoln Building	Complete	2019	6	4,000	Mixed Use

POTENTIAL FUTURE DEVELOPMENT

MAPC consulted with the Local Hazard Mitigation Planning Team to determine areas that may be developed in the future, based on the Town’s comprehensive planning efforts and current trends and projects. In order to characterize any change in the town’s vulnerability associated with new developments, a GIS mapping analysis was conducted which overlaid the development sites with

the FEMA Flood Insurance Rate Map, areas projected to be inundated by mean high water with one foot of sea level rise, and the hottest 5% of land surface in the MAPC region. Table 31 shows the relationship between potential future development areas and the applicable mapped hazard areas. This information is provided so that planners can ensure that development proposals comply with floodplain zoning and that careful attention is paid to drainage, heat, and other issues.

Table 31: Relationship of Potential Development to Hazard Areas

Map ID	Potential Future Project	Flood Zones	Sea Level Rise	High Heat
A	Hingham Shipyard	-	-	37%
B	Linden Ponds – Phase 3	-	-	-
C	Bristol Brothers	6%	-	45%
D	South Shore Industrial Park	32%	-	-
E	Selectman’s Housing Beal St.	<1%	-	-
F	Hingham Housing Authority	-	-	-
G	Cappo Real Estate Old Derby St.	-	-	-
H	Town of Hingham Public Safety Complex	-	-	-
I	Foster School Reconstruction	50%	52%	-

Several of the parcels are partially located in flood zone. As new development and redevelopment occurs it will be subject to the latest building code requirements and zoning regulations pertaining to wind, earthquakes, and flooding. Overall, Hingham’s potential future development would not significantly increase the Town’s vulnerability if existing regulations are adhered to, and with careful attention to site planning and climate resilience strategies.

CRITICAL FACILITIES & INFRASTRUCTURE IN HAZARD AREAS

Critical facilities and infrastructure includes facilities that are important for disaster response and evacuation (such as emergency operations centers, fire stations, water pump stations, communications, and electricity) and facilities where additional assistance might be needed during an emergency (such as nursing homes, elderly housing, day care centers, etc.). There are 155 facilities identified in Hingham. These are listed in Table 32 and are shown on the maps in Appendix B.

Explanation of Columns in Table 32

- **Column 1: ID #:** The first column in Table 32 is an ID number which appears on the maps that are part of this plan. See Appendix B.
- **Column 2: Name:** The second column is the name of the site.
- **Column 3: Type:** The third column indicates what type of site it is.
- **Column 4: FEMA Flood Zone:** The fourth column addresses the risk of flooding. A “No” entry in this column means that the site is not within any of the mapped risk zones on the Flood Insurance Rate Maps (FIRM maps). If there is an entry in this column, it indicates the type of flood zone. as follows:
 - **Zone AE** Zones AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the FIS by detailed methods. Mandatory flood insurance purchase requirements apply.
 - **Zone A** Areas subject to inundation by the 1-percent-annual-chance flood event. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
 - **Zone AE** Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
 - **Zone AH** Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are 1–3 feet. BFEs derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.
 - **Zone VE** (1% annual chance) - Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.
 - **Zone X (shaded)** Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones. (formerly Zone B)
- **Column 5: Locally Identified Area of Flooding:** The fifth column indicates the risk of flooding in local hazard areas. If there is an entry in this column, it indicates the local hazard area.
- **Column 6:** Hot spots indicates areas that are within the 5% of hottest areas in the MAPC region based on satellite data from 2016.
- **Column 7:** The seventh column indicates the risk of brushfire. If there is an entry in this column, it indicates the local hazard area.
- **Column 8:** This column indicates locations subject to inundation at Mean Higher High Water with 3 feet of sea level rise.

Table 32: Critical Facilities and Relationship to Hazard Areas

ID	NAME	TYPE	FEMA Flood Zone	Locally Identified Flood Area	Brushfire Rsk	Hot Spot	Sea Level Rise
1	Wm L Foster Elem	School	No	No	No	No	No
2	Rockland Street #39	Hazardous Material Site	AE	Kilby St. and Rockland St.	No	No	No
3	Harbor House	Special Needs	No	No	No	No	No
4	Hingham Police Dept Hdq	Police Station	No	No	No	No	No
5	Stop & Shop	Grocery Store	No	No	No	Yes	No
6	Hewitt's Cove Marina, Llc	Hazardous Material Site	No	No	No	No	No
7	Derby Academy	School	No	No	No	No	No
8	Glastonbury Abbey	Church	No	No	No	No	No
9	St Paul's Elementary	School	No	No	No	No	No
10	North Fire Station	Medical Facility	AE	No	No	No	No
11	Thaxter Park Housing	Senior Living	No	No	No	No	No
12	Hingham Housing Collab.	Senior Living	No	No	No	No	No
13	East School	School - Special Needs	No	No	No	No	No
14	Harriet Rust Home	Special Needs	No	No	No	No	No
15	Lincoln Apartments	Senior Living	No	No	No	No	No
16	Pat Roche Hospice Home	Senior Living	No	No	No	No	No
17	Group Residence	Special Needs	No	No	No	No	No
18	Town Hall	Emergency Operations Center	No	No	No	No	No
19	Hingham High School	School	No	No	No	Yes	No
20	Central Fire Station	Fire Station	No	No	No	No	No
21	Group Residence	Special Needs	No	No	No	No	No
23	Queen Anne's Nursing	Senior Living	No	No	No	No	No
24	Plymouth River School	School	No	No	No	No	No
25	South Elementary	School	No	No	No	No	No
26	South Fire Station	Medical Facility	No	No	No	No	No
27	Weir River Water System	Hazardous Material Site	No	No	No	No	No
28	Notre Dame Academy	School	No	No	No	Yes	No
29	Hingham Middle School	School	No	No	No	No	No
30	Old Colony Montessori Sch	School	No	No	No	No	No
31	South Shore Ed. Collab.	School	No	No	No	Yes	No
32	Deerfield Senior Services	Special Needs	No	No	No	No	No
33	Road To Responsibility	Special Needs	No	No	No	Yes	No
34	DPW	Municipal	No	No	No	No	No
35	Allerton House	Senior Living	No	No	No	No	No
36	Gas Junction	Gas Pipeline	No	No	No	No	No

ID	NAME	TYPE	FEMA Flood Zone	Locally Identified Flood Area	Brushfire Rsk	Hot Spot	Sea Level Rise
37	DCR / Police	Police Station	No	No	No	No	No
38	MBTA Commuter Boat	Transportation Facility	VE	No	No	No	Yes
39	Communications Tower	Communication Tower	No	No	No	Yes	No
40	MWRA Sewer Pump	Sewer Pump Station	No	No	No	No	No
41	Back River Bridge	Bridge	No	No	No	No	Yes
42	Bright Horizons DC	Child Care	No	No	No	No	No
44	Sewer Pumpstation (UNG)	Sewer Pump Station	No	No	No	No	No
45	Gas Junction	Gas Pipeline	No	North/Water /Summer Sts	No	No	No
46	Post Office	Post Office	No	No	No	No	No
47	Old Ship Church	Church	No	No	No	No	No
46	Armory Building	Armory	No	No	No	No	No
49	Library	Library	No	No	No	No	No
50	EOC Backup	Emergency Operations Center	No	No	No	No	No
51	Growing Tree School	Child Care	No	No	No	No	No
52	Wilder Memorial School	Child Care	No	No	No	No	No
53	Cushing Pond Dam	Dam	AE	No	No	No	No
54	Fulling Mill Pond dam	Dam	A	No	No	No	No
55	Water Treatment	Waste Water Treatment	No	No	No	No	No
56	Holly Pond Dam	Dam	No	No	Wompatuck State Park	No	No
57	Accord Pond Dam	Dam	A	No	No	No	No
58	South Shore Conservatory	School	No	No	Bare Cove Park	No	No
59	Fuel Depot	Gas Distribution	No	No	No	No	No
60	Bus Garage	Municipal	No	No	No	No	No
61	MNG Motor Pool	Federal Office	No	No	No	No	No
62	South Shore Country Club	Place of Assembly	No	No	No	No	No
63	Sub Station	Power Substation	No	No	No	No	No
64	Transfer Facility	DPW	No	No	No	No	No
65	Hingham Municipal Garage	Municipal	No	No	No	No	No
66	St. John's Church	Church	No	No	No	No	No
67	Water Storage Tank	Water Storage Tank	No	No	No	No	No
68	Communication Towers	Communication Tower	No	No	No	No	No
69	TRIPHAMMER POND DAM	Dam	A	No	No	No	No
70	FOUNDRY POND DAM	Dam	AE	No	No	No	No
71	DOLLY'S NURSERY	Child Care	No	No	No	No	No
72	George Washington Blvd. Bridge	Bridge	No	No	No	No	No
73	HING DISTRICT COURT	Court House	No	No	No	No	No

ID	NAME	TYPE	FEMA Flood Zone	Locally Identified Flood Area	Brushfire Rsk	Hot Spot	Sea Level Rise
74	TOWN LANDING	Marina	VE	North/Water /Summer Ss	No	No	Yes
75	HINGHAM YACHT CLUB	Marina	VE	Yacht Club	No	No	Yes
76	SEWER PUMP	Sewer Pump Station	VE	Yacht Club	No	No	No
77	HOWE ST PUMP STATION	Sewer Pump Station	No	North Beach	No	No	No
78	BEL AIR PUMP STATION	Sewer Pump Station	AE	No	No	No	No
79	Walter Cove Sewer Pump Stations	Sewer Pump Station	No	No	No	No	No
80	Broad Cove Sewer Pump Station	Sewer Pump Station	No	No	No	No	No
81	Bradley Woods Pump Station	Sewer Pump Station	No	No	No	No	No
82	BAYBERRY LIFT STATION	Sewer Pump Station	No	No	No	No	No
83	Town Brook Pump Station	Sewer Pump Station	No	No	No	No	No
84	MILL ST PUMP STATION	Sewer Pump Station	AE	North/Water /Summer Sts	No	No	No
85	MURRAY BRIDGE	Bridge	No	North/Water /Summer Sts	No	No	No
86	West Corner Pump Station	Sewer Pump Station	AE:	No	No	No	Yes
87	HS SEWER PUMP STATION	Sewer Pump Station	No	No	No	No	No
88	DOWNING ST WELL	Water Supply	No	No	No	No	No
89	Town Hall Pump Station	Sewer Pump Station	No	No	No	No	No
90	Lewis Court Pump Station	Sewer Pump Station	No	No	No	No	No
91	SEWER DUMP STATION	Sewer Pump Station	No	No	No	No	No
92	ACCORD POST OFFICE	Post Office	No	No	No	No	No
93	ACCORD RESERVOIR	Reservoir	A	No	No	No	No
94	DERBY ST OVERPASS	Bridge	No	No	No	No	No
95	Sereno Labs Medical Research	Medical Facility	No	No	No	No	No
96	ELECTRIC SUB STATION	Power Substation	No	No	No	No	No
97	Water Storage Tank	Water Storage Tank	No	No	No	No	No
98	CRAIG LANE WELL	Well	No	No	No	No	No
99	SCOTLAND STREET WELL	Well	AE	No	No	No	No
100	FREE STREET WELL	Well	AE	No	No	No	No
101	FREE STREET WELL	Well	AE	No	No	No	No
102	FREE STREET WELL	Well	AE	No	No	No	No
103	FIRST BAPTIST CHURCH	Church	No	No	No	No	No
104	Faith Church of the Nazarene	Church	No	No	No	No	No
105	NEW NORTH CHURCH	Church	No	No	No	No	No
106	First Church of Christ Scientist	Church	No	No	No	No	No
107	South Shore Baptist Church	Church	No	No	No	No	No

ID	NAME	TYPE	FEMA Flood Zone	Locally Identified Flood Area	Brushfire Rsk	Hot Spot	Sea Level Rise
109	Church of the Latterday Saints	Church	No	No	No	No	No
110	CONGREGATION SHA'ARAY SHALOM	Church	No	No	No	No	No
111	RESURRECTION CHURCH	Church	No	No	No	No	No
112	Second Parish Church	Church	No	No	No	No	No
113	RITE-AID PHARMACY	Pharmacy	No	No	No	No	No
115	PILGRIM SKATING ARENA	Cold Storage	A	No	No	No	No
116	ST PAULS CEMETERY	Cemetery	No	No	No	No	No
117	Hingham Bathing Beach	Recreation	VE	Hingham Bathing Beach	No	No	Yes
118	Inner Hingham Harbor Seawall	Flood Protection	AE	North/Water /Summer Sts	No	No	No
119	Seawall at Downer Avenue	Flood Protection	VE	Yacht Club	No	No	Yes
120	HELIPORT AT HINGHAM HIGH SCHOOL	Heliport	No	No	No	Yes	No
121	HELIPORT AT HINGHAM MIDDLE SCHOOL	Heliport	No	No	No	No	No
122	HELIPORT AT PLYMOUTH RIVER SCHOOL	Heliport	No	No	No	No	No
123	HELIPORT AT SOUTH SHORE COUNTRY CLUB	Heliport	No	No	No	No	No
124	HELIPORT AT RT 3 EXIT 15	Heliport	No	No	No	No	No
125	HELIPORT AT KRESS FIELD	Heliport	No	No	No	No	No
126	Heliport at Derby Academy	Heliport	No	No	No	No	No
127	HELIPORT AT P.A.L. FIELD	Heliport	No	No	No	No	No
128	Heliport at Fire Station #1	Heliport	No	No	No	No	No
129	Heliport at Bathing Beach	Heliport	No	Hingham Bathing Beach	No	No	No
130	Linden Ponds	Senior Living	No	No	No	No	No
131	L.P. Waste Water Treatment	Waste Water Treatment	No	No	No	No	No
132	Communications Tower	Communication Tower	No	No	No	No	No
133	Communications Tower	Communication Tower	A	No	No	No	No
134	Communications Tower	Communication Tower	No	No	No	No	No
135	Nantasket Train Station	Transportation Facility	No	No	No	No	No
136	West Hingham Train Station	Transportation Facility	No	No	No	No	No
137	Greenbush Train Tunnel	Tunnel	No	No	No	No	No
138	Telephone Exchange Bldg	Telecommunications	No	North/Water /Summer Sts	No	No	No
139	DPW Storage	DPW	No	No	No	No	No

ID	NAME	TYPE	FEMA Flood Zone	Locally Identified Flood Area	Brushfire Rsk	Hot Spot	Sea Level Rise
140	Sandcastle Day Care	Child Care	No	No	No	No	No
141	EOC	Emergency Operations Center	No	No	No	No	No
142	Hingham Light Dept. Offices	Municipal	No	No	No	No	No
143	South Shore Hospital Bone & Muscle Ctr.	Medical Facility	No	No	No	No	No
144	Hingham Nursery School	Child Care	No	No	No	No	No
145	Water Booster Station	Pump Station	No	No	No	No	No
146	Black Rock Golf Facility	Recreation	No	No	No	No	No
147	South Shore Educational Collaborative	Special Needs	No	No	No	Yes	No
148	Blue Cross - Blue Shield	Office	No	No	No	No	No
149	State Park Campground	Recreation	No	No	Wompatuck State Park	No	No
150	Renaissance Garden	Senior Living	No	No	No	No	No
151	Old Derby Animal Hospital	Animal Hospital	No	No	No	No	No
152	Emergency Distribution Site (Hingham High)	Emergency Distribution Site	No	No	No	Yes	No
153	Black Rock Waste Water Treatment	Waste Water Treatment	No	No	No	No	No
154	Skating Club Dam	Dam	AE	No	No	No	No
155	Hobart Street Dam	Dam	No	No	Hobart St Cons. Area	No	No
156	Cranberry Pond Dam	Dam	A	No	No	No	No
157	Little Sprouts Child Care	Child Care	No	No	No	No	No
158	Bridges by Epoch	Senior Living	No	No	No	No	No
159	The Residences at Penniman Hill	Senior Living	No	No	No	No	No

VULNERABILITY ASSESSMENT

The purpose of the vulnerability assessment is to estimate the extent of potential damages from natural hazards of varying types and intensities. A vulnerability assessment and estimation of damages was performed for hurricanes, earthquakes, and flooding through the HAZUS-MH software.

Introduction to HAZUS-MH

HAZUS- MH (multiple-hazards) is a computer program developed by FEMA to estimate losses due to a variety of natural hazards. The following overview of HAZUS-MH is taken from the FEMA website. For more information on the HAZUS-MH software, go to <https://www.fema.gov/hazus/>

“HAZUS-MH is a nationally applicable standardized methodology and software program that contains models for estimating potential losses from earthquakes, floods, and hurricane winds. HAZUS-MH was developed by the Federal Emergency Management Agency (FEMA) under contract with the National Institute of Building Sciences (NIBS). Loss estimates produced by HAZUS-MH are based on current scientific and engineering knowledge of the effects of hurricane winds, floods, and earthquakes. Estimating losses is essential to decision-making at all levels of government, providing a basis for developing and evaluating mitigation plans and policies as well as emergency preparedness, response, and recovery planning.

HAZUS-MH uses state-of-the-art geographic information system (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of hurricane winds, floods and earthquakes on populations.”

There are three modules included with the HAZUS-MH software: hurricane wind, flooding, and earthquakes. There are also three levels at which HAZUS-MH can be run. Level 1 uses national baseline data and is the quickest way to begin the risk assessment process. The analysis that follows was completed using Level 1 data. Level 1 relies upon default data on building types, utilities, transportation, etc. from national databases as well as census data. While the databases include a wealth of information on the Town of Hingham, it does not capture all relevant information. In fact, the HAZUS training manual notes that the default data is “subject to a great deal of uncertainty.”

However, for the purposes of this plan, the analysis is useful. This plan is attempting to generally indicate the possible extent of damages due to certain types of natural disasters and to allow for a comparison between different types of disasters. Therefore, this analysis should be considered to be a starting point for understanding potential damages from the hazards.

ESTIMATED DAMAGES FROM HURRICANES

The HAZUS software was used to model potential damages to the community from a 100-year and 500-year hurricane event; storms that are 1% and 0.2% likely to happen in a given year, and roughly equivalent to a Category 2 and Category 4 hurricane. The damages caused by these hypothetical storms were modeled as if the storm track passed directly through the town, bringing the strongest winds and greatest damage potential.

Though there are no recorded instances of a hurricane equivalent to a 500-year storm passing through Massachusetts, this model was included in order to present a reasonable “worst case scenario” that would help planners and emergency personnel evaluate the impacts of storms that might be more likely in the future, as we enter into a period of more intense and frequent storms.

Table 33: Estimated Damages from Hurricanes

	Category 2	Category 4
Building Characteristics		
Estimated total number of buildings	9,840	
Estimated total building replacement value (2014 \$)	\$4,539,000,000	
Building Damages		
# of buildings sustaining minor damage	734	2,178
# of buildings sustaining moderate damage	89	438
# of buildings sustaining severe damage	3	50
# of buildings destroyed	1	47
Population Needs		
# of households displaced	8	55
# of people seeking public shelter	2	21
Debris		
Building debris generated (tons)	2,607	11,302
Tree debris generated (tons)	8,957	19,143
# of truckloads to clear building debris	104	452
Value of Damages		
Total property damage (buildings and content)	\$38,969,540	\$167,806,120
Total losses due to business interruption	\$1,810,850	\$15,784,280

ESTIMATED DAMAGES FROM EARTHQUAKES

The HAZUS earthquake module allows users to define an earthquake magnitude and model the potential damages caused by that earthquake as if its epicenter had been at the geographic center of the study area. For the purposes of this plan, two earthquakes were selected: magnitude 5.0 and a magnitude 7.0. Historically, major earthquakes are rare in New England, though a magnitude 5 event occurred in 1963.

Table 34: Estimated Damages from Earthquakes

	Magnitude 5.0	Magnitude 7.0
Building Characteristics		
Estimated total number of buildings	9,840	
Estimated total building replacement value (2014 \$)	\$4,539,000,000	
Building Damages		
# of buildings sustaining slight damage	2,843	454
# of buildings sustaining moderate damage	1,507	2,316

# of buildings sustaining extensive damage	411	2,784
# of buildings completely damaged	103	4,242
Population Needs		
# of households displaced	386	5,368
# of people seeking public shelter	194	2,711
Debris		
Building debris generated (tons)	110,000	810,000
# of truckloads to clear debris (@ 25 tons/truck)	4,200	32,480
Value of Damages		
Total property damage	\$509,806,800	\$3,854,532,700
Total losses due to business interruption	\$93,278,300	\$530,722,900

ESTIMATED DAMAGES FROM FLOODING

The HAZUS flooding module allows users model the potential damages caused by a 100-year flood event and a 500-year flood event.

Table 35: Estimated Damages from Flooding

	100-Year Flood	500-Year Flood
Building Characteristics		
Estimated total number of buildings	9,840	
Estimated total building replacement value (2014 \$)	\$4,539,000,000	
Building Damages		
# of buildings sustaining limited damage	50	68
# of buildings sustaining moderate damage	150	208
# of buildings sustaining extensive damage	0	19
# of buildings substantially damaged	10	15
Population Needs		
# of households displaced	2,748	3,973
# of people seeking public shelter	95	146
Value of Damages		
Total property damage	\$88,590,000	\$158,940,000
Total losses due to business interruption	\$65,100,000	\$107,090,000

IMPACTS ON PEOPLE

Just as some locations in Hingham will be more vulnerable to climate impacts than others, it is also true that climate change and natural hazards will not affect all residents of Hingham equally. People who may be more susceptible to negative health effects can include older adults, young children, pregnant women, people with disabilities, and people with pre-existing health conditions, as they are more likely to be physically vulnerable to the health impacts of extreme heat and poor air quality. Individuals with physical mobility constraints may need additional assistance with emergency response. Older adults are often at elevated risk due to a high prevalence of pre-existing and chronic conditions. People who live in substandard housing and in housing without air conditioning have increased vulnerability to heat-related illnesses. Black and Latino residents in Massachusetts are hospitalized for asthma at considerably higher rates than the population as whole, reflecting the reality that longstanding societal inequities can lead to differential health outcomes based on race and ethnicity.

Low-income people are often more susceptible to financial shocks, which can occur after extreme weather, and which can impact financial security and the ability to secure safe shelter and meet medical needs. Social isolation can also influence vulnerability, as it limits access to critical information, municipal resources, and social support systems. In the absence of strong social support networks and translation services, people living alone and those with limited English language proficiency may experience social isolation. People of color and undocumented immigrants may also experience social isolation where there are historically strained or tenuous relationships with government officials and first responders. Certain occupations may also experience more severe impacts. People who work outdoors, or in unregulated temperatures, are at increased risk for heat-related illnesses.

In developing mitigation measures Hingham will want to consider the needs of all of its residents. In Hingham 6% of residents are below the poverty level (4-person household earning less than \$24,563) and 27% are low-income (4-person household earning less than \$78,150) (American Community Survey). The over 65 population is growing and 33% of residents 65 or older live alone (Census 2010). Although census records do not report Hingham residents who do not speak English language very well, 10% of residents do speak another language at home (Census 2010).

RISK ASSESSMENT SUMMARY

CLIMATE CHANGE	NATURAL HAZARD	PRIORITY (H/M/L)	KEY CONCERNS SOCIETY	KEY CONCERNS BUILT ENVIRONMENT	KEY CONCERNS NATURAL RESOURCES
Changes in Precipitation 	Inland Flooding	Medium	Property damage	Roadways, Foster School, brook by the high school	Pollutants, erosion, tree damage on river banks
	Drought	High	Water supply – at capacity/ private wells go dry		Fire, low flow or dry streams
	Landslide	Low (none)			
Sea Level Rise 	Coastal Flooding	High	Property damage – concern about private investments in flood risk areas/ septic is vulnerable	Sea Level Rise: Roadways, sewer pump stations, substation, harbor seawalls	Septic pollution
	Coastal Erosion	Medium	Hingham is relatively sheltered	Bathing beach – sand management	
	Tsunami	Low			
Rising Temperatures 	Average and Extreme Temperatures	Medium	Health impacts for lacking or failed AC and heat. Esp. congregate housing	Schools and Lincoln Schools senior apartments lack AC	
	Wildfires	Medium			Damage, fuel in forest
	Invasive species	High			Vines in trees, garlic mustard, phragmites. Town Forest – insect damage to red pines, milfoil expanding in conservation ponds
Extreme Weather 	Hurricanes / Tropical Storms	High	flooding	Limited access/egress from properties. Hingham Light does a good job w/ management	Possible pollution
	Severe Winter Storms	High	flooding	Limited access/egress due to snow, tree damage, flood, downed wires	

	Tornadoes	Low			
	Other (Wind/ Thunderstorms/ Microburst)	Low		Limited access/egress due to tree damage, downed wires	
Non-Climate Hazard	Earthquake	Low (none)			

SECTION 5: HAZARD MITIGATION GOALS

The Hingham Local Hazard Mitigation Planning Team reviewed and discussed the goals from the 2016 Hazard Mitigation Plan for the Town of Hingham. All of the goals are considered critical for the town, and they are not listed in order of importance. Prior to this Hazard Mitigation Plan update, the Town of Hingham completed a climate change planning process as part of the state Municipal Vulnerability Preparedness program. The local team chose to incorporate climate considerations as noted in Goal 11.

1. Ensure that critical infrastructure sites are protected from natural hazards.
2. Protect existing residential and business areas from flooding.
3. Maintain existing mitigation infrastructure in good condition.
4. Continue to enforce existing zoning and building regulations.
5. Educate the public about zoning and building regulations, particularly with regard to changes in regulations that may affect tear-downs and new construction.
6. Work with surrounding communities to ensure regional cooperation and solutions for hazards affecting multiple communities such as coastal erosion.
7. Encourage future development in areas that are not prone to natural hazards.
8. Educate the public about natural hazards and mitigation measures.
9. Make efficient use of public funds for hazard mitigation.
10. Prepare to respond to various natural hazard events.
11. Consider the potential impacts of future climate change. Incorporate sustainability and resiliency in hazard mitigation planning.

SECTION 6: EXISTING MITIGATION MEASURES

The existing protections in the Town of Hingham are a combination of zoning, land use, and environmental regulations, infrastructure maintenance, and drainage infrastructure improvement projects. Infrastructure maintenance generally addresses localized drainage clogging problems, while large scale capacity problems may require pipe replacement or invert elevation modifications. These more expensive projects are subject to the capital budget process and lack of funding is one of the biggest obstacles to completion of some of these. Hingham's adoption of a stormwater utility will contribute significantly to efforts to address stormwater flooding.

The Town's existing mitigation measures, which were in place prior to the original 2008 Plan, are listed by hazard type here and are summarized in Table 36 below. Many upgrades to existing measures have occurred and are noted in the following sections.

EXISTING TOWN-WIDE MITIGATION FOR MULTIPLE HAZARDS

Comprehensive Emergency Management Plan (CEMP) – Every community in Massachusetts is required to have a Comprehensive Emergency Management Plan. These plans address mitigation, preparedness, response, and recovery from a variety of natural and man-made emergencies. These plans contain important information regarding flooding, hurricanes, tornadoes, dam failures, earthquakes, and winter storms. Therefore, the CEMP is a mitigation measure that is relevant to all of the hazards discussed in this plan.

Communications Equipment – Hingham has full coverage of the Town with emergency services radio. Since the 2005 plan new radios were acquired for the Police and Fire Departments and Department of Public Works (using UHF), as well as the Emergency Management Agency (using UHF and VHF). All the town's radios are interoperable according to NIMS standards. Incident command units are available through Plymouth County and MEMA. The Town made significant investments in upgraded equipment since the adoption of the 2016 plan.

Massachusetts State Building Code – The Massachusetts State Building Code contains many detailed regulations regarding wind loads, earthquake resistant design, flood-proofing, and snow loads. The town has adopted the state building code.

Emergency Power Generators – The Town has invested in generator for most facilities and critical equipment. The McCulloch Building is the key remaining building that needs generator backup.

Local Emergency Planning Committee (LEPC) – The LEPC is active; it is headed by the Emergency Management/Civil Defense Director.

Public Education – The Town provides a variety of fire and winter hazard public education and outreach.

EXISTING TOWN-WIDE MITIGATION FOR FLOOD-RELATED HAZARDS

Hingham employs a number of practices to help minimize potential flooding and impacts from flooding, and to maintain existing drainage infrastructure. Existing town-wide mitigation measures include the following:

National Flood Insurance Program (NFIP) – Hingham participates in the NFIP with 271 policies in force as of the November 2, 2021. FEMA maintains a database on flood insurance policies and claims. This database can be found on the FEMA website at <http://www.fema.gov/business/nfip/statistics/pcstat.shtm>

The following information is provided from the Community Information System for the Town of Hingham:

Flood insurance policies in force (as of September 30, 2020)	190
Coverage amount of flood insurance policies	\$56,064,300
Premiums paid	\$255,728
Closed losses (Losses that have been paid)	138
Total payments (Total amount paid on losses)	\$1,143,765

The Town complies with the NFIP by enforcing floodplain regulations, maintaining up-to-date floodplain maps, and providing information to property owners and builders regarding floodplains and building requirements.

Public Works Operations/Maintenance Activities – The Public Works Department actively maintains the Town’s storm drain system. The following specific activities serve to maintain the capability of the drainage system through the reduction of sediment and litter build up and proper maintenance and repair.

- Street sweeping is conducted annually.
- Catch basins are cleaned to prevent sedimentation.
- DPW cleans inlet grates of culverts to remove debris prior to major storms.
- Roadway winter treatments: Minimal use of sand to reduce siltation.
- Continued repair and rehabilitation of drainage systems.

Town of Hingham Master Plan – The Town of Hingham adopted a new Master Plan in 2021. The plan focuses on climate resilience, in particular coastal impacts.

Hingham Open Space and Recreation Plan – The draft plan for the years 2016-2023 needs to be completed. The draft plan recognizes the value of open space for floodplain management.

Zoning Bylaw: Floodplain and Watershed Protection District– Zoning is intended to protect the public health and safety through the regulation of land uses. Hingham has adopted the state model floodplain bylaw. In addition, it includes a provision that those lands along the following named streams and their tributaries: Weir River, Accord Brook, Back River, Eel River, Plymouth

River, Crooked Meadow River, Fresh River, Tower Brook, Fulling Mill Brook and by other brooks and streams that lie within a horizontal distance of twenty-five (25) feet from the mean high water line along each bank are also included in this district.

Subdivision Control Law – The Town’s subdivision regulations include dimensional and area grading limits, and requirements for drainage design mitigating the 10, 25, and 100 year storms for new construction. The bylaw was updated since the 2016 plan.

Wetlands Bylaw – The purpose of the Wetlands Bylaw (Article 22) is to protect the foreshores, wetlands, and groundwater supply of the Town of Hingham by controlling activities deemed to have a significant effect on wetland and water quality value. The bylaw requires a 50 foot setback for habitable structures and 35’ for ancillary structures from any wetland resource, bordering vegetated wetland, coastal dune or bank, and/or isolated vegetated wetland and any proposed site disturbance. The bylaw also requires applicants to take sea level rise into consideration.

Maintenance of seawalls, jetties and other shoreline armoring structures – The Town monitors and repairs seawalls as needed and as resources allow. The Town has invested significant resources in seawall analysis and planning for improvements.

DCR dam safety regulations – The state has enacted dam safety regulations mandating inspections and emergency action plans. All new dams are subject to state permitting.

EXISTING TOWN-WIDE MITIGATION FOR WIND-RELATED HAZARDS

Massachusetts State Building Code – The town enforces the Massachusetts State Building Code whose provisions are generally adequate to protect against most wind damage. The code’s provisions are the most cost-effective mitigation measure against tornados given the extremely low probability of occurrence. If a tornado were to occur, the potential for severe damages would be extremely high.

Zoning regulations for Communications Towers - Section V-E of the Hingham Zoning Bylaw controls for personal wireless facilities and states that Tower height shall not exceed one hundred (100) feet above the natural grade.

EXISTING TOWN-WIDE MITIGATION FOR WINTER-RELATED HAZARDS

Snow disposal – The Town conducts general snow removal operations with its own equipment and has adequate snow storage/disposal space at Hingham Bathing Beach.

EXISTING TOWN-WIDE MITIGATION FOR GEOLOGIC HAZARDS

Massachusetts State Building Code – The State Building Code contains a section on designing for earthquake loads (780 CMR 1612.0). Section 1612.1 states that the purpose of these provisions is “to minimize the hazard to life to occupants of all buildings and non-building structures, to

increase the expected performance of higher occupancy structures as compared to ordinary structures, and to improve the capability of essential facilities to function during and after an earthquake.” This section goes on to state that due to the complexity of seismic design, the criteria presented are the minimum considered to be “prudent and economically justified” for the protection of life safety. The code also states that absolute safety and prevention of damage, even in an earthquake event with a reasonable probability of occurrence, cannot be achieved economically for most buildings.

Slope Bylaw – The Town has site plan review process, and it is triggered when there is a proposed land disturbance of more than 2500 square feet in areas with slopes greater than 10%. The purpose of the review is to control and address development proposed in locations with steeper slopes.

EXISTING TOWN-WIDE MITIGATION FOR FIRE-RELATED HAZARDS

Burn Permits – The Town fire department requires a permit for outdoor burning, consistent with State regulations. The permit includes explanation of the related regulations and precautions for the permit-holder to take. The permit-holder must call the fire department on each and every day that a permit-holder intends to burn. Burning of leaves, grass, hay, stumps, rubbish, building materials and tires are prohibited. Outdoor burning is only allowed from January to May, and between the hours of 10AM and 4PM.

Subdivision/Development Review – The Fire Department participates in the review of new subdivisions and development projects.

COMPILATION OF EXISTING MITIGATION

Table 36 summarizes the many existing natural hazard mitigation measures already in place in Hingham when the first Hazard Mitigation Plan was developed in 2005. Because of the number of entities, public and private, involved in natural hazard mitigation, it is likely that this list is a starting point for a more comprehensive inventory of all measures.

Table 36: Existing Natural Hazard Mitigation Measures in Hingham

Existing Mitigation Measures	Effectiveness	Improvements/Changes Needed
MULTIPLE HAZARDS		
Comprehensive Emergency Management Plan (CEMP)	Emphasis is on emergency response.	Updated in 2017, next update planned in 2022.
Communications Equipment	Effective	An alternative power source for Turkey Hill is needed. Plan for future needs/evaluation across depts.
Massachusetts State Building Code	Effective for new construction.	10 th edition due in 2022.
Emergency Power Generators	Effective	Upgrade generators as needed.

Existing Mitigation Measures	Effectiveness	Improvements/Changes Needed
Participation in the Local Emergency Planning Committee (LEPC)	A forum for inter-departmental cooperation and planning for natural and manmade disasters.	Re-focus attention on hazardous materials.
Public Education	Effective	Continue to stay up to date with materials at state and federal levels.
FLOOD HAZARDS		
Participation in the National Flood Insurance Program (NFIP)	There are 197 policies in force.	Encourage all eligible homeowners to obtain insurance.
Public Works Operations/Maintenance Activities	Effective	None
Hingham Master Plan	Effective	The new plan was adopted 8/2021
Hingham Open Space and Recreation Plan	Effective	The draft for 2016-2023 needs to be completed.
Zoning Bylaw: Floodplain and Watershed Protection District	Effective for new construction.	None. The new state model bylaw was adopted. Preliminary FIRMs will be adopted.
Subdivision Control Law	Effective for new construction.	Updated in 2018.
Wetlands Bylaw	Effective	Planning to update regulations primarily for climate resilience.
Maintenance of seawalls, jetties and other shoreline armoring structures	Moderately effective. Actions by private parties are outside of town control.	Completed comprehensive study for the inner harbor. Have near-term plan (2030 to 2050) and long-term options (2050-2070). Town funding for initial projects is in place.
DCR Dam Safety Regulations	Effective	None
WIND HAZARDS		
The Massachusetts State Building Code	Effective for most situations except severe storms	None
Zoning regulations for Communications Towers	Effective	None
WINTER HAZARDS		
Snow Disposal Site	Sufficient	None
GEOLOGIC HAZARDS		
The Massachusetts State Building Code	Effective	None
Slope Bylaw	Effective	None
BRUSH FIRE HAZARDS		

Existing Mitigation Measures	Effectiveness	Improvements/Changes Needed
Burn Permit	Effective	None
Subdivision/Development Review	Effective	None

MITIGATION CAPABILITIES AND LOCAL CAPACITY FOR IMPLEMENTATION

Under the Massachusetts system of “Home Rule,” the Town of Hingham is authorized to adopt and from time to time amend local bylaws and regulations that support the town’s capabilities to mitigate natural hazards. These include Zoning Bylaws, Subdivision and Site Plan Review Regulations, Wetlands Bylaw, Health Regulations, Public Works regulations, and local enforcement of the State Building Code.

Local Bylaws may be amended by the Town Meeting to improve the town’s capabilities, and changes to most regulations simply require a public hearing and a vote of the authorized board or commission. The Town of Hingham has recognized several existing mitigation measures that require implementation or improvements and has the capacity within its local boards and departments to address these.

The Town can improve its hazard mitigation capabilities with the following measures:

- Complete the update of the Open Space and Recreation Plan and incorporate Hazard Mitigation and Climate Resilience as a formal component of the plan. Identify opportunities for open space protection and land acquisition that would have specific hazard mitigation co-benefits, such as managing stormwater to reduce flooding, protecting vegetation for shade to mitigate extreme heat, and managing forests to mitigate climate impacts.
- Consider adopting a Stormwater Utility or stormwater user fee to provide a dedicated, predictable revenue stream to finance upgrades to the stormwater infrastructure. This would address the noted need for additional funds for DPW for maintenance and rehabilitation of stormwater systems.
- Update the Cluster Zoning bylaw.
- Update the Zoning Bylaw and relevant regulations to incorporate low impact development and green infrastructure strategies and requirements.
- Financing the implementation of mitigation measures: the Town can incorporate a program of mitigation measures into its Capital Investment Program to ensure that these receive priority along with other categories of municipal investment such as roadways and municipal buildings.

SECTION 7: MITIGATION MEASURES FROM PREVIOUS PLAN

IMPLEMENTATION PROGRESS ON THE PREVIOUS PLAN

At a meeting of the Local Hingham Hazard Mitigation Planning Committee, Town staff reviewed the mitigation measures identified in the 2016 Hingham Hazard Mitigation Plan and determined whether each measure had been implemented or deferred. Of those measures that had been deferred, the committee evaluated whether the measure should be deleted or carried forward into this Hazard Mitigation Plan 2022 Update. The decision on whether to delete or retain a particular measure was based on the committee's assessment of the continued relevance or effectiveness of the measure and whether the deferral of action on the measure was due to the inability of the Town to take action on the measure. Table 37 summarizes the status of mitigation measures from the 2016 plan.

Table 37: Mitigation Measures from the 2016 Plan

Mitigation Action	Priority in 2016 plan	Current Status	Include in 2022 Plan?
Study Bonny Brier roadway elevation	Medium	Not complete This is not a top priority roadway flooding location.	No
Work with private dam owners on maintenance plans	Low	Not complete. The Cushing Pond Dam should be pursued.	Yes
Weir River Corridor Restoration study	High	Not complete. Low flow rather than flooding is the primary concern.	No
Stream Clearing	High	Done on an as-needed basis. Mosquito ditching improved flow and work to facilitate fish passage was completed on Weir River. Needs on an on-going attention.	Yes
Seawall study	Medium	Studies and plans completed.	No
Bank Stabilization along Route 3A	Medium	Complete	No
Management Plan for Sand at Hingham Bathing Beach	Medium	Complete. On-going maintenance is required.	No
Update erosion Control By-law	Medium	Complete	No
Floodplain Management	High	Complete and on-going.	No
Floodplain Mapping	High	Complete and ongoing. Future mapping may include sea level rise projections.	Yes
Acquisition of Vacant Flood Prone Lands	High	The Lehner property purchase included wetlands and preserves flood storage capacity.	Yes
Expand depth of tree trimming	Medium	Complete and on-going.	No

Mitigation Action	Priority in 2016 plan	Current Status	Include in 2022 Plan?
Plant Vegetated Buffer along Route 3A by the Hingham Bathing Beach	Low	Complete	No
Vegetated Buffer along Union Street	Low	Not complete, other projects had higher priority.	Yes
Seismic Study	Low	Not complete, other projects had higher priority.	Yes
Acquire Gator Fire Units	Medium	Complete	No
Clearing Town Forest debris for brushfire control	Medium	Not complete. Some clearing was done. The town received funding for a forest stewardship plan which will be completed in 1/2022.	Yes
Brush Fire Education	Low	Not complete - other fire education was completed.	Yes
Update Town Master Plan	Medium	Adopted by Planning Board 8/2021.	No
Encourage Private Residential Developments to Develop Natural Hazard Mitigation and Response Plans	Medium	Not complete, other projects had higher priority	No
Climate Change Vulnerability and Adaptation Study	Medium	The plan was completed in 2016. In addition, Hingham is a state-certified MVP community, and additional studies on the Inner Harbor have been completed. More can be implemented.	Yes

As indicated in Table 37, Hingham made good progress implementing mitigation measures identified in the 2016 Hazard Mitigation Plan. Hingham completed significant planning for coastal impacts, including the Climate Change Vulnerability, Risk Assessment and Adaptation Study in 2015, and an additional community workshop and climate resilience report in 2019. Hingham’s new Master Plan, adopted in 2021, has extensive focus on climate change and the need to adapt to increasing coastal risks. Study and plans for improved seawall protection were completed and the town is seeking funds for implementation. Bank stabilization along Route 3A and beach nourishment at the Hingham Bathing Beach were completed. Mosquito ditching improved flow on the Weir River. The Town purchased a 56-acre parcel that provides flood storage and gator units for wildfire management. Finally, the town updated its erosion control bylaw.

Overall, nine mitigation measures from the 2016 plan will be continued in the plan update. Most retain the same priority in this 2022 Update. Moving forward into the next five-year plan implementation period there will be many more opportunities to incorporate hazard mitigation into the Town’s decision-making processes. The challenges the Town faces in implementing these

measures are primarily due to limited funding and available staff time. This plan should help the Town prioritize the best use of its limited resources for enhanced mitigation of natural hazards.

Policy, programmatic areas, and plans that incorporated hazard mitigation priority achievements since the 2016 plan include: completion of the Climate Change Vulnerability, Risk Assessment and Adaptation Study in 2015 and the completion of the Municipal Vulnerability Preparedness planning process in 2019, update of the floodplain bylaw to incorporate the state model bylaw and update of wetlands regulations to include planning for sea level rise, adoption of a Master Plan that incorporates climate resilience and planning for sea level rise, and analysis and planning for seawall improvements.

SECTION 8: HAZARD MITIGATION STRATEGY

WHAT IS HAZARD MITIGATION?

Hazard mitigation means to permanently reduce or alleviate the losses of life, injuries and property resulting from natural hazards through long-term strategies. These long-term strategies include planning, policy changes, education programs, infrastructure projects and other activities. FEMA currently has three mitigation grant programs: the Hazards Mitigation Grant Program (HGMP), the Building Resilient Infrastructure and Communities (BRIC), and the Flood Mitigation Assistance (FMA) program. The three links below provide additional information on these programs.

<https://www.fema.gov/hazard-mitigation-grant-program>

<https://www.fema.gov/pre-disaster-mitigation-grant-program>

<https://www.fema.gov/flood-mitigation-assistance-grant-program>

Hazard Mitigation Measures can generally be sorted into the following groups:

- **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.
- **Property Protection:** Actions that involve the modification of existing buildings or infrastructure to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, flood proofing, storm shutters, and shatter resistant glass.
- **Public Education & Awareness:** Actions to inform and educate citizens, elected officials, and property owners about the potential risks from hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include storm water controls (e.g., culverts), floodwalls, seawalls, retaining walls, and safe rooms.
- **Emergency Services Protection:** Actions that will protect emergency services before, during, and immediately after an occurrence. Examples of these actions include protection of warning system capability, protection of critical facilities, and protection of emergency response infrastructure.

(Source: FEMA Local Multi-Hazard Mitigation Planning Guidance)

REGIONAL AND INTER-COMMUNITY CONSIDERATIONS

Some hazard mitigation issues are strictly local. The problem originates primarily within the municipality and can be solved at the municipal level. Other issues are inter-community and require cooperation between two or more municipalities. There is a third level of mitigation which is regional and may involve a state, regional or federal agency or three or more municipalities.

REGIONAL PARTNERS

In developed urban and suburban communities such as the metropolitan Boston area, mitigating natural hazards, particularly flooding, is more than a local issue. The drainage systems that serve these communities are complex systems of storm drains, roadway drainage structures, pump stations and other facilities owned and operated by a wide array of agencies including the Town, the Department of Conservation and Recreation (DCR), the Massachusetts Department of Transportation (MassDOT) and the Massachusetts Bay Transportation Authority (MBTA). The planning, construction, operation, and maintenance of these structures are integral to the flood hazard mitigation efforts of communities. These agencies must be considered the communities' regional partners in hazard mitigation. These agencies also operate under the same constraints as communities do including budgetary and staffing constraints and they must make decisions about numerous competing priorities.

Following is a brief overview of regional facilities found in Hingham and a discussion of inter-municipal issues.

OVERVIEW OF REGIONAL FACILITIES WITHIN HINGHAM

Major facilities owned, operated, and maintained by state or regional entities include:

- State Routes 3, 3A, 18, and 228 (MassDOT)
- Greenbush Commuter Rail: West Hingham and Nantasket Junction stops (MBTA)
- Wompatuck State Park and Stodder's Neck (Mass DCR)

INTER-COMMUNITY CONSIDERATIONS

Mitigation measures for the following regional issues should be taken into account as Hingham develops its own local plan:

A) Coordinate and Review Developments on a Regional Basis

As Hingham and the surrounding communities are undergoing development, it is vital that these communities communicate and provide input during the review processes. When addressing housing, transportation, and economic development projects, the impacts to neighbors must be addressed.

- B) Hingham is closely connected with its neighboring communities in multiple ways. The Town of Hingham owns the Weir River Water System which provides drinking water for Hingham, Hull, and part of Cohasset. The communities jointly rely on surface water and ground water resources located in the Weir River watershed. Hingham, Norwell, Cohasset, and Hull share a regional emergency communications center. The Hull Wastewater Treatment Plant serves the West Corner area of Hingham. These shared resources and facilities require close collaboration.
- C) Hingham, Weymouth, Cohasset, and Hull are each vulnerable to impacts from coastal storms and future sea level rise. As roadways and shorelines are connected, the communities will benefit from shared planning and resources.

NEW DEVELOPMENT AND INFRASTRUCTURE

As part of the process of developing recommendations for new mitigation measures for this plan update, the Town considered the issues related to new development, redevelopment, and infrastructure needs in order limit future risks. Taking into consideration the Wetlands Act and bylaw enforced by the Conservation Commission and updates to the floodplain bylaw, stormwater bylaw and the erosion and sedimentation bylaw, the town determined that existing regulatory measures are taking good advantage of local Home Rule land use regulatory authority to minimize natural hazard impacts of development. Priorities for the future include fully incorporating climate resilience in the wetland bylaw.

PROCESS FOR SETTING PRIORITIES FOR MITIGATION MEASURES

The last step in developing the Town's mitigation strategy is to assign a level of priority to each mitigation measure so as to guide the focus of the Town's limited resources towards those actions with the greatest potential benefit. At this stage in the process, the Local Hazard Mitigation Planning Team had limited access to detailed analyses of the cost and benefits of any given mitigation measure, so prioritization is based on the local team members' understanding of existing and potential hazard impacts and an approximate sense of the costs associated with pursuing any given mitigation measure.

Priority setting was based on local knowledge of the hazard areas, including impacts of hazard events, the extent of the area impacted, and the relation of a given mitigation measure to the Town's goals. In addition, the Local Hazard Mitigation Planning Team also took into consideration factors such as the number of homes and businesses affected, whether or not road closures occurred and what impact closures had on delivery of emergency services and the local economy, anticipated project costs, whether any environmental constraints existed, and whether the Town would be able to justify the costs relative to the anticipated benefits.

Table 38 below demonstrates the prioritization of the Town's potential hazard mitigation measures. For each mitigation measure, the geographic extent of the potential benefiting area is

identified as is an estimate of the overall benefit and cost of the measures. The benefits, costs, and overall priority were evaluated in terms of:

Estimated Benefits	
High	Action will result in a significant reduction of hazard risk to people and/or property from a hazard event
Medium	Action will likely result in a moderate reduction of hazard risk to people and/or property from a hazard event
Low	Action will result in a low reduction of hazard risk to people and/or property from a hazard event
Estimated Costs	
High	Estimated costs greater than \$100,000
Medium	Estimated costs between \$10,000 to \$100,000
Low	Estimated costs less than \$10,000 and/or staff time
Priority	
High	Action very likely to have political and public support and necessary maintenance can occur following the project, and the costs seem reasonable considering likely benefits from the measure
Medium	Action may have political and public support and necessary maintenance has potential to occur following the project
Low	Not clear if action has political and public support and not certain that necessary maintenance can occur following the project

INTRODUCTION TO MITIGATION MEASURES TABLE

Description of the Mitigation Measure – The description of each mitigation measure is brief and cost information is given only if cost data were already available from the community. The cost data represent a point in time and would need to be adjusted for inflation and for any changes or refinements in the design of a particular mitigation measure.

Priority – As described above and summarized in Table 38, the designation of high, medium, or low priority was done considering potential benefits and estimated project costs, as well as other factors in the STAPLEE (Social, Technical, Administrative, Legal, Economic, and Environmental) analysis.

Implementation Responsibility – The designation of implementation responsibility was done based on a general knowledge of what each municipal department is responsible for. It is likely that most mitigation measures will require that several departments work together and assigning staff is the sole responsibility of the governing body of each community.

Time Frame – The time frame was based on a combination of the priority for that measure, the complexity of the measure and whether or not the measure is conceptual, in design, or already designed and awaiting funding. Because the time frame for this plan is five years, the timing for

all mitigation measures has been kept within this framework. The identification of a likely time frame is not meant to constrain a community from taking advantage of funding opportunities as they arise.

Potential Funding Sources – This column attempts to identify the most likely sources of funding for a specific measure. The information on potential funding sources in this table is preliminary and varies depending on a number of factors. These factors include whether or not a mitigation measure has been studied, evaluated, or designed, or if it is still in the conceptual stages. MEMA and DCR assisted MAPC in reviewing the potential eligibility for hazard mitigation funding. Each grant program and agency has specific eligibility requirements that would need to be taken into consideration. In most instances, the measure will require a number of different funding sources. Identification of a potential funding source in this table does not guarantee that a project will be eligible for, or selected for, funding. Upon adoption of this plan, the local team responsible for its implementation should begin to explore the funding sources in more detail.

Additional information on funding sources – The best way to determine eligibility for a particular funding source is to review the project with a staff person at the funding agency. The following websites provide an overview of programs and funding sources.

Army Corps of Engineers (ACOE) – The website for the North Atlantic district office is <http://www.nae.usace.army.mil/>. The ACOE provides assistance in a number of types of projects including shoreline/streambank protection, flood damage reduction, flood plain management services and planning services.

Massachusetts Emergency Management Agency (MEMA) – The grants page <https://www.mass.gov/hazard-mitigation-assistance-grant-programs> describes the various Hazard Mitigation Assistance Program.

Table 38: Mitigation Measures Prioritization

CLIMATE CHANGE	ACTION	GEOGRAPHIC COVERAGE	LEAD	TIME FRAME	EST. BENEFIT	EST. COST	FUNDING SOURCE	PRIORITY
Changes in Precipitation 	Inland Flooding							
	Design and permitting for East Street bridge	Site specific	DPW	2023	Medium	High	MassDOT	High
	Cushing Dam flood management plan	Site specific	Emer. Mgmt.	2023	High	Medium	Private	Low
	Stream clearing for flood prevention	Site specific	DPW	2022	Medium	Low	DPW funds	Low
	Town-wide culvert performance evaluation	Site specific	DPW	2022	Low	Medium	Town capital funds	High
	Acquisition of vacant flood prone lands	Town-wide	Conservation/ Planning	2025	Med	High	CPA	High
	Drought							
	Manage drinking water storage	Town-wide	Weir River Water System	2023	High	Low	WRWS funds	Medium
Landslide								
Evaluate coastal landslide potential	Coastal	Conservation/ DPW	2024	Medium	Low	Capital funds	Low	
Sea Level Rise 	Coastal Flooding (and Tsunamis)							
	Elevate bulkheads in the Inner Harbor	Site specific	DPW	2022/3	High	High	Town capital/ State- MVP/ FEMA	High
	Mitigate flooding on MassDOT roadways	Town-wide	DPW	2027	Med	High	MVP/BRIC	Medium
	Publicize sea level rise maps	Coastal areas	GIS	2023	Low	Low	GIS budget	High
	Plan for a new tide gate at Town Brook	Site specific	DPW	2026	Medium	High	Capital/ CZM grant	Medium
	Mitigate storm surge behind MassDOT roadways	Site Specific	DPW	2027	High	High	Capital/MA DOT/BRIC	Medium
	Feasibility study for coastal nature-based solutions	Site Specific	Conservation	2023	High	High	Conservation Dept./MVP	High
	Coastal Erosion							
Implement the beach management plan	Site specific	DPW	2022	Low	High	DPW	High	

CLIMATE CHANGE	ACTION	GEOGRAPHIC COVERAGE	LEAD	TIME FRAME	EST. BENEFIT	EST. COST	FUNDING SOURCE	PRIORITY
Rising Temperatures 	Extreme Heat and Heat Waves							
	Adopt tree protection regulations	Town-wide	Planning	2022	Medium	Low	Planning	High
	Add solar canopies to municipal parking areas	Site specific	Public safety	2024	Low	Medium	DPW	High
	Wildfires							
	Implement Hingham's Forest Stewardship Plan	Forested areas	DPW	2023	Medium	Medium	Conservation /DCR grant	Low
	Brushfire education	Town-wide	Fire/Emer. Mgmt.	2024	Medium	Low	Fire	Low
	Invasive species							
Provide Lyme disease education	Town-wide	Health/Conservation	2022	Medium	Low	Public Health	Medium	
Require management of invasives in permits	Town-wide	Conservation	2022	Medium	Low	Conservation	Medium	
Extreme Weather 	Severe Winter Storm/Nor'easter							
	Plant vegetated buffer along Union Street	Site specific	DPW	2024	Medium	medium	DPW	Low
	Tornadoes							
	Hurricanes and Tropical Storms							
	Other Severe Weather (strong winds, thunderstorms)							
Increase tree trimming to prevent power outages	Town-wide	Light Dept./DPW	2023	Medium	High	Light/DPW	Medium	
Multihazards	Multihazards							
	Implement the 2015 Climate Adaptation Study	Town-wide	Planning/DPW/Conservation	2023	High	High	MVP/Capital funds	High
	Purchase generator for warming/cooling center	Site specific	Emer. Mgmt.	2022	High	High	Capital/ARPA/BRIC	High
Non-Climate Hazard	Earthquake							
Seismic study	Site specific	DPW/Building	2026	Low	Medium	DPW	Low	

DESCRIPTION OF MITIGATION MEASURES

Changes in Precipitation

Inland Flooding

Design and permitting for East Street bridge: Work with MassDOT to move forward with replacement plans for the East Street bridge over the Weir River.

Cushing Dam flood management plan: Cushing Dam is a privately owned significant hazard dam. Hingham will work with ownership to ensure proper management plans and communications are in place for extreme rain events.

Stream clearing for flood prevention: Remove debris from waterways so that vegetation does not block streams; focus on choke points including culverts and bridges.

Town-wide culvert performance evaluation: Evaluate the condition of culverts and their capacity to handle extreme flows. Prioritize upgrades and begin implementation.

Acquisition of vacant flood prone lands: Identify and purchase parcels in floodplain areas in order to maintain flood storage and water infiltration capacity. These parcels may also be used for general conservation and recreation purposes.

Drought

Manage water storage: Since the last plan was adopted, the Town of Hingham assumed ownership of the Weir River Water System (WRWS). The WRWS will improve surface and subsurface water supply by developing new strategies that balance the need for flood storage with the need for water supply.

Landslide

Evaluate coastal landslide potential: The Town will investigate potential shoreline landslide risk locations.

Sea Level Rise

Coastal Flooding

Elevate bulkheads in the Inner Harbor: Elevate seaward bulkheads to provide protection from flooding to Route 3A and downtown Hingham assets.

Mitigate flooding on MassDOT roadways: Work with MassDOT to minimize or eliminate flooding on MassDOT right-of-ways.

Publicize sea level rise maps: Make future projected flood maps available on the town website.

Plan for a new tide gate at Town Brook: Develop design plans for a new tide gate to manage discharge at Town Brook and North Street.

Mitigate storm surge behind MassDOT roadways: Work with MassDOT to evaluate options to reduce the risk of storm surge flooding behind MassDOT right-of-ways.

Feasibility study for coastal nature-based solutions: Assess the coastline for feasibility of nature-based solutions, particularly within Broad Cove and Beal Cove. Develop designs for implementation.

Coastal Erosion

Implement the beach management plan: Monitor erosion at the Hingham Bathing Beach. Install beach nourishment as needed.

Rising Temperatures

Extreme Heat and Heatwaves

Adopt tree protection regulations: Implement regulations for the preservation and protection of trees.

Add solar canopies to municipal parking areas: Consider installing a solar canopy over the parking area at the new public safety building.

Wildfires

Implement Hingham's Forest Stewardship Plan: Hingham recently completed a Forest Stewardship Plan for the Town Forest. The plan focuses on environmental stewardship and includes plans for clearing brush which can also reduce the risk of brushfire.

Brushfire education: Implement an education program for property owners in or near brush fire hazard areas with regard to controlling vegetation near homes to limit the ability of fires to spread to buildings.

Invasive Species

Provide Lyme disease information: Educate the public about Lyme disease risks and prevention.

Require management of invasives in permits: Include invasive species management requirements in wetlands permits.

Extreme Weather

Hurricanes/Tropical storms: see Severe Winter Storm/Nor'easter

Severe Winter Storm/Nor'easter

Plant vegetated buffer along Union Street: Snow from the nearby playing fields blows across Union Street reducing visibility and has accumulated into drifts. The planting of a vegetated buffer will mitigate the impacts of this winter storm and snow hazard.

Tornadoes

Hurricanes/Tropical Storms

Other Severe Weather: (strong winds, thunderstorms)

Increase tree trimming to prevent power outages: Seek additional resources to increase capacity for tree trimming and dead tree removal to reduce the likelihood of power outages.

Multihazards

Implement the Climate Adaptation Study: Hingham completed a Climate Change Vulnerability Risk Assessment and Adaptation study in 2015. Many aspects of the plan have been implemented. The Town will continue to refer to the plan to address vulnerabilities.

Purchase generator for warming/cooling center: Hingham Town Hall serves as the warming and cooling center. It needs a generator in order to function during power outages.

Non-Climate Hazard

Earthquake

Seismic study: The Town will conduct a study of the seismic vulnerability and upgrade needs for critical infrastructure sites, both public and private.

SECTION 9: PLAN ADOPTION & MAINTENANCE

PLAN ADOPTION

The Hingham Hazard Mitigation Plan 2022 Update was adopted by the Select Board on June 28, 2022. See Appendix D for documentation. The plan was approved by FEMA on July 11, 2022 for a five-year period that will expire on July 10, 2027.

PLAN MAINTENANCE

MAPC worked with the Hingham Local Hazard Mitigation Planning Team to prepare this plan. This group will continue to meet on an as-needed basis to coordinate the implementation and maintenance of this plan. A member of the Town staff will be designated as the team coordinator. Additional members could be added to the local team from businesses, non-profits, and institutions. The Town will encourage public participation during the next 5-year planning cycle. As updates and a review of the plan are conducted by the Hazard Mitigation Team, these will be placed on the Town’s web site, and any meetings of the Hazard Mitigation Team will be publicly noticed in accordance with town and state open meeting laws.

IMPLEMENTATION AND EVALUATION SCHEDULE

Mid-Term Survey on Progress – The Deputy Fire Chief will prepare and distribute a survey in year three of the plan. The survey will be distributed to all the local team members and other interested local stakeholders. The survey will poll the members on progress and accomplishments for implementation, any new hazards or problem areas that have been identified, and any changes or revisions to the plan that may be needed.

This information will be used to prepare a report or addendum to the local hazard mitigation plan in order to evaluate its effectiveness in meeting the plan’s goals and identify areas that need to be updated in the next plan. The Hazard Mitigation Implementation Team will have primary responsibility for tracking progress, evaluating, and updating the plan.

Begin to Prepare for the next Plan Update – FEMA’s approval of this plan is valid for five years, by which time an updated plan must be approved by FEMA in order to maintain the Town’s approved plan status and its eligibility for FEMA mitigation grants. Given the lead time needed to secure funding and conduct the planning process, the Hazard Mitigation Implementation Team will begin to prepare for an update of the plan in year three. This will help the Town avoid a lapse in its approved plan status and grant eligibility when the current plan expires.

The Hazard Mitigation Implementation Team will use the information from the Mid-Term progress review to identify the needs and priorities for the plan update and seek funding for the plan update process. Potential sources of funding may include FEMA Pre-Disaster Mitigation grants and the Hazard Mitigation Grant Program. Both grant programs can pay for 75% of a planning project, with a 25% local cost share required

Prepare and Adopt an Updated Local Hazard Mitigation Plan – Once the resources have been secured to update the plan, the Hazard Mitigation Team may decide to undertake the update themselves, contract with the Metropolitan Area Planning Council to update the plan or to hire another consultant. However, the Hazard Mitigation Implementation Team decides to update the

plan, the Town will need to review the current FEMA hazard mitigation plan guidelines for any changes in requirements for hazard mitigation plans since the previous plan. Once the next plan update is prepared, the Town will submit it to MEMA and FEMA for review and approval and adopt the plan update in order to obtain formal FEMA approval of the plan.

INTEGRATION OF THE PLANS WITH OTHER PLANNING INITIATIVES

Upon approval of the Hingham Hazard Mitigation Plan 2022 Update by FEMA, the Local Hazard Mitigation Planning Team will provide all interested parties and implementing departments with a copy of the plan and will initiate a discussion regarding how the plan can be integrated into that department's ongoing work. At a minimum, the plan will be reviewed and discussed with the following departments:

- Fire/Emergency Management
- Police
- Public Works
- Planning
- Building Department
- Conservation
- Health
- Harbormaster

Other groups that will be coordinated with include large institutions, Chambers of Commerce, land conservation organizations and watershed groups. The plan will also be posted on the Town's website with the caveat that a local team coordinator will review the plan for sensitive information that would be inappropriate for public posting. The posting of the plan on the website will include a mechanism for citizen feedback such as an e-mail address to send comments.

The Hazard Mitigation Plan will be integrated into other Town plans and policies as they are updated and renewed, including the Open Space and Recreation Plan, Comprehensive Emergency Management Plan, and local wetlands regulations.

SECTION 10: LIST OF REFERENCES

Hingham Zoning Bylaw
Town of Hingham Climate Change Vulnerability, Risk Assessment and Adaptation Study, 2015
Town of Hingham Community Resilience Building Workshop Summary of Findings 2019
Town of Hingham Draft Open Space and Recreation Plan 2016-2023
Blue Hill Observatory
Boston HIRA
FEMA Flood Insurance Rate Maps for Hingham, MA 7/6/2021
FEMA, Hazards U.S. Multi-Hazard
FEMA, Local Mitigation Plan Review Guide, October 2011
Fourth National Climate Assessment, 2018
Massachusetts Flood Hazard Management Program
Massachusetts Office of Coastal Zone Management Shoreline Change Data
Massachusetts Office of Dam Safety, Inventory of Massachusetts Dams 2018
Massachusetts State Hazard Mitigation Plan, 2013
Massachusetts State Hazard Mitigation and Climate Adaptation Plan, 2018
Metropolitan Area Planning Council, GIS Lab, Regional Plans and Data
National Weather Service
Nevada Seismological Library
New England Seismic Network, Boston College Weston Observatory, <http://aki.bc.edu/index.htm>
NOAA National Climatic Data Center, <http://www.ncdc.noaa.gov/>
Northeast Climate Adaptation Science Center
Northeast States Emergency Consortium, <http://www.nesec.org/>
Tornado History Project
US Census, 2010 and American Community Survey 2017 5-Year Estimates
USGS, National Water Information System, <http://nwis.waterdata.usgs.gov/usa/nwis>

APPENDIX A: MEETING AGENDAS

Hingham Hazard Mitigation Plan Update

LOCAL HAZARD MITIGATION PLANNING TEAM

Meeting #1

Monday, September 27, 2021

9:30 am

via Zoom

AGENDA

1. Welcome and introductions
2. Overview of the planning process
3. Climate impacts on natural hazards
4. Review hazards – identify key concerns
5. Identify/update local hazard and development areas
 - a) Flood Hazard Areas
 - b) Fire Hazard Areas
 - c) Anticipated development
6. Review critical infrastructure
7. Next steps

Hingham Hazard Mitigation Plan Update

LOCAL HAZARD MITIGATION PLANNING TEAM

Meeting #2

Monday November 15, 2021

9:00 am

via Zoom

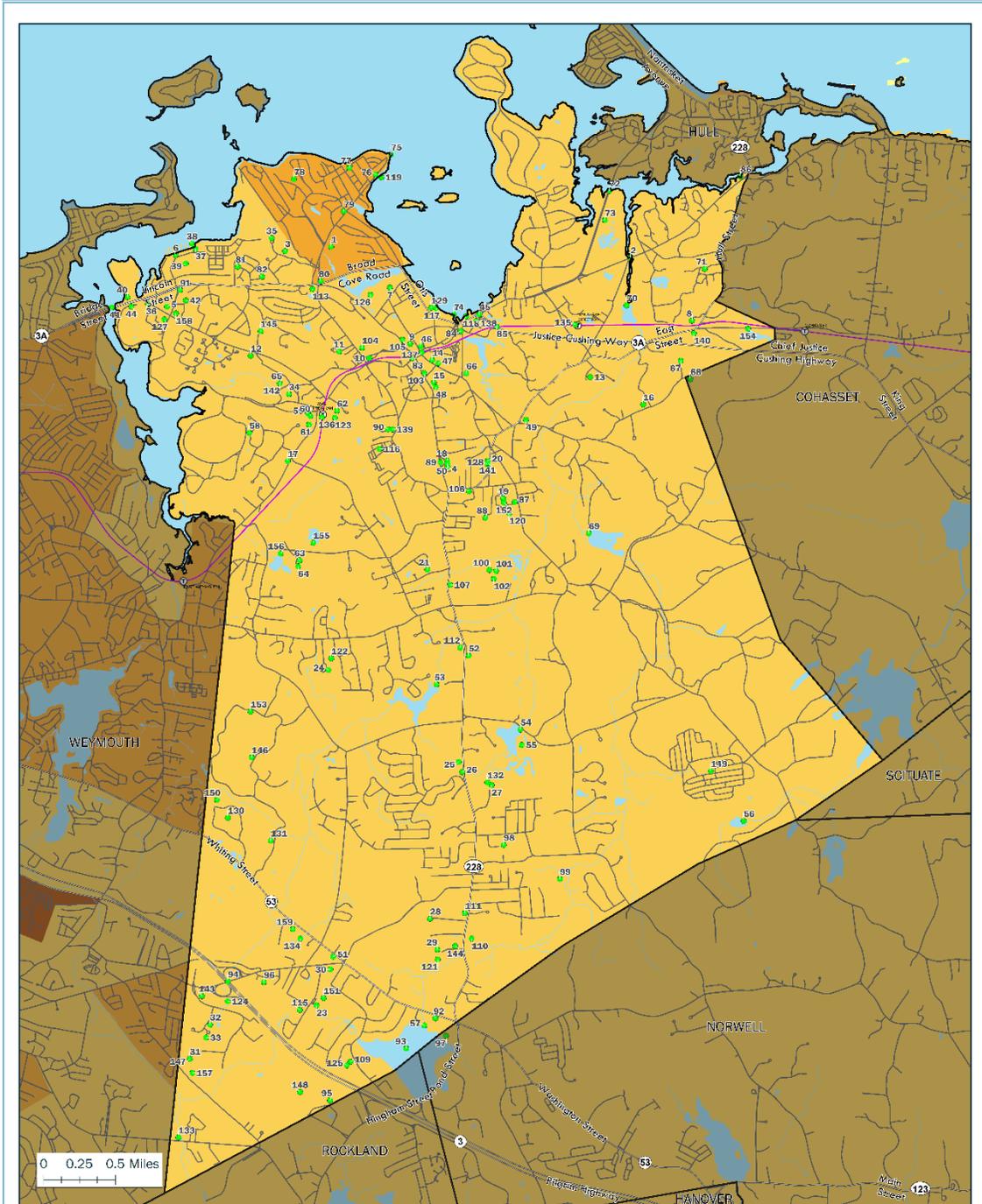
AGENDA

1. Review Hazard Mitigation Goals
2. Review/update mitigation measures from the original (2008) plan
3. Review/update mitigation measures from the 2016 plan
4. Plan first public meeting

Hingham Hazard Mitigation Plan
Meeting #3
March 7, 2022
9:00 – 10:30
via Zoom

1. Recap 1st public meeting and feedback
2. Develop mitigation measures for the plan update
3. Next steps – public meeting

APPENDIX B: HAZARD MAPPING



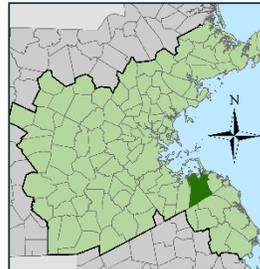
**Map 1:
Population Density**



FEMA Hazard
Mitigation Planning Grant
HINGHAM, MA

- Sites**
- Critical Infrastructure*
 - Water Bodies
- Population Density**
- Census 2020 Block Groups**
- People per acre**
- 0 or No Data
 - 0.1 - 5.0
 - 5.1 - 15.0
 - 15.1 - 30.0
 - More than 30

- All Roads**
- Interstate
 - U.S. Highway
 - State Route
 - Street
- Rail**
- Stations
 - Commuter Rail



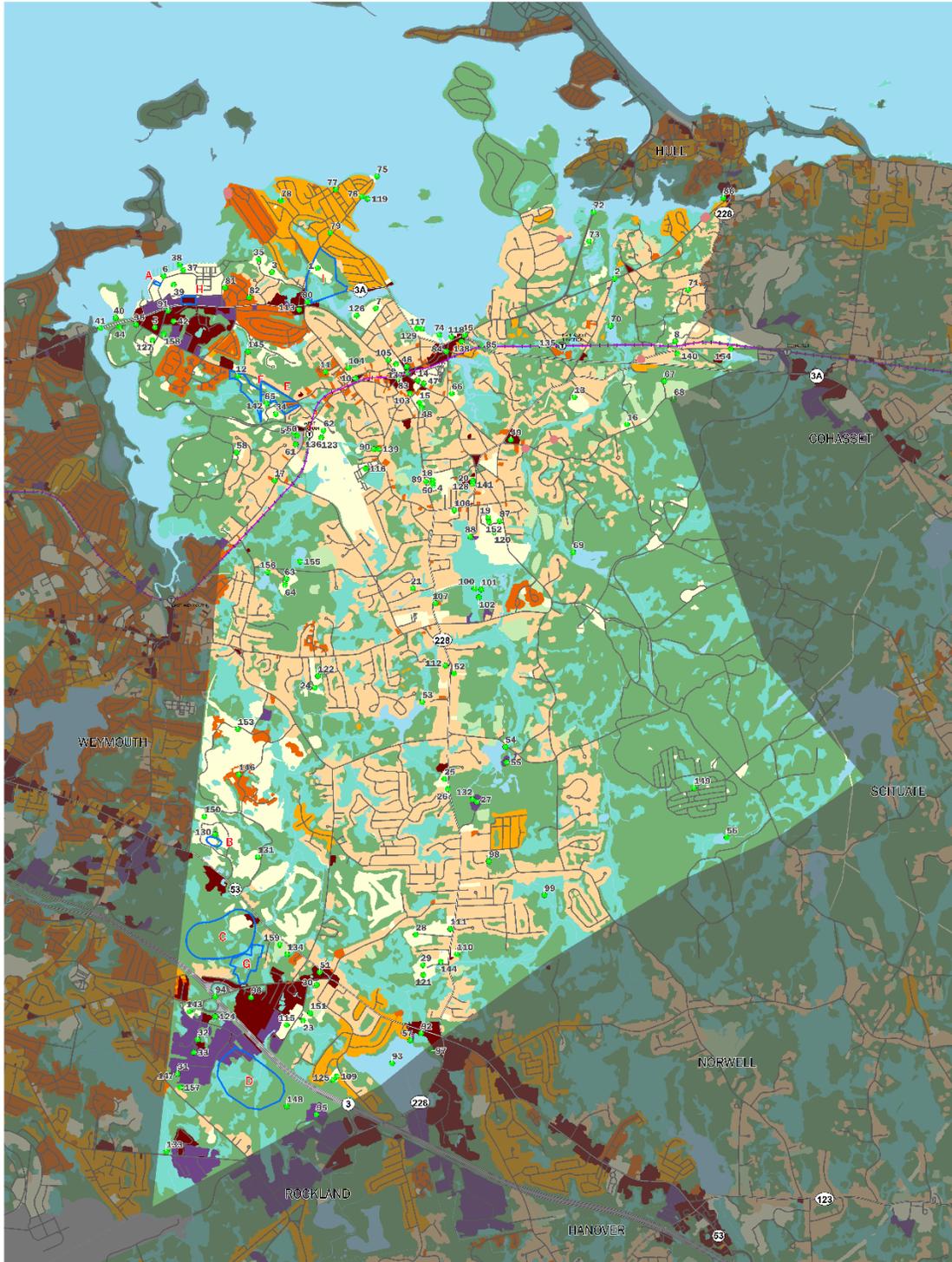
The information depicted on this map is for planning purposes only. It is not intended for legal boundary definition, regulatory interpretation, or parcel level analysis.

Prepared by MAPC Data Services
60 Temple Place, Boston, MA 02111 (617) 451-2770

Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Northeast States Emergency Consortium (NEMEC)
Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)

HINGHAM, MA
Date: 3/21/2022

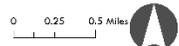
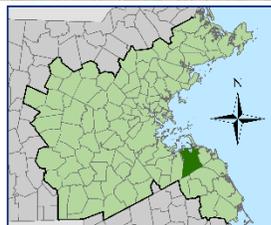
Public: \\data-001\public\GIS\DataServices\F\Projects\Current_Projects\Environment\POV\Project_Files\FDM_M



Map 2: Land Use



- Sites**
- Critical Infrastructure Sites*
 - Repetitive Loss Sites*
 - * See details in separate table
- Train Stations**
- Commuter
 - Rail Lines
 - Trains
- All Roads**
- Interstate
 - U.S. Highway
 - State Route
 - Street
 - Water Bodies
- Development Areas**
- High Density Residential
 - Medium Density Residential
 - Low Density Residential
 - Non-Residential
 - Developed
 - Commercial
 - Industrial
 - Transportation
 - Agriculture
 - Undeveloped
 - Undeveloped Wetlands

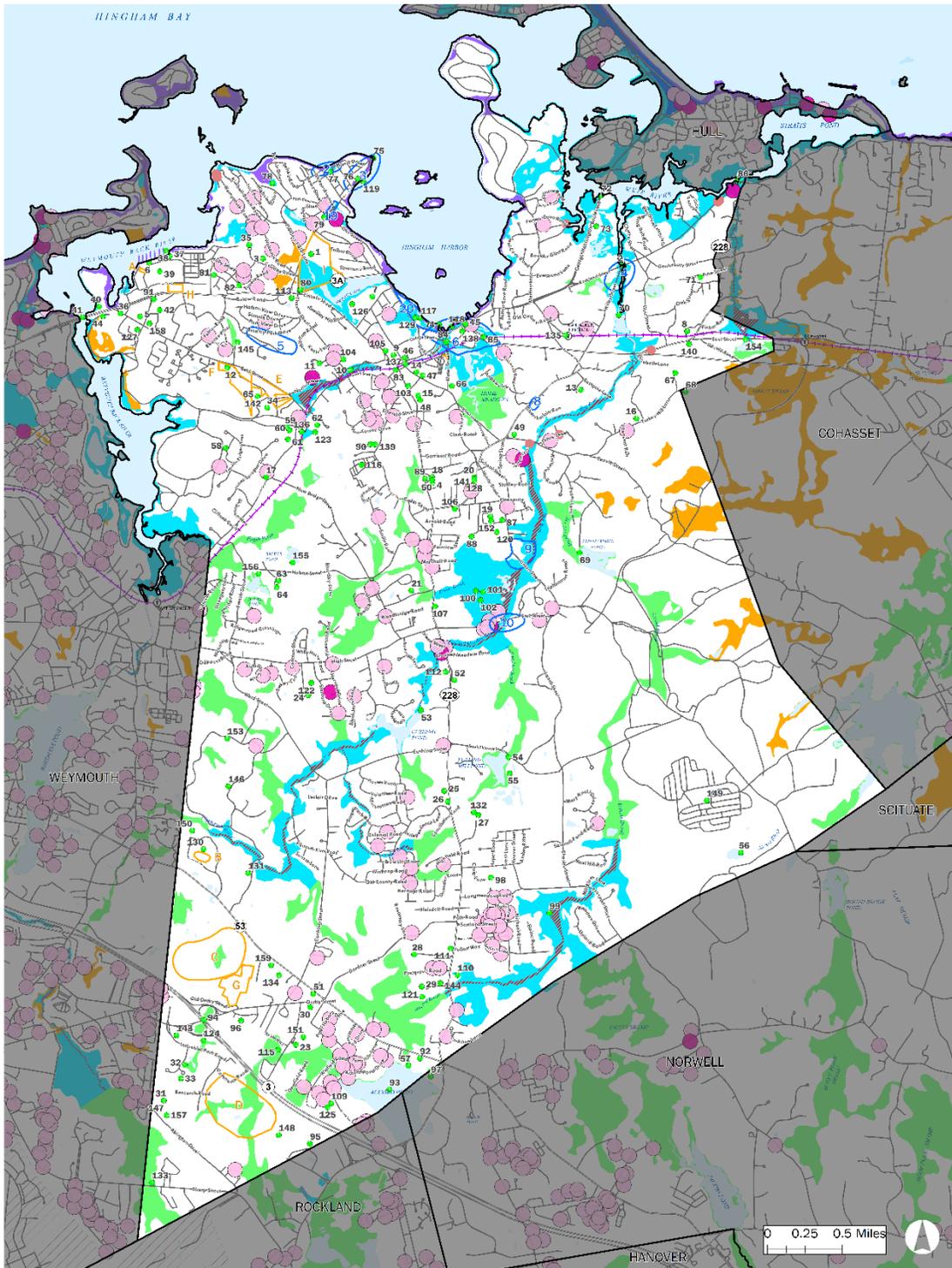


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Produced by:
Metropolitan Area Planning Council
60 Temple Place, Boston, MA 02111 | (617) 933-0700

Data Sources:
Metropolitan Area Planning Council (MAPC);
Massachusetts Geographic Information System (MassGIS);
Massachusetts Department of Transportation (MassDOT)

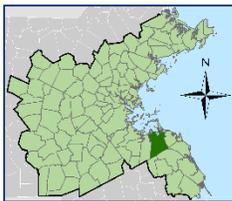
March 2022



Map 3: Flood Zones
 FEMA Hazard Mitigation Planning Grant
 HINGHAM

Download Path: \\dms-001\gs\GIS\Data\GIS\Projects\Current\Projects\GIS\GIS\Projects\GIS\GIS\Map3_Web.mxd

- Sites**
- Critical Infrastructure Sites*
- Repetitive Loss Sites
- * See details in separate table
- Flood Zones, 2017 (Annual Chance)**
- AE: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory
- VE: High Risk Coastal
- X: 0.2% Annual
- March 2010 Flood Claims**
- Disaster Assistance
- Flood Insurance
- Locally Identified Hazard Areas***
- Flooding
- See Section V Risk Assessment
- Development Areas**
- ** See details in separate table
- Train Stations
- Commuter
- Rail Lines
- Trains

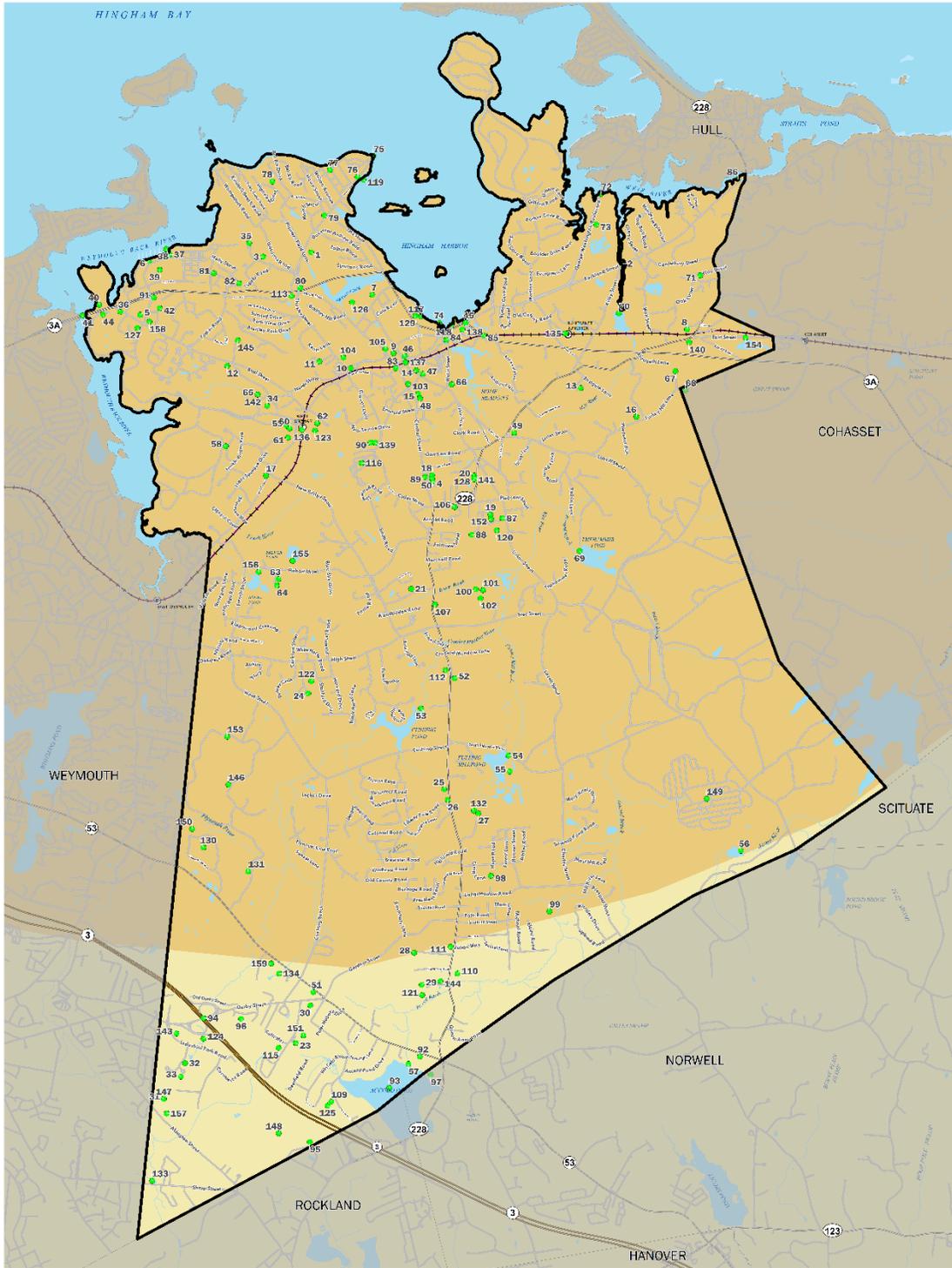


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 Metropolitan Area Planning Council
 60 Temple Place, Boston, MA 02111 | (617) 933-0700

Data Sources:
 Metropolitan Area Planning Council (MAPC)
 Massachusetts Geographic Information System (MassGIS)
 Massachusetts Department of Transportation (MassDOT)
 Massachusetts Emergency Management Agency (MEMA)
 Massachusetts Department of Conservation and Recreation (DCR)

March 2022



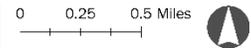
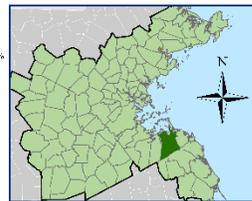
Map 4:
Earthquakes / Landslides



FEMA Hazard
Mitigation Planning Grant
HINGHAM, MA

Download Path: \\files-001\gis\GIS\Data\GIS\Projects\Current\Projects\GIS\Hazard\Mitigation\Map4_V04.mxd

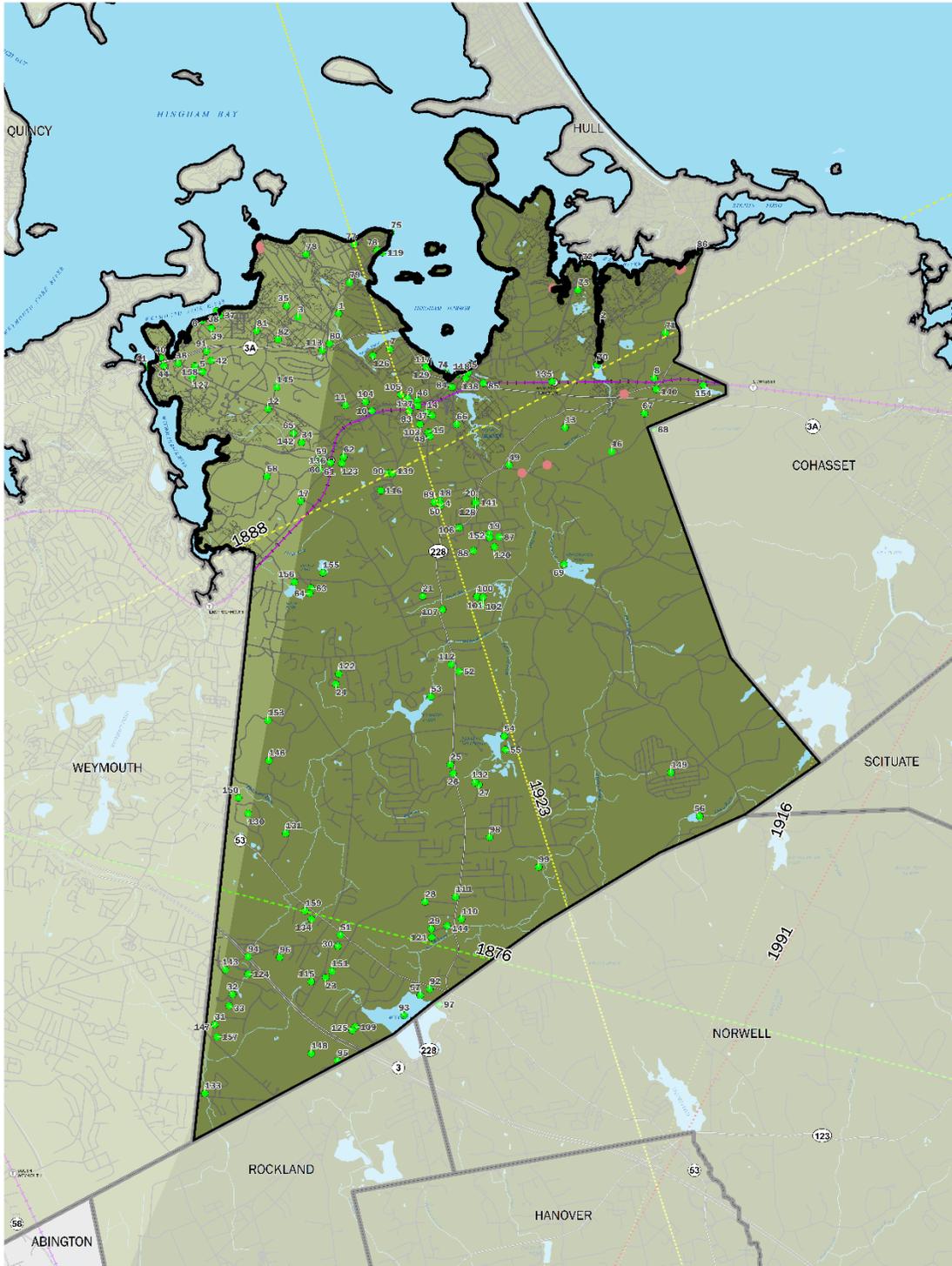
- Sites**
- Critical Infrastructure Sites*
- * See details in separate table
- Earthquakes**
- Epicenters
- Train Stations
- Commuter Rail Lines
- Trains
- All Roads**
- Interstate
- U.S. Highway
- State Route
- Street
- Landslides**
- High landslide incidence (greater than 15% of the area is involved in landsliding)
- High susceptibility to landsliding and moderate incidence
- High susceptibility to landsliding and low incidence
- Moderate susceptibility to landsliding and low incidence
- Low landslide incidence (less than 1.5% of the area is involved in landsliding)
- Water Bodies**



The information depicted on this map is for planning purposes only. It is not adequate for legal boundary determinations, regulatory interpretation, or parcel-level analyses.

Prepared by:
Metropolitan Area Planning Council (MAPC)
60 Temple Place, Boston, MA 02111 | (617) 933-0700

Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Massachusetts Department of Transportation (MassDOT)
U.S. Geological Survey (USGS)
March 2022



Map 5: Hurricanes / Tornadoes



FEMA Hazard Mitigation Planning Grant
HINGHAM, MA

- Sites**
- Critical Infrastructure Sites
 - Repetitive Loss Sites
- Tornadoes**
- Tornado
- All Roads**
- Interstate
 - U.S. Highway
 - State Route
 - Street
 - Train Stations
 - Commuter Rail Lines
 - Traffic
 - Water Bodies

- Storm Tracks**
- Tropical Depression
 - Tropical Storm
 - Category 1 Hurricane
 - Category 2 Hurricane
 - Category 3 Hurricane
 - Category 4 Hurricane
 - Category 5 Hurricane
- Hurricane Surge Inundation Areas**
- 100 Year Wind Speeds Miles Per Hour**
- 90 MPH
 - 100 MPH
 - 110 MPH
 - 120 MPH
 - 130 MPH

0 0.25 0.5 Miles

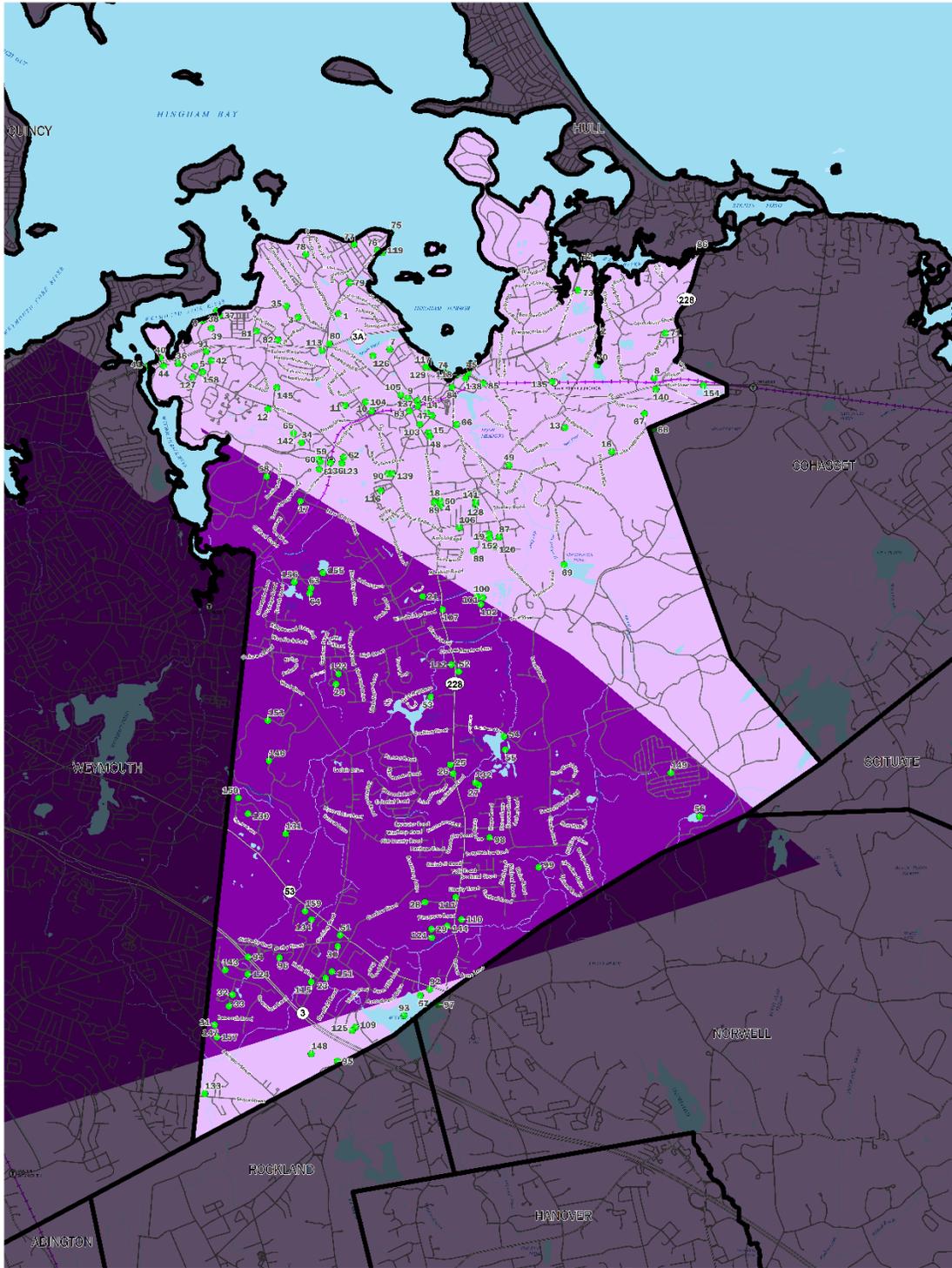


The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis.

Produced by:
Metropolitan Area Planning Council
60 Temple Place, Boston, MA 02111 (617) 933-0700

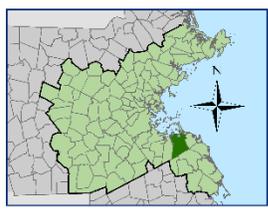
Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Massachusetts Department of Transportation (MassDOT)

March 2022



Map 6:
Average Snowfall
MAPC dcr
FEMA Hazard
Mitigation Planning Grant
HINGHAM, MA

- Sites**
- Critical Infrastructure Sites*
 - * See details in separate table
- Average Annual Snowfall**
- 36.1 to 48.0 inches
 - 48.1 to 72.0 inches
- All Roads**
- Interstate
 - U.S. Highway
 - State Route
 - Street



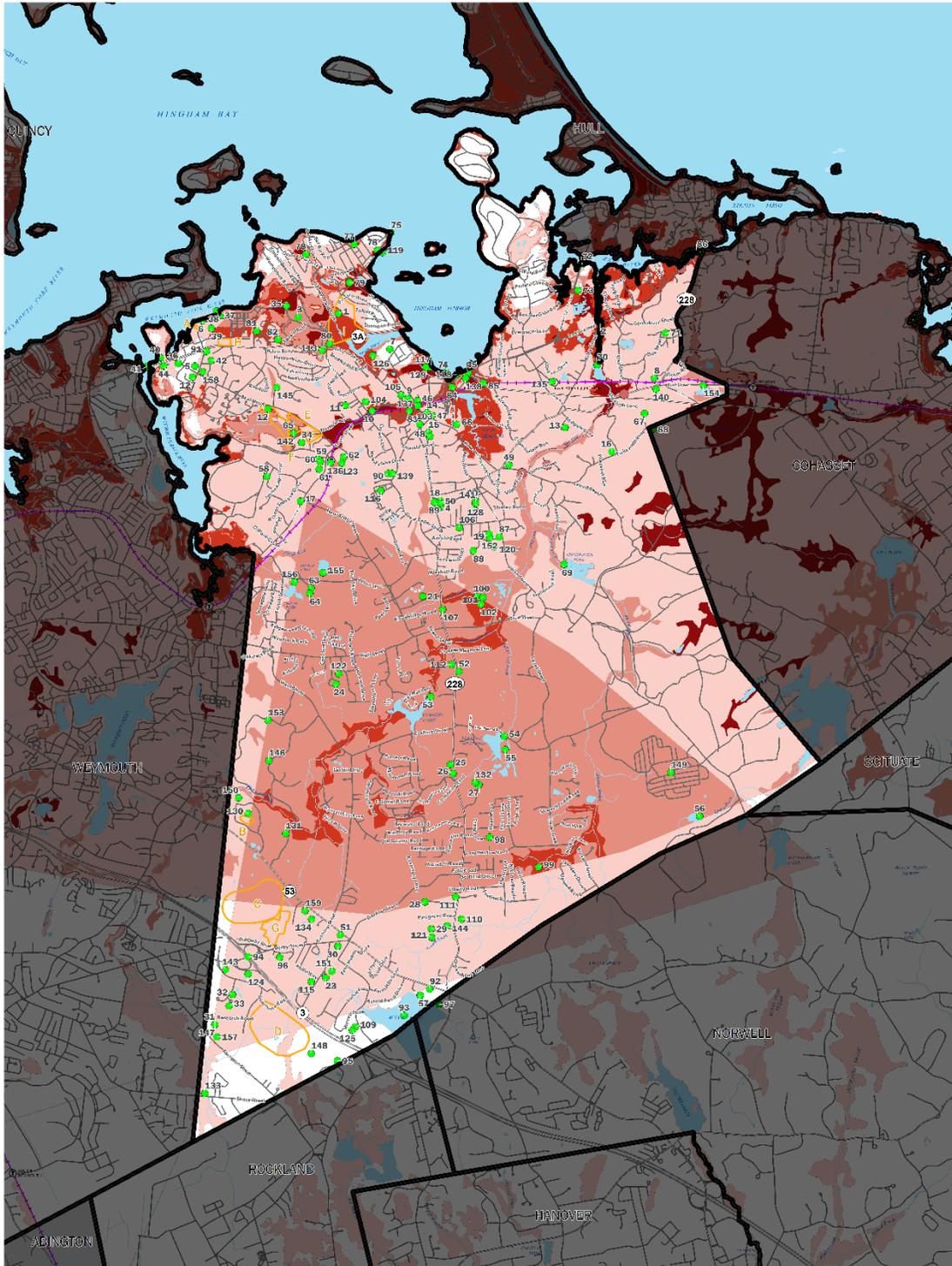
0 0.2 0.4 0.8 Miles

The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis.

Produced by:
Metropolitan Area Planning Council
60 Temple Place, Boston, MA 02111 | (617) 933-0700

Data Sources:
Metropolitan Area Planning Council (MAPC);
Massachusetts Geographic Information System (MassGIS);
Massachusetts Department of Transportation (MassDOT)

March 2022



Map 7: Composite Natural Hazards

MAPC **dc**
FEMA Hazard Mitigation Planning Grant
HINGHAM, MA

Composite Natural Hazards

- Low (2 Hazards)
- Moderate (3 Hazards)
- Very High (5 Hazards)

* See details in separate table

Composite natural hazards show the total of existing environmental hazards (total):

- 100 or less total points
- 100-200 total points
- 200-300 total points
- 300-400 total points
- 400-500 total points
- 500-600 total points
- 600-700 total points
- 700-800 total points
- 800-900 total points
- 900-1000 total points

Water Bodies

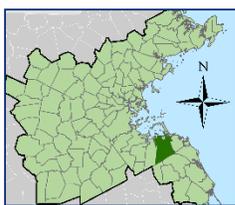
- Water Bodies

All Roads

- Interstate
- U.S. Highway
- State Route
- Street
- Train Stations
- Commuter Rail Lines
- Trains

Sites

- Critical Infrastructure
- Repetitive Loss Sites
- Development Areas



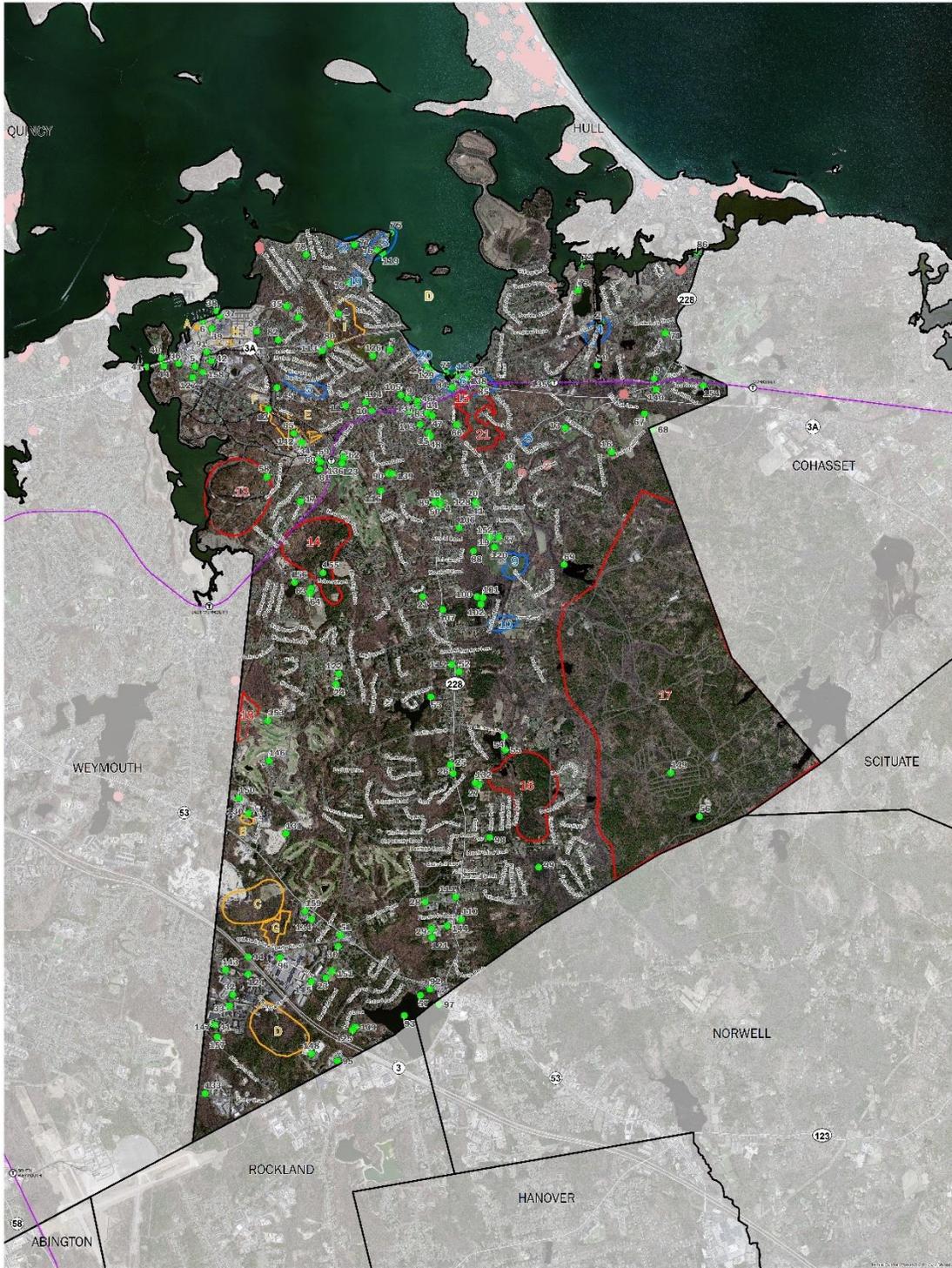
0 0.2 0.4 0.8 Miles

The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis.

Produced by:
 Metropolitan Area Planning Council (MAPC)
 60 Temple Place, Boston, MA 02111 (617) 933-0700

Data Sources:
 Metropolitan Area Planning Council (MAPC)
 Massachusetts Geographic Information System (MassGIS)
 Massachusetts Department of Transportation (MassDOT)

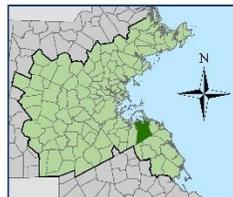
March 2022



Map 8:
Local Hazard Areas
MAPC dcr
FEMA Hazard
Mitigation Planning Grant
HINGHAM, MA

- Sites**
- Critical Infrastructure Sites*
 - Repetitive Loss Sites
 - Locally Identified Hazard Areas
 - Brush Fires
 - Flooding
 - Historic
 - Development Sites
- * See Section IV Risk Assessment
* See details in separate table

- Train Stations
— Commuter Rail Lines
— Trains
- All Roads**
- Interstate
 - U.S. Highway
 - State Route
 - Street



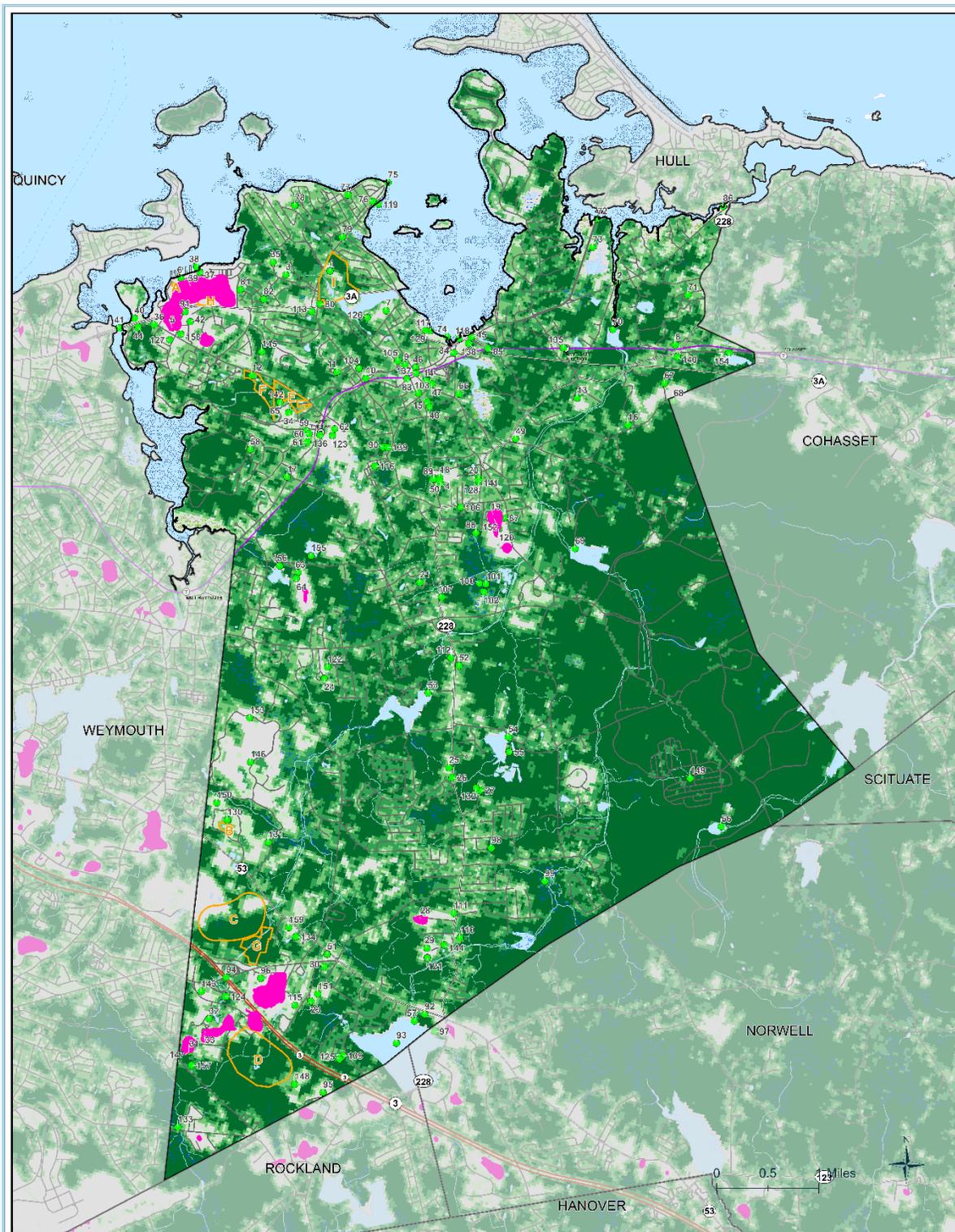
0 0.25 0.5 1 2 4 8 Miles

The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analyses.

Produced by:
Metropolitan Area Planning Council
60 Temple Place, Boston, MA 02111 | (617) 933-0700

Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Massachusetts Department of Transportation (MassDOT)
Imagery from 2020

March 2022



Map 9: High Land Surface Temperature



FEMA Hazard Mitigation Planning Grant
HINGHAM, MA

Climate
 Hottest 5% of region's land area

Tree Canopy Coverage

- 0%
- 1-25%
- 26-50%
- 51-75%
- 76 - 100%

Transportation

- Rail Stations
- Commuter Rail

Roads

- Interstate
- U.S. Highway
- State Route
- Streets

Sites

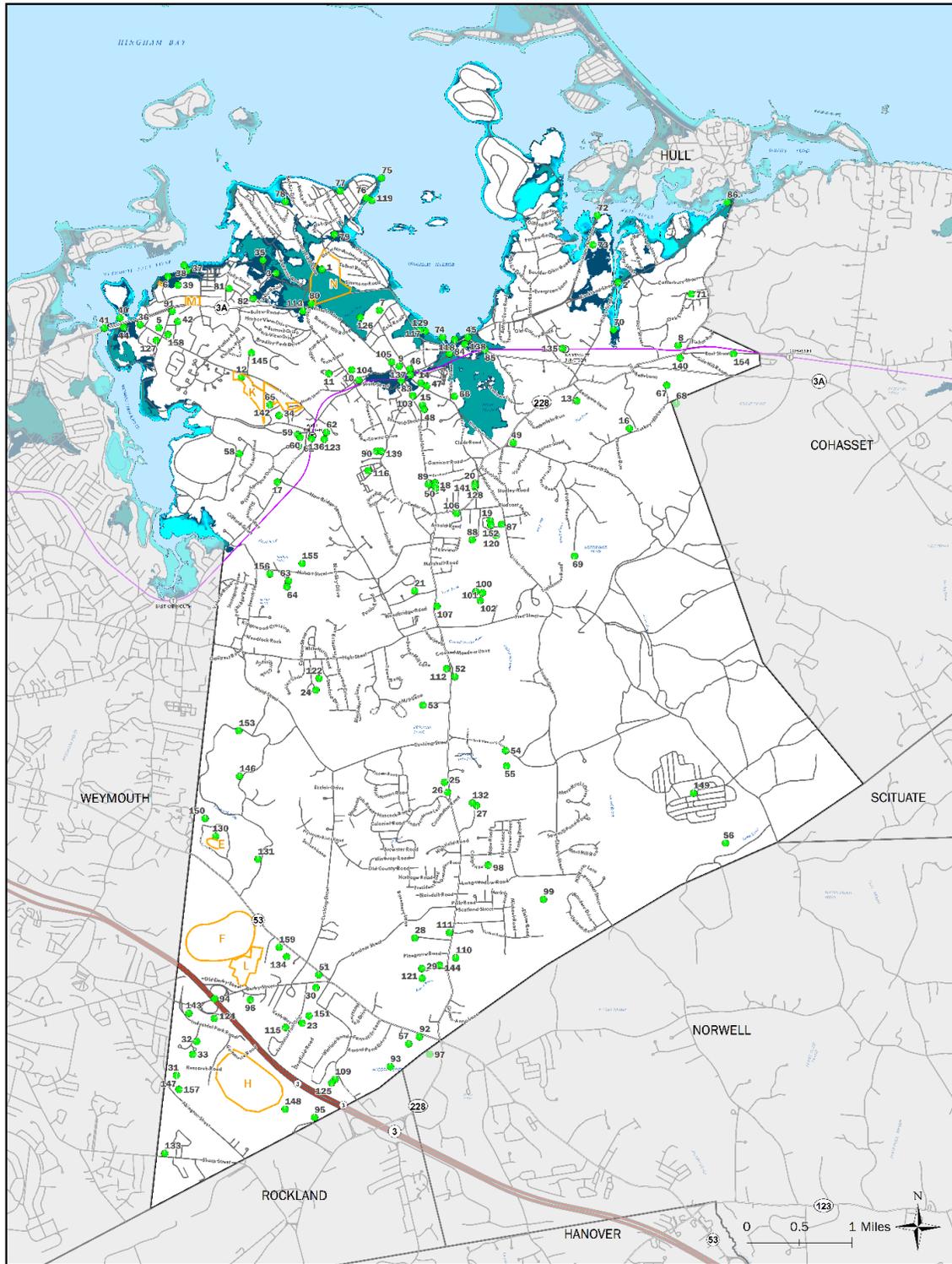
- Critical Infrastructure*
- Development Areas

The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis.

Produced by MAPC Data Services
 60 Temple Place, Boston, MA 02111 (617) 451-2770

Data Sources:
 Metropolitan Area Planning Council (MAPC)
 Massachusetts Geographic Information System (MassGIS)
 Northeast States Emergency Consortium (NESEC)
 Massachusetts Emergency Management Agency (MEMA)
 Federal Emergency Management Agency (FEMA)
 Imagery © Google

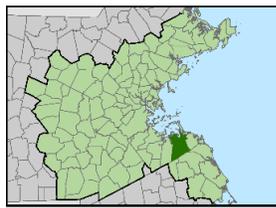
HINGHAM, MA
 Date: 3/23/2022



Map 10:
Sea Level Rise

FEMA Hazard
Mitigation Planning Grant
HINGHAM, MA

- Sites
- Critical Infrastructure Sites*
- Repetitive Loss Sites
- Development Sites
- Future Coastline
- Sea Level Rise (1 ft.)
- Sea Level Rise (3 ft.)
- Sea Level Rise (6 ft.)
- Sea Level Rise (10 ft.)
- All Roads
- Interstate
- U.S. Highway
- State Route
- Street
- Train Stations
- Commuter Rail Lines
- Trains



The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis.

Produced by MAPC Data Services
60 Temple Place, Boston, MA 02111 (617) 451-2170

Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Northeast States Emergency Consortium (NEMSC)
Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)
Imagery © Google

HINGHAM, MA
Date: 3/21/2022

APPENDIX C: PUBLIC MEETINGS

The Town of Hingham invites you to a

Climate Change and Natural Hazards Public Meeting

Natural hazards have serious impacts on the
Town of Hingham and its residents



The Town of Hingham is updating its Hazard Mitigation Plan to prepare for future extreme weather events. The plan will make the Town eligible to apply for funding of priorities identified in the plan.

Have you experienced flooding? Do you have concerns about future climate impacts? Please join us. We are seeking your input.

Date: Monday, January 10, 2022
Time: 7:00 PM
Location: Virtual Meeting on Zoom

Register in advance with this link:

<https://zoom.us/meeting/register/tJYlcOmpT8qGT5-radN4As4ztaC5mN46LXU>

After registering, you will receive a confirmation email containing information about joining the meeting.

For more information, please contact MAPC Environmental Planner Anne Herbst at (617) 933-0781 or email a Herbst@mapc.org.

CALENDAR LISTING / MEDIA ADVISORY

HINGHAM'S DRAFT HAZARD MITIGATION PLAN TO BE PRESENTED AT JANUARY 10 PUBLIC MEETING

Meeting to present Hingham's Hazard Mitigation Plan and solicit public comments

Who: Hingham residents, business owners, representatives of non-profit organizations and institutions, and others who are interested in preventing and reducing damage from natural hazards and future climate change impacts.

What: On Monday, January 10, at 7:00 PM, a presentation will be made by the Metropolitan Area Planning Council (MAPC), which is assisting the Town on the development of its Hazard Mitigation Plan update.

The plan identifies natural hazards affecting Hingham such as floods, hurricanes, winter storms, and earthquakes, as well as actions that the Town can take to reduce its vulnerability to these hazards. Upon approval of the plan by the Town and by FEMA, Hingham will be eligible for hazard mitigation grants.

When: Monday, January 10, at 7:00 PM

Where: The meeting will be held virtually on Zoom.
Register in advance with this link:
<https://zoom.us/meeting/register/tJYlcOmpT8qGtS-radN4As4ztaC5mN46LXU>
After registering, you will receive a confirmation email with information about joining the meeting.

MAPC is the regional planning agency for 101 communities in the metropolitan Boston area, promoting smart growth and regional collaboration. More information about MAPC is available at www.mapc.org.

##

Climate Change and Natural Hazards Public Meeting

Natural hazards have serious impacts on the
Town of Hingham and its residents



The Town of Hingham is updating its Hazard Mitigation Plan to prepare for future extreme weather events. The plan will make the Town eligible to apply for funding of priorities identified in the plan. Please join us for a presentation on the final draft of the Plan at a meeting of the Select Board. The Plan is also available for public comment until April 19, 2022; it is posted on the Emergency Management Department website.

Date: Tuesday, April 12, 2022
Time: 6:00 PM
Location: Virtual Meeting on Zoom

Zoom information will be posted on the Town of Hingham website:

[Agenda.Center • Hingham, MA • CivicEngage \(hingham-ma.gov\)](#)

For more information, please contact MAPC Environmental Planner Anne Herbst at (617) 933-0781 or email aherbst@mapc.org.

CALENDAR LISTING / MEDIA ADVISORY

HINGHAM'S DRAFT HAZARD MITIGATION PLAN TO BE PRESENTED AT APRIL 12 PUBLIC MEETING

Meeting to present Hingham's Hazard Mitigation Plan and solicit public comments

Who: Hingham residents, business owners, representatives of non-profit organizations and institutions, and others who are interested in preventing and reducing damage from natural hazards and future climate change impacts.

What: At a public meeting on Tuesday April 12 at 6:00 PM, a presentation on the *Hingham Draft Hazard Mitigation Plan, 2022* will be hosted by the Select Board. The presentation will be made by the Metropolitan Area Planning Council (MAPC), which is assisting the Town on the development of its Hazard Mitigation Plan update. The draft plan is posted on the Emergency Management Department website and public comments will be accepted through April 19, 2022.

The Town of Hingham has prepared the draft Hazard Mitigation plan to document natural hazards that affect the Town, such as floods, hurricanes, and severe winter storms, and to recommend actions that the Town can take to reduce its vulnerability to these hazards. Once completed and approved by the Federal Emergency Management Agency (FEMA), the Town will be eligible for federal Hazard Mitigation Grants from FEMA.

When: Tuesday, April 12, at 6 PM

Where: The meeting will be held on Zoom. The Zoom link will be posted, with the agenda, at: [Agenda Center • Hingham, MA • CivicEngage \(hingham-ma.gov\)](#) and broadcast on Hingham Harbor Media

MAPC is the regional planning agency for 101 communities in the metropolitan Boston area, promoting smart growth and regional collaboration. More information about MAPC is available at www.mapc.org.

##

Town of Hingham



Select Board Meeting Agenda

April 12, 2022
6:00 P.M.

Remote meeting via Zoom:

Dial-in number: 929-205-6099

Meeting ID: 451-213-735

Passcode: 111222

Website: <https://zoom.us/join>

1. Call to order
2. Approval of Minutes
3. To consider approval of the Special (One Day) Wine and Malt Beverages license to Lucy Hancock for Beyond the Books: A Celebration of the Hingham Public Library to be held outside at the Hingham Public Library on Friday, May 6, 2022 from 5:30 pm to 8:00 pm
4. To consider approval of the Special (One Day) Wine and Malt Beverages license to Michael Snowdale on behalf of Stellwagon Beer Company for the Spring Fest at Weir River Farm to be held at Weir River Farm on Saturday, April 23, 2022 from 9:30 am to 4:30 pm
5. To consider approval of the Special (One Day) Wine and Malt Beverages license to Stephanie Aquino for the Spring Fest at Weir River Farm to be held at Weir River Farm on Saturday, April 23, 2022 from 9:30 am to 4:30 pm
6. Appointment of Assistant Harbormasters and Deputy Shellfish Constable (Potential candidates: Joseph Driscoll, Michael McCue, Danny Sousa, Raymond Abreu, Michael Riley, and John Algrid)
7. Town of Hingham Hazard Mitigation Plan 2022 Update
8. 7:00 PM: To consider approval of the request of LSF Hingham, LLC d/b/a Legal C Bar, 96 Derby Street, for an Alteration of Licensed Premises
9. To consider approval of the request of Locales Taco, LLC d/b/a Locales Tacos y Tequila, 6 Crow Point Lane, for an Alteration of Licensed Premises
10. To consider approval of an agreement with Hingham Access and Media, Inc. d/b/a Harbor Media, or in the alternative, a one-month extension of the existing agreement
11. To proclaim April 12, 2022 as Education and Sharing Day in the Town of Hingham
12. To proclaim April 22, 2022 as Earth Day in the Town of Hingham
13. To proclaim April 29, 2022 as Arbor Day in the Town of Hingham

APPENDIX D: PLAN ADOPTION AND APPROVAL

TOWN OF HINGHAM

OFFICE OF THE SELECT BOARD

William C. Ramsey, Chair
Elizabeth F. Klein
Joseph M. Fisher



Tom Mayo, Town Administrator
Michelle Monsegur, Assistant
Town Administrator
Arthur P. Robert, Assistant Town
Administrator

CERTIFICATE OF ADOPTION CHIEF EXECUTIVE OFFICER TOWN OF HINGHAM, MASSACHUSETTS

A RESOLUTION ADOPTING THE TOWN OF HINGHAM HAZARD MITIGATION PLAN 2022 UPDATE

WHEREAS, the Town of Hingham established a Committee to prepare the *Town of Hingham Hazard Mitigation Plan 2022 Update*; and

WHEREAS, the *Town of Hingham Hazard Mitigation Plan 2022 Update* contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Hingham, and

WHEREAS, duly noticed public meetings were held by the LOCAL HAZARD MITIGATION PLANNING TEAM on January 10, 2022, and April 12, 2022, and

WHEREAS, the Town of Hingham authorizes responsible departments and/or agencies to execute their responsibilities demonstrated in the plan, and

NOW, THEREFORE BE IT RESOLVED that the Town of Hingham Select Board adopts the *Town of Hingham Hazard Mitigation Plan 2022 Update*, in accordance with M.G.L. 40 §4 or the charter and bylaws of the Town of Hingham.

ADOPTED AND SIGNED this Date: June 28, 2022

HINGHAM SELECT BOARD


William C. Ramsey


Elizabeth F. Klein


Joseph M. Fisher

210 Central Street, Hingham, MA 02043-2757 • Telephone (781) 741-1451 • Fax (781) 741-1454



FEMA

July 18, 2022

Dawn Brantley, Acting Director
Massachusetts Emergency Management Agency
400 Worcester Road
Framingham, Massachusetts 01702-5399

Acting Director Brantley:

The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) Region I Mitigation Division has approved the Town of Hingham Hazard Mitigation Plan 2022 Update effective July 11, 2022 through July 10, 2027 in accordance with the planning requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended, the National Flood Insurance Act of 1968, as amended, and Title 44 Code of Federal Regulations (CFR) Part 201.

With this plan approval, the jurisdiction is eligible to apply to the Massachusetts Emergency Management Agency for mitigation grants administered by FEMA. Requests for funding will be evaluated according to the eligibility requirements identified for each of these programs. A specific mitigation activity or project identified in this community's plan may not meet the eligibility requirements for FEMA funding; even eligible mitigation activities or projects are not automatically approved.

The plan must be updated and resubmitted to the FEMA Region I Mitigation Division for approval every five years to remain eligible for FEMA mitigation grant funding.

Thank you for your continued commitment and dedication to risk reduction demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please contact Brigitte Ndikum-Nyada at (617) 378-7951 or brigitte.ndikum-nyada@fema.dhs.gov.

Sincerely,

PAUL F FORD
Digitally signed by PAUL F FORD
Date: 2022.07.18 13:32:21 -0400

Paul F. Ford
Deputy Regional Administrator
DHS, FEMA Region I

PFF: bnn

cc: Jeffrey Zukowski, Hazard Mitigation Planner, MEMA
Marybeth Groff, CFM, Hazard Mitigation & Climate Adaptation Coordinator
Beth Dubrawski, Hazard Mitigation Contract Specialist, MEMA

APPENDIX E: MVP WORKSHOP RESULTS

Top priority recommendations from the 2018 Municipal Vulnerability Preparedness workshop that focused on preparing for climate impacts in Hingham.

1. Increase the height of the existing seawalls and adjacent upland, continue ongoing maintenance of existing walls, and work with private property owners to improve private seawalls.
2. Implement resiliency improvements to sewer pump stations, including installation of watertight mitigation gates, improvements to pump station buildings, and sealing of manhole covers.
3. Protect the quality and quantity of potable groundwater and surface water supply, including:
 - a. Identifying additional sources of water supply
 - b. Reducing water usage within the Town
 - c. Establishing emergency water distribution sites
 - d. Educating homeowners on testing of private wells
 - e. Educating private well owners and developing a bylaw related to irrigation

High priority recommendations included the following:

Infrastructure

Coastal Resiliency	Increase the height of the existing <u>seawalls</u> and adjacent upland, continue ongoing maintenance of existing walls, and work with private property owners to improve private seawalls
Utility Infrastructure	Implement resiliency improvements to <u>sewer lines and pump stations</u> , including installation of watertight mitigation gates, improvements to pump station buildings, and sealing of manhole covers
Coastal Resiliency	Install automatic tide gates at the Broad Cove culvert to replace <u>aging infrastructure</u>
Municipal Facilities	Conduct flood protection project(s) for the Foster School to protect <u>aging infrastructure</u>
Municipal Facilities	Construct a new fire station to replace <u>aging infrastructure</u>
Municipal Facilities	Provide dock space for the Harbormaster to replace <u>aging infrastructure</u>
Utility Infrastructure, Transportation	Identify impacts of road salting on <u>aging infrastructure</u>
Utility Infrastructure	Improve stormwater and <u>drainage</u> technology
Regulatory/Planning	Develop regulations that require sewer inflow and infiltration mitigation to reduce pollution risk from <u>drainage</u>
Utility Infrastructure	Conduct a design assessment or “stress test” of the existing <u>drainage</u> system
Regulatory/Planning	Require new development to use corrosion-resistant additives in concrete to improve <u>drainage</u>

Societal

Emergency Response, Transportation	Finalize and implement <u>evacuation routes</u>
Multiple	Conduct outreach to other towns regarding <u>aging population</u>
Emergency Response	Establish an outreach program that travels to vulnerable populations, including the <u>aging population</u> , and encourage additional outreach from neighbors
Emergency Response	Educate the public, particularly vulnerable and <u>aging populations</u> , on the Reverse 911 program

Environmental

Water Supply and Quality	Protect the quality and quantity of potable <u>groundwater and surface water supply</u> , including finding additional sources of water supply, reducing water usage within the Town, establishing emergency water distribution sites, educating homeowners on testing of private wells, and educating private well owners and developing a bylaw related to irrigation
Water Supply and Quality, Utility Infrastructure	Install stormwater controls to treat nutrients in runoff to maintain the quality and quantity of <u>groundwater and surface water supply</u>
Water Supply and Quality	Educate public on nutrients and pesticides in runoff to maintain the quality and quantity of <u>groundwater and surface water supply</u>
Coastal Resiliency	Conduct beach nourishment and construct an armor stone wall at North Beach to protect the <u>coastline</u> in this area
Coastal Resiliency	Conduct beach nourishment and additional protection at residences to protect the <u>coastline</u>
Municipal Facilities	Construct a new and/or improved salt shed to improve <u>chemical management</u>
Water Supply and Quality	Reduce road salt use and develop an alternative or low-sodium ice treatment to improve <u>chemical management</u>
Regulatory/Planning	Improve regulatory controls regarding storage of oil and hazardous materials in areas vulnerable to hazards to improve <u>chemical management</u>
Water Supply and Quality, Emergency Response	Improve the existing Fire Department database regarding the presence of hazardous material storage in areas vulnerable to hazards to improve <u>chemical management</u>