TOWN OF WINTHROP

HAZARD MITIGATION PLAN

DRAFT 2025 UPDATE

Draft For Review
October 10, 2025

Prepared by
Metropolitan Area Planning Council
For the Town of Winthrop

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Cover photo: Aerial view of Winthrop, Town of Winthrop Linked In page

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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. Other common concerns are the impacts of extreme heat, drought, and nor'easters. This plan also considers how our changing climate will affect natural hazards. Warming temperatures will fuel changing precipitation patterns 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

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. However, the plan focuses on all categories of natural hazards that could potentially affect the community, including those that infrequently occur.

The Federal Disaster Mitigation Act of 2000 requires all municipalities that wish to be eligible to receive FEMA funding for hazard mitigation grants, such as Flood Mitigation Assistance (FMA) and the Hazard Mitigation Grant Program (HMGP), to adopt a local multi-hazard mitigation plan and update this plan in five-year intervals.

This is an update of the 2015 Winthrop Hazard Mitigation Plan, which was approved by FEMA on August 3, 2015. That plan updated the Town's original Hazard Mitigation Plan, which prepared in 2005 as part of a regional North Shore planning effort.

Planning for this Hazard Mitigation Plan update was led by the Winthrop Local Hazard Mitigation Team, composed of staff from a number of different Town Departments and representatives of the North Suffolk Office of Resilience and Sustainability. This team met on the following dates focusing on various aspects of developing the updated plan:

July 16, 2024	Identify and map Critical Facilities, Local Hazard Areas, and Development
October 28, 2024	Review/update Existing Mitigation Measures and Hazard Mitigation Goals
March 26, 2025	Review the status of recommended mitigation measures from the 2015 plan
April 15, 2025	Review and finalize the mitigation strategy for the 2025 updated plan

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 Winthrop Town Council hosted two public meetings, the first on May 20, 2025, and the second on October xx, 2025. The Town Council meetings were televised locally and available on videos on You Tube. The meetings included a description of the hazard mitigation planning process, an overview of the plan and proposed mitigation actions, as well as directions on how

the public could access the draft plan on the Town website and make comments. The plan was posted online for public review, and a dedicated project email, WinthropResilience@mapc.org, was set up to receive public comments and questions.

Key town stakeholders and neighboring communities were notified and invited to review the draft plan and submit comments. See Documentation of Public Meetings in Appendix C.

RISK ASSESSMENT

The Winthrop Hazard Mitigation Plan assesses the potential impacts to the Town from flooding, high winds, winter storms, brush fire, geologic hazards, extreme temperatures, and drought. Coastal flooding, driven by hurricanes, northeasters and other storms, clearly presents the greatest hazard to the Town. These are described in Section 4 and the locations of hazard areas are shown on the map series in Appendix A. The plan also addresses the projected future flooding impacts related to sea level rise using the state's Massachusetts Coastal Flook Risk Model (MC-FRM).

The Winthrop Hazard Mitigation Team identified 97 Critical Facilities, four more than in the 2015 plan. These are shown on the map series in Appendix A and listed in Table 43, identifying which facilities are located within the mapped hazard zones.

A HAZUS-MH analysis provided estimates of damages from Hurricanes of 100-year and 500-year recurrence ($6.7 million to $28.1 million) as well as earthquakes of magnitudes 5 and 7 ($375 million to $2.1 billion). Flood damage estimates range from $236 million for a 100-year event to $334 million for a 500-year event.

HAZARD MITIGATION GOALS

The Winthrop Hazard Mitigation Team reviewed and discussed the goals from the previous 2015 Hazard Mitigation Plan. The Team retained the nine goals from the previous plan for the 2025 update, and endorsed the addition of five new goals (#10 – 15 below) to reflect a more comprehensive approach and to incorporate climate resiliency for this 2025 plan update. All of the goals are considered critical for the Town, and they are not listed in order of importance.

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. Encourage future development in areas that are not prone to natural hazards.

7. Educate the public about natural hazards and mitigation measures.
8. Make efficient use of public funds for hazard mitigation.
9. Protect the Town's ability to respond to various natural hazard events.
10. Consider the potential impacts of climate change and incorporate climate sustainability and resiliency into hazard mitigation planning.
11. Incorporate environmental justice considerations into natural hazard mitigation, including outreach to climate vulnerable populations, identification of hazard impacts, and related mitigation measures.
12. Integrate hazard mitigation planning as an integral factor in all relevant municipal departments, committees and boards.
13. Encourage the business community, local institutions and non-profits to work with the Town to develop, review and implement the hazard mitigation plan.
14.: Work with surrounding communities, state, regional and federal agencies to ensure regional cooperation and solutions for hazards affecting multiple communities.

HAZARD MITIGATION STRATEGY

The Winthrop Local Hazard Mitigation Planning Team identified a number of mitigation measures that would serve to reduce the Town's vulnerability to natural hazard events. These are described in Section 8 and listed in Table 50. A brief summary list of recommended mitigation measures follows:

- Yirrell Beach project
- Complete utility elevation project in flood hazard area
- Ingleside Park drainage upgrade
- Lower Nahant Avenue drainage upgrade
- Upgrade Bayou Street drain line
- Lewis Lake drainage upgrade
- Boston Harbor Drainage Outfall Headwalls / Seawalls
- Consider Community Rating System application
- Acquire vacant flood prone lands as or if they become available.
- Ensure electrical utilities are properly maintained
- Upgrade emergency generators: Town Hall/EOC
- Integrate mitigation into local planning
- Increase hazard education and risk awareness
- Assess vulnerability to severe winds
- Implement a structural retrofit program for town's priority at risk buildings

- Incorporate drought tolerant species into regulations
- Require permeable driveways to promote infiltration and reduce runoff
- Incentivize hazard mitigation (Stormwater fee with incentives)

Overall, the Town' hazard mitigation strategy recognizes that mitigating hazards for Winthrop 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 regional and local factors impact the Town's vulnerability, and local officials will need to work together across municipal lines and with state and federal agencies to address these changes.

This Hazard Mitigation Strategy is intended to provide the Town with a "roadmap" to key actions that will improve its resilience to natural hazards. The plan's recommendations will be incorporated into other municipal plans and policies, such as the Open Space and Recreation Plan, , the Capital Investment Plan, and Municipal Vulnerability Preparedness 2.0.

PLAN REVIEW & UPDATE PROCESS

The process for developing the Winthrop Hazard Mitigation Plan 2025 Update is summarized in Table 1 below.

Table 1 Plan Review and Update Process

Plan Section	Reviews and Updates
3 – Public Participation	The Local Hazard Mitigation Team presented the planning process at two public meetings hosted by the Town Council. The first meeting was held during plan development, and the second was held when the draft plan was completed and made available online for public comment. Outreach efforts to publicize these engagement opportunities included webpage content, social media, email, flyers, and press outreach.
4 – 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. Town staff reviewed critical infrastructure with MAPC staff in order to create an up-to-date inventory and GIS mapping. MAPC also used the most recently available version of HAZUS to assess potential impacts of flooding, earthquakes, and hurricanes.
5 - Goals	The Hazard Mitigation Goals were reviewed and endorsed by the Winthrop Hazard Mitigation Planning Team. The goals were revised and added to in order to reflect a more comprehensive approach and to incorporate climate resiliency for this 2025 plan update.
6 – Existing Mitigation Measures	The list of existing mitigation measures from the 2015 plan was updated to reflect current mitigation activities in the Town.
7 & 8 – Hazard Mitigation Strategy	Mitigation measures from the 2015 plan were reviewed and assessed as to whether they were completed, in-progress, or deferred. The Winthrop Hazard Mitigation Team determined whether to carry forward recommended mitigation measures into this 2025 Plan, or

	modify or delete them. The 2025 Plan's mitigation strategy reflects both new measures and those carried forward from the 2015 plan that have not yet been completed. The Winthrop Hazard Mitigation Team prioritized the mitigation measures based on current conditions.
9 – Plan Adoption & Maintenance	This section of the plan was updated with an on-going plan implementation review and five-year update process that will assist the Town in incorporating hazard mitigation issues into other Town planning and regulatory review processes and better prepare the Town for the next comprehensive plan update.

As indicated on Table xx, Winthrop made progress on implementing mitigation measures identified in the 2015 Hazard Mitigation Plan. Several recommended mitigation measures have been completed, including

- Winthrop Shore Drive seawall
- Floodplain District Management
- Floodplain mapping updates
- Plan for storm surge events.
- Limit development in V-Zones.
- Adopt coastal A-Zones.
- Update building permit to add incentives for additional height above BFE
- Climate change master plan update or action plan
- Drainage preventive practices: vactor truck
- Stormwater best practices training
- Increase wetlands law enforcement practices
- Digitally map storm drains and outfalls
- Wetlands and Stormwater Outreach program
- Update stormwater ordinance
- Update tree maintenance program
- Regional Sea Level Rise Action Work Group participation
- Partner with utility to document hazard areas
- Retrofit at-risk critical, public building roofs to withstand snow loads
- Construct snow fences
- ID populations vulnerable to long term power outage
- Include wildfire risk and mitigation in comprehensive planning
- Inspect fire hydrants on a routine basis
- Require Green Building and parking best practices
- Purchase new trailer-mounted light tower
- Purchase two, 5kW trailer-mounted mobile generators
- Upgrade radio repeater units

- Assess and map community risk
- Winthrop obtained high water rescue vehicles
- Winthrop obtained an inflatable rescue raft

Several others are in progress or have been partially completed. Progress toward implementing these mitigation measures will be continued in this 2025 Plan Update. Moving forward into the next five-year plan implementation period there will be more opportunities to incorporate hazard mitigation into the Town's decision-making processes. The Hazard Mitigation Team, consisting of the Town Administrator and representatives of Public Works, Police, Fire, the Planning Board, Conservation Commission, Building Commissioner, Board of Appeals, Public Health, and the North Suffolk Office of Resilience and Sustainability, will continue a coordinating role under the direction of the Town Administrator, 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 Winthrop contracted with the Metropolitan Area Planning Council (MAPC), to assist the Town in updating its local Hazard Mitigation Plan, which was approved by FEMA in 2015. The updated local plan produced under this contract is designed to meet the requirements of the Disaster Mitigation Act for the Town of Winthrop, addressing local and regional concerns and hazards that impact the Town.

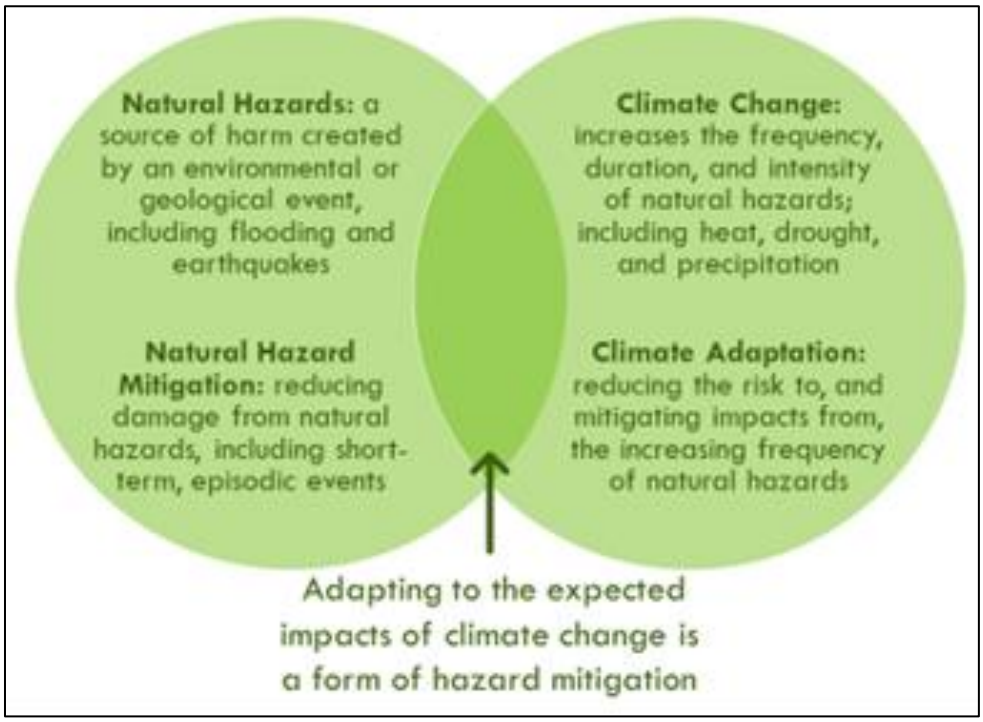
WHAT IS A HAZARD MITIGATION PLAN?

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.

As more is understood about the impacts of climate change, it is becoming increasingly important to recognize the relationship between climate change and many of the natural hazards addressed in hazard mitigation plans. This was addressed in the last two editions of the Massachusetts State Hazard Mitigation Plan in 2018 and the 2023. Resilient MA Plan. These plans recognizes that many hazards are being exacerbated by changing climate, and that adapting to the expected impacts of climate change is a form of hazard mitigation. Therefore, this plan incorporates consideration of future risks based on projections for increased temperatures, future sea level rise, and increased frequency and severity of extreme weather fueled by global climate change effects.

Accordingly, MAPC has updated the format of this Hazard Mitigation Plan to incorporate climate considerations. Figure 1 illustrates the relationship between natural hazards and climate change.

Figure 1. Natural Hazards and Climate Change



PREVIOUS FEDERAL/STATE DISASTERS

The Town of Winthrop has experienced 24 natural hazards that triggered federal or state disaster declarations since 1991. These are listed in Table 2 below. The majority of these events involved flooding, while eight were due to hurricanes or nor'easters, and seven were due to severe winter weather.

Table 2 Previous Federal Disaster Declarations

DISASTER NAME (DATE OF EVENT)	TYPE OF ASSISTANCE	DECLARED AREAS
Hurricane Bob (August 1991)	FEMA Public Assistance Project Grants	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk (16 projects)
No-Name Storm (October 1991)	FEMA Public Assistance Project Grants	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk

DISASTER NAME (DATE OF EVENT)	TYPE OF ASSISTANCE	DECLARED AREAS
No-Name Storm (October 1991) *(continued)*	FEMA Individual Household Program	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk (10 projects)
December Blizzard (December 1992)	FEMA Public Assistance Project Grants	Counties of Barnstable, Dukes, Essex, Plymouth, Suffolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Dukes, Essex, Plymouth, Suffolk (7 projects)
March Blizzard (March 1993)	FEMA Public Assistance Project Grants	All 14 Counties
January Blizzard (January 1996)	FEMA Public Assistance Project Grants	All 14 Counties
October Flood (October 1996)	FEMA Public Assistance Project Grants	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
	FEMA Individual Household Program	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
	Hazard Mitigation Grant Program	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk (36 projects)
1997	Community Development Block Grant-HUD	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
June Flood (June 1998)	FEMA Individual Household Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
	Hazard Mitigation Grant Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester (19 projects)
(1998)	Community Development Block Grant-HUD	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
March Flood (March 2001)	FEMA Individual Household Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
	Hazard Mitigation Grant Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester (16 projects)
February Snowstorm (Feb 17-18, 2003)	FEMA Public Assistance Project Grants	All 14 Counties
January Blizzard (January 22, 2005)	FEMA Public Assistance Project Grants	All 14 Counties

DISASTER NAME (DATE OF EVENT)	TYPE OF ASSISTANCE	DECLARED AREAS
Hurricane Katrina (August 29, 2005)	FEMA Public Assistance Project Grants	All 14 Counties
May Rainstorm/Flood (May 12-23, 2006)	Hazard Mitigation Grant Program	Statewide
April Nor'easter (April 15-27, 2007)	Hard Mitigation Grant Program	Statewide
Flooding (March, 2010)	FEMA Public Assistance FEMA Individuals and Households Program SBA Loan	Bristol, Essex, Middlesex, Suffolk, Norfolk, Plymouth, Worcester
	Hazard Mitigation Grant Program	Statewide
Hurricane Earl (September 2010)	FEMA Public Assistance Project Grants	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester
Tropical Storm Irene (August 27-28, 2011)	FEMA Public Assistance	Statewide
Hurricane Sandy (October 27-30, 2012)	FEMA Public Assistance	Statewide
Severe snowstorm and Flooding (February 8-09, 2013	FEMA Public Assistance; Hazard Mitigation Grant Program	Statewide
Blizzard of 2015 (January 26-28, 2015)	FEMA Public Assistance; Hazard Mitigation Grant Program	Statewide
Severe winter storm and Snowstorm (January 2018)		Essex, Middlesex, Norfolk, Suffolk, Worcester
Severe winter storm and flooding (March 2018)		Barnstable, Bristol, Essex, Nantucket, Norfolk, Plymouth
COVID-19 Pandemic (January 2020)		Statewide

Source: database provided by MEMA

Since 2018, there have been five Massachusetts State Declared Disasters that affected Winthrop. Below is a list of them, which includes several winter storms as well as the Covid-19 pandemic.

Table 3. State Disaster Declarations since 2018

Disaster Name	*Date of Event*	*Declared Areas*
Massachusetts Severe Winter Storm and Flooding	March 2-3, 2018	Statewide
Massachusetts Severe Winter Storm and Snowstorm	March 13-14, 2018	Statewide
Massachusetts Covid-19 Pandemic	January 20, 2020 – May 11, 2023	Statewide
Massachusetts Severe Winter Storm and Snowstorm	January 28-29, 2022	Statewide
Massachusetts Hurricane Lee	September 15-17, 2023	Statewide

Source: FEMA Declared Disasters; OpenFEMA Dataset: Disaster Declarations; and FEMA Declared Disasters.

FEMA FUNDED MITIGATION PROJECTS

Over the last 20 years the Town of Winthrop has received funding from FEMA for two mitigation projects under the Hazard Mitigation Grant Program. These projects totaled $214,004, with $67,597.50 covered by FEMA grants and $5,000 by local funding. The projects are summarized in Table 4 below.

Table 4 FEMA-Funded Mitigation Projects

Project Title	Scope of Work	Total Cost	Federal Funding	Local Funding
Point Shirley Storm Surge Impact Reduction Study	The proposed scope of work is for a storm surge impact study reduction study to mitigate flooding in the Point Shirley Area.	$20,000.00	$14,210.00	$5,000.00
Flood mitigation Utility Retrofit Project	Elevation of utilities above base flood elevation for 20 properties	$194,004.00	$53,387.50	$0.00

Source: database provided by MEMA

COMMUNITY PROFILE

The Town of Winthrop is a municipality in Suffolk County, Massachusetts, United States. The population of Winthrop was 19,031 at the 2020 U.S. Census. It is an ocean-side suburban community situated at the north entrance to Boston Harbor and is very close to Logan International Airport. The Town is a peninsula, 1.6 square miles (4.2 km2) in area, connected to Revere by a narrow isthmus and to East Boston by a bridge over the harbor inlet to the Belle Isle Marsh Reservation. Settled in 1630, Winthrop is one of the oldest communities in the United States. It is also one of the smallest and most densely populated municipalities in Massachusetts.

Winthrop has a reputation for being a safe and pleasant place to live. Winthrop is a close-knit, family-oriented community where everything is within walking distance. There is a public bus route which travels throughout the Town and connects to the Orient Heights stop on the Blue Line of the MBTA A seasonal ferry provides water transportation to downtown Boston. There are numerous parks and playgrounds, six public beaches, four tennis courts, five athletic fields, a public landing for boats and an indoor skating rink. There is a youth center as well as a senior center which both offer many activities and programs.

Winthrop Center offers a multitude of shops as well as small clusters of stores in other sections of the Town. Local retail and commercial areas are shown on Figure 2. There are numerous physicians and dentists in the community as well as a community ambulance service. Public facilities include gas, sewer, water, electricity and cable to the entire Town and trash is collected weekly with provision for recycling.

Figure 2 Local Retail and Commercial Areas of Winthrop

Source: Winthrop 2030, MAPC

Additionally, active organizations include the Chamber of Commerce, Rotary, American Legion, Amvets, Little League, Soccer Association, Elks, Sons of Italy, Boy and Girl Scouts, Historical Society, Council on Aging, Winthrop Playmakers, three yacht clubs, and a golf club.

Transportation and Connectivity

One of the most important features of Winthrop to consider for any hazard mitigation is the town's location on a peninsula where Boston Harbor meets the Atlantic Ocean. Being surrounded by coastal waters on three sides, Winthrop has very limited transportation connections to the mainland. The Town's *Community Resilience Building* report notes that:

> Access to the Town of Winthrop is primarily along Route 145, Winthrop Parkway or across the Belle Isle Bridge (Main Street). Winthrop Parkway connects the town to Revere along a narrow strip of land and this connection has been closed by the Town of Revere in the past due to storm conditions resulting in unsafe passage. With only two main roadways to access Winthrop, managing this infrastructure is critical for emergency evacuation and response. Or, if evacuation and response is not possible, managing isolation and sheltering in place becomes critical.

In addition to road access, a passenger ferry connects Winthrop to downtown Boston. However, during extreme storm events this would not be available to aid in evacuating residents.

Figure 3 Belle Isle Bridge and Winthrop Ferry

Resilient Winthrop, Stantec/Woods Hole Group

Photo: M. Pillsbury

Resilient Winthrop also underscores the critical nature of Winthrop's limited roadway connectivity:

> With only two roadways to access the Winthrop peninsula, the resilience of transportation infrastructure is particularly important for emergency evacuation and response. Roads play an important role in disaster recovery efforts by providing access to damaged areas for emergency responders and construction equipment.

The Town's *Climate Action Plan* also emphasizes the importance of connectivity and evacuation routes: "Flooding occurs on critical path evacuation routes, including Main Street, Shirley Street, Washington Street and Pleasant Street, creating a public safety issue"

Demographic Characteristics

The 2020 population of Winthrop was 19,031 people and there were 8,242 households. (2020 US Census, 2017-21 American Community Survey). The significant demographic characteristics of the Town of Winthrop are summarized in Table 5. Some of these features are important to keep in mind for hazard mitigation as well as emergency preparedness and response in the Town.

Table 5. Town of Winthrop Characteristics

Population	
Total population	19,031
Residents under 5 years old	4.4%
Residents 65 years old and over	20.2%
Race & Ethnicity	
American Indian and Alaska Native	48
Asian	293
African American	790
White	15,031
Hispanic or Latino	2,533
Other Race	894
Two or More Races	993
Household Income	
Total Households	8,242
Median Household Income	$86,780
Renter occupied housing units	41.1%
Languages	
Speak a language other than English at home	
Spanish	2230
Other Indo-European languages	2283
Asian and Pacific Island languages	269
Other languages	157
Speaks English less than "very well"	2.6%
Residents with a Disability	29.8%
Age 65 and over with a disability	6.3%
Households in Poverty	12.2%
Households with no vehicle	12.5%
Households with no internet service	12.8%

Sources: US Census, 2020 Decennial Census and American Community Survey (ACS) 5-Year Estimates (2017-2021)

Environmental Justice Populations

There are seven Environmental Justice census block groups in Winthrop designated by the MA Executive Office of Energy and Environmental Affairs. An environmental justice population is a neighborhood where one or more of the following criteria are true:

- Median household income is 65 percent or less of the statewide median household income
- Minorities make up 40 percent or more of the population
- 25 percent or more of households identify as speaking English less than "very well"

In Winthrop, four census block groups are designated Environmental Justice based on minority population and three are designated based on median household income. None of the block groups meet the criteria for limited English. See Map 1A in Appendix A.

Water Resources

Winthrop is located within the Mystic River Watershed and within the Boston Harbor Subbasin. The Mystic River Watershed is a densely populated and very urban watershed with a long history of industrial development and pollution. Water quality issues stem from a variety of sources including stormwater runoff, point source pollution, contaminated sediments in the river due to industrial uses, lack of access to open space as well as invasive species. A large number of community organizations as well as New England EPA and the Mystic River Watershed Association are actively working to improve water quality and access to open space.

There are no rivers or streams within the town. The only body of surface water is Lewis Lake. Belle Isle Inlet to the north forms the boundary between Boston and Winthrop. Therefore, the major water quality issue in Winthrop is the health of Boston Harbor and its impact on the cleanliness of the beaches.

Lewis Lake receives stormwater runoff from approximately 1/3 of the town. The lake is only a few inches deep because of siltation from run-off. The upper lake is freshwater and the lower lake is brackish water and saltwater. The edge of the lake is very weedy with phragmites. There is a manually operated tidal gate. The lake needs to be dredged or it will eventually fill in and be unable to hold and absorb stormwater runoff. The town is investigating installing a closed drainage pipe in the existing culvert and swale along Veterans Road as well as installation of an automatic tide gate.

SECTION 3: PLANNING PROCESS & PUBLIC PARTICIPATION

MAPC employs a 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. 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.

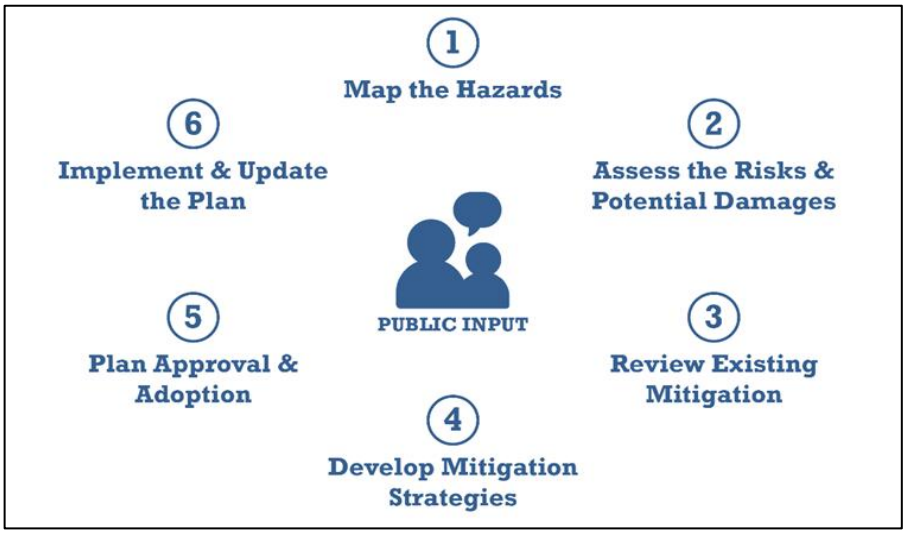
MAPC supports participation by the general public and other plan stakeholders through:

- Four meetings and coordination with the Local Hazard Mitigation Team
- Two public meetings, advertised through email, webpage content, a flyer, press release to local media, and social media posts, and made available town-wide on Local Access TV,
- A project website at: www.mapc.org/resource-library/winthrop-hmp and a dedicated email for public comments, WinthropResilience@mapc.org
- Opening a public comment period at the second public meeting, and posting the draft plan to the project website to facilitate public review,
- Outreach to neighboring communities, boards and commissions, the local chamber of commerce and businesses, environmental NGO's, social service providers, and other local or regional stakeholders.

PLANNING PROCESS SUMMARY

The six-step planning process outlined below and in Figure 4 is based on the guidance provided by FEMA in the Local Multi-Hazard Mitigation Planning Guidance. The process focuses on local problem areas and identifies needed mitigation measures based on where gaps occur in the existing mitigation efforts of the municipality. The planning process allows municipal staff to bring the most recent hazard information into the plan, including new hazard occurrence data, changes to a municipality's mitigation measures, and progress made on actions identified in previous plans.

Figure 4: 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, which is collected. These maps can be found in Appendix A.

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:

    - Town of Winthrop, General Bylaws
    - Town of Winthrop, Zoning Bylaw
    - Town of Winthrop, Business District Master Plan, 2017
    - Town of Winthrop, Climate Action Plan for Winthrop, 2025
    - Town of Winthrop, Municipal Vulnerability Preparedness, 2018
    - Town of Winthrop, Stormwater Management Program Plan, 2022
    - Town of Winthrop, Open Space and Recreation Plan, 2014
    - Town of Winthrop, Resilient Winthrop, Designing Coastal Infrastructure for Climate Change
    - Town of Winthrop, Winthrop 2030
    - Blue Hills Observatory
    - Environment America Research and Policy Center, When It Rains It Pours–Global Warming and the Increase in Extreme Precipitation, July 2012
    - FEMA, Disaster Declarations for States and Counties, 1978-2025
    - FEMA, Flood Insurance Study, Suffolk County, 2024
    - FEMA Flood Insurance Rate Maps for Suffolk County, MA, 2016
    - FEMA, HAZUS-MH, 2023
    - FEMA, Local Mitigation Planning Policy Guide, 2025
    - Massachusetts Climate Change Assessment, 2022
    - Massachusetts Report of the MA Coastal Erosion Commission, 2016
    - MA Office of Coastal Zone Management, Sea Level Rise: Understanding and Applying Trends and Future Scenarios for Analysis and Planning, December 2013.
    - MA Office of Dam Safety, Inventory of Massachusetts Dams
    - Massachusetts State Hazard Mitigation and Climate Adaptation Plan, 2018, 2023
    - Massachusetts State Hazard Mitigation Plan, 2013
    - Metropolitan Area Planning Council, Winthrop Climate Resilient Land Use Project
    - Metropolitan Area Planning Council, GIS Lab, Regional Plans and Data.
    - New England Seismic Network, Boston College Weston Observatory
    - NOAA Centers for Environmental Information
    - Northeast States Emergency Consortium
    - Tornado History Project

- US Census, 2020, American Community Survey2017-21
- USDA Forest Service, Wildfire Risk to Communities
- USGS, National Water Information System
- U.S. Global Change Research Program, Fourth National Climate Assessment, 2018

3. Review Existing Mitigation – Municipalities in the Boston Metropolitan Region have an active history in hazard mitigation as most have adopted flood plain 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. All current municipal mitigation measures are documented in the plan.

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 Chapter 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 Chapter IX and documentation of plan adoption can be found in Appendix E.

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. Chapter IX includes more detailed information on plan implementation.

THE LOCAL HAZARD MITIGATION PLANNING TEAM

MAPC worked with the municipal leadership to convene and facilitate a local Hazard Mitigation Planning Team for Winthrop. MAPC briefed the municipality as to the desired composition of that team as well as the need for outreach to stakeholders such as the business community, civic organizations and citizens. The team was composed of staff and local officials from a number of different Town Departments and representatives of the North Suffolk Office of Resilience and Sustainability. The Winthrop Hazard Mitigation Planning Team membership can be found in Table 6 below.

The Hazard Mitigation 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 help to develop new mitigation measures for this plan update.

The team met on the following dates focusing on various aspects of developing the updated plan:

July 16, 2024	Identify and map Critical Facilities, Local Hazard Areas, and Development
October 28, 2024	Review/update Existing Mitigation Measures and Hazard Mitigation Goals
March 26, 2025	Review the status of recommended mitigation measures from the 2015 plan
April 15, 2025	Review and finalize the mitigation strategy for the 2025 updated plan

Table 6: Membership of the Winthrop Hazard Mitigation Team

Name	Position
Anthony Marino	Town Manager
Cheryl McCormick	Assistant Town Manager
John Goodwin	Police Chief
Scott Wiley	Fire Chief
Steven Calla	Director of Public Works Department
Stephen Calandra	Deputy Fire Chief
Al Legee	Building Commissioner
Chris Boyce	Planning Board Chair
D. Baird	Board of Appeals Chair
Kim Dimes	Conservation Commission Chair
Barbara Evangelista	Planning Board/Board of Appeals Clerk
Laurisa Wojcik	Executive Assistant to Town Manager
Steve Rogers	Police Dept.
Ferruccio Romeo	Deputy Chief of Policed
Meredith Hurley	Director, Winthrop Public Health and Clinical Services
Homeyer, Kristen	Resilience Manager, N. Suffolk Resilience & Sustainability
Abderezak Azib	Resilience Manager, N. Suffolk Resilience & Sustainability

Under Massachusetts Home Rule law and tradition, the Town of Winthrop has primary responsibility for regulating development in town. The Winthrop Planning Board and the Conservation Commission are the primary local agencies responsible for regulating development in town. The Board of Appeals and the Building Commissioner also have key responsibilities for development in Winthrop. Their feedback on development of the plan was assured through the participation of the Chairmen of the Planning Board, Conservation Commission, and Board of Appeals as well as the Building Commissioner on the local Hazard Mitigation Team.. In addition, MAPC, as the State designated regional planning agency for Winthrop, works with all agencies that regulate development and infrastructure in the region, including the l municipal entities and state agencies, such as MassDOT, the Massachusetts Dept. of Conservation and Recreation and the Massachusetts Water Resources Authority.

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 can be a good source for information on the historical and potential impacts of natural hazard events and particular vulnerabilities the community may face from these hazards. Their participation in the planning process also builds understanding of the concept of

hazard mitigation, potentially creating support for mitigation actions taken in the future to implement the plan.

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 public had an opportunity to provide input to the hazard mitigation planning process at two public meetings, one during the planning process and one after a complete draft plan is available for review. The Winthrop Town Council hosted the public meetings, the first on May 20, 2025, and the second on October xx, 2025. The Town Council meetings were publicized according to Massachusetts Open Meeting Law and were televised locally and available on videos on You Tube. Both meetings were publicized on the Town's website and social media, and direct outreach by email. A Media Advisory was also sent to the local press.

The first meeting featured an overview of the hazard mitigation planning process, and summary of the plan and mitigation actions. The draft plan was presented at the second public meeting. The plan was posted online on the project web page for public access to review and comment on the plan. and a dedicated project email, WinthropResilience@mapc.org , was set up to receive public comments and questions. Key town stakeholders and neighboring communities were notified and invited to review the draft plan and submit comments. See Documentation of Public Meetings in Appendix C.

LOCAL STAKEHOLDER INVOLVEMENT

The Town reached 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:

Table 7: Winthrop Community Stakeholders

Cat Pedmonti	Mystic River Watershed Association
Cindy Baxter	Friends of Belle Isle Marsh
John DaRos	Winthrop Town Councilor, Precinct 6
Town of Winthrop	Winthrop Climate Commission
Town of Winthrop	Citizens Advisory Committee on Climate
Town of Winthrop	Council on Aging
City Clerk	City of Boston
City Clerk	City of Revere

The draft plan was posted online for public review, The Town received [TBD] comments, which are included in Appendix C.

CONTINUING PUBLIC PARTICIPATION

Following the adoption of the plan update, the planning team will continue to provide residents, businesses, and other stakeholders with 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 the review of the plan is 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.

PLANNING TIMELINE

PLAN UPDATE PROCESS 2024-25

July 16, 2024	1st Meeting of the Winthrop Hazard Mitigation Team
October 28, 2024	2nd Meeting of the Winthrop Hazard Mitigation Team
March 26, 2025	3rd Meeting of the Winthrop Hazard Mitigation Team
April 15, 2025	4th Meeting of the Winthrop Hazard Mitigation Team
May 20, 2025	Public Meeting #1 hosted by the Town Council
Oct. xx, 2025	Public Meeting #2 hosted by the Town Council

PLAN IMPLEMENTATION MILESTONES 2026-30

After this plan update is approved by FEMA for a five-year period, the Town should take note of the following milestones for the ongoing implementation, review, and updating of this plan:

2028	Conduct Mid-Term Plan Survey on Progress
2029	Seek FEMA grant to prepare next plan update
2030	Begin process to update the plan
2031	Submit Draft 2031 Plan Update to MEMA and FEMA
2031	FEMA approval of 2030 Plan Update

SECTION 4: RISK ASSESSMENT

The risk assessment analyzes the potential natural hazards that could occur within the Town 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 Marlborough's risk assessment, MAPC gathered the most recently available hazard and land use data and met with the Local Team to identify changes in local hazard areas and development trends. MAPC also used FEMA's damage estimation software, Hazards US (HAZUS).

The projected impacts of our warming climate on natural hazards are integrated throughout this risk assessment. Key impacts include rising temperatures, which in turn affect precipitation patterns and extreme weather. Analysis of these impacts included in this plan aligned closely with the data and assessment presented in Massachusetts' State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) and the Massachusetts' 2022 Climate Change Assessment.

> *"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)

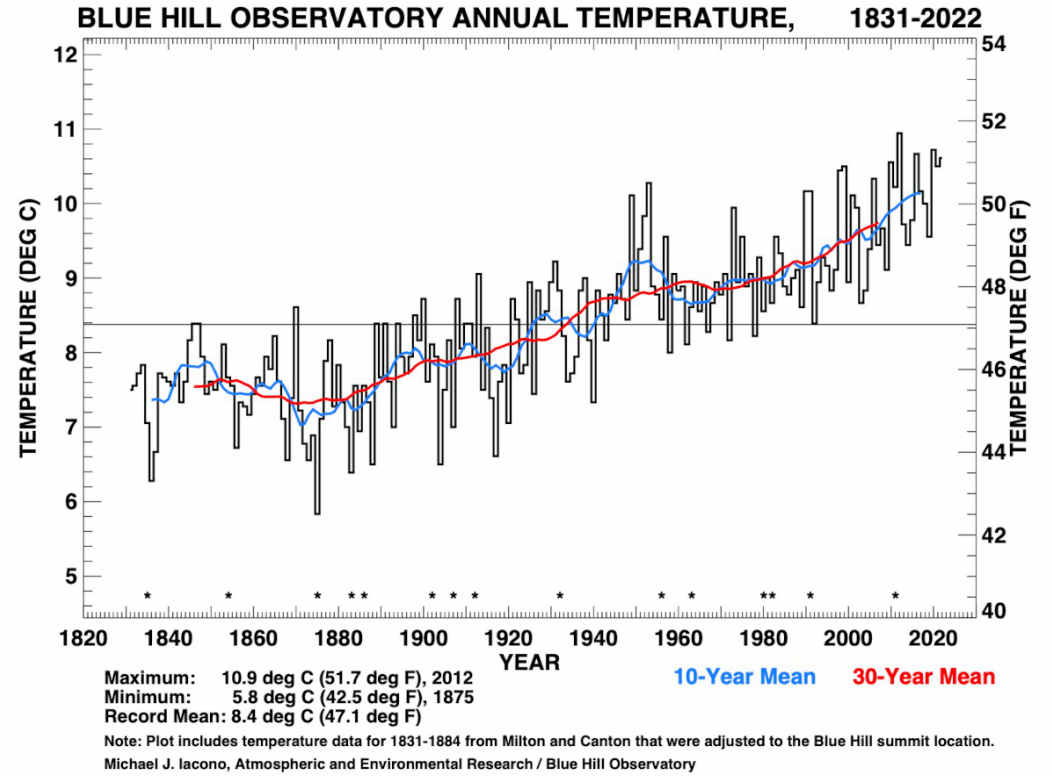
CLIMATE CHANGE OBSERVATIONS AND PROJECTIONS

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

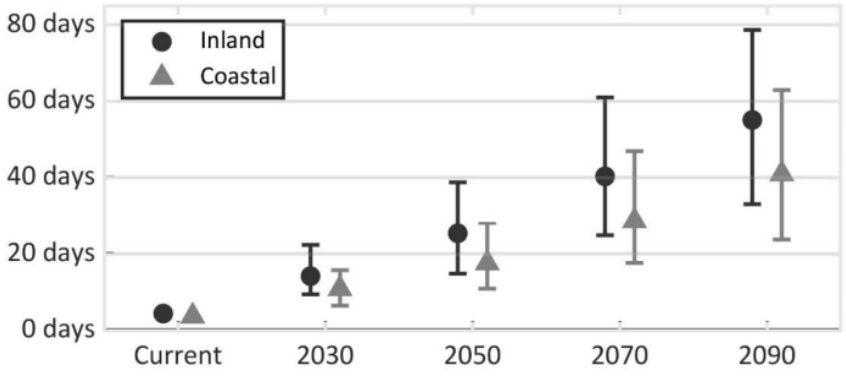
Our climate has always been regulated by gases, including carbon dioxide, methane, and nitrous oxide, which blanket the earth. These gases trap heat that would otherwise be reflected out to space; without them our planet would be too cold to support life. We refer to these gases as "greenhouse gases" (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. See Figure 5 below for more information.

Figure 5: 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. By 2030, the summer mean temperature could increase by 3.6°F from the historical period (1950-2013). By 2070, there could be 58 fewer days below freezing, which could lead to an increase in ticks. By mid-century, the State anticipates about 25 more days per year where the temperature exceeds 90°F for inland areas, and about 19 more days above 90°F for coastal areas (Commonwealth of Massachusetts, 2022).

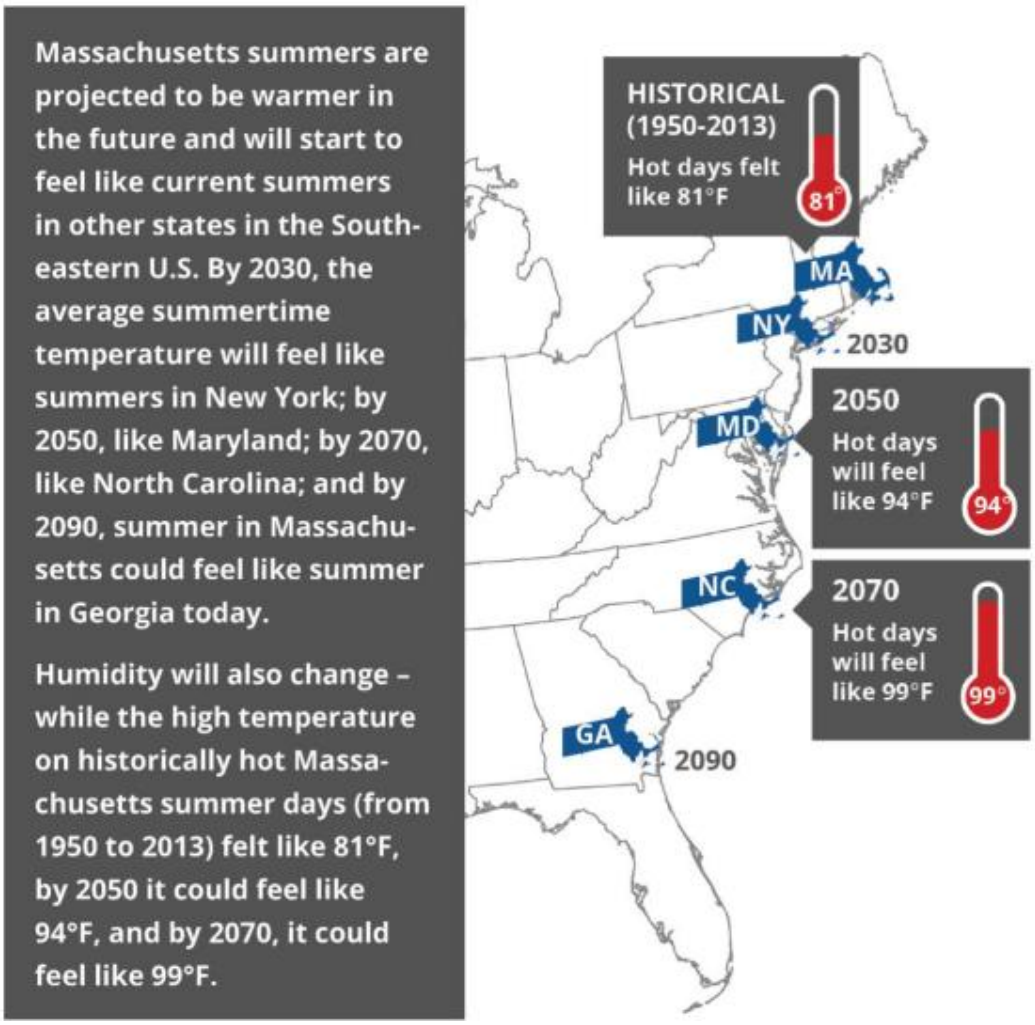
Figure 6: Change in the Annual Number of Days Over 90°F Compared to Today



Sources: 2022 MA Climate Change Assessment and Stochastic Weather Generator

These changes could result in Massachusetts summers feeling like a more southern state, as described in the infographic in Figure 7 from the State's 2022 Climate Change Assessment.

Figure 7: Change in Average Summertime Temperatures for Massachusetts

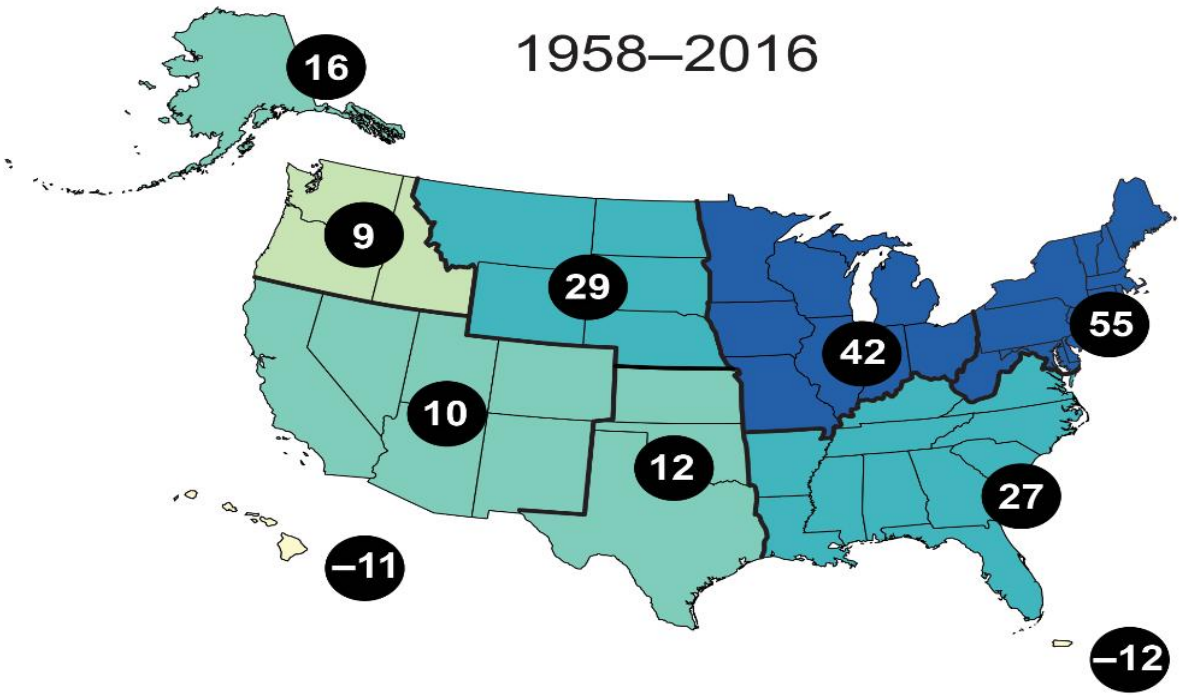


Source: 2022 MA Climate Change Assessment

PRECIPITATION PATTERNS

Annual precipitation in Massachusetts has increased by approximately 10% in the fifty-year period from 1960 to 2010 (MA EEA, 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, as shown in Figure 8 below (US Global Change Research Program, 2018). Changes in precipitation are fueled by warming temperatures which increase evaporation and, therefore, the amount of water vapor in the air.

Figure 8: Observed Change in Total Annual Precipitation in the Heaviest 1% Events

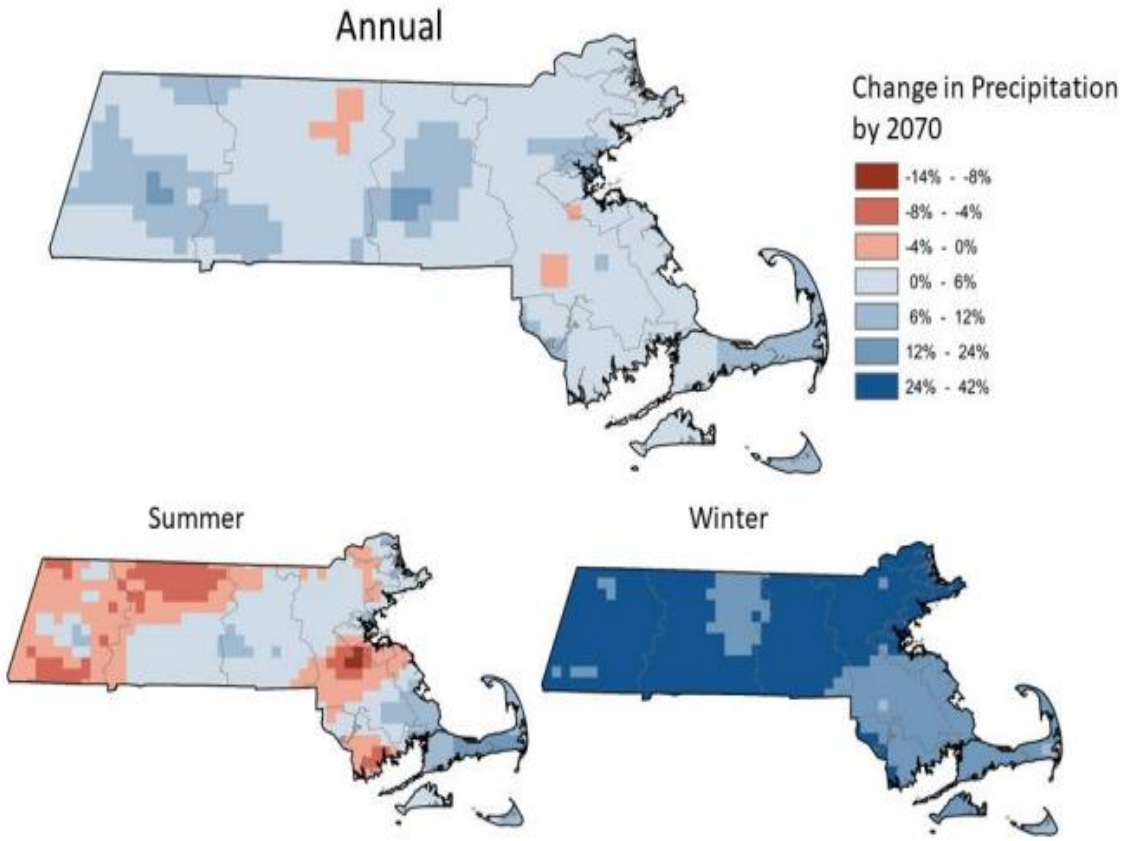


Source: Fourth National Climate Assessment, 2018
Numbers circled in black indicate % change.

Massachusetts' 2022 Climate Change Assessment anticipates that most parts of the State will see a future increase in annual total precipitation of less than 8% per year. Most of these increases are anticipated during the winter months (see Figure 9 below).

Additionally, the historic 10% annual chance daily rainfall event (2.8-4.0" of rain) could occur four times more frequently by 2090 (Commonwealth of Massachusetts, 2022).

Figure 9: Change in Annual and Seasonal Precipitation in 2070 Compared to Today



Source: 2022 MA Climate Change Assessment. The current climate is the 1986-2005 era, the projection for 2070 is for a 20-year era centered on 2070. Maps show LOCA downscaled GCM projections at the 50th percentile across 20 LOCA GCMs that overlap with the GCMs used in the Stochastic Weather Generator.

Despite overall increasing precipitation, more frequent and significant summer droughts are also a projected consequence of climate change. This is due to projections that precipitation will increase in winter and spring and decrease slightly in the summer and, as a result of earlier snow melt, and higher temperatures that will reduce soil moisture. Massachusetts' 2022 Climate Change Assessment anticipates that these changes will vary by region. The North and South Shore region where Winthrop is located may experience slightly more consecutive dry days, and significantly more days without rain per year, by 2090 (Commonwealth of Massachusetts, 2022). See Figure 10 below for more information.

Figure 10: Consecutive dry day events (number of multiple-dry-day events per year)

Panel A: Consecutive dry day events (number of multiple-dry-day events per year)

Region	Baseline	2030	2050	2070	2090
Berkshires & Hilltowns	29	29	30	30	31
Greater Connecticut River Valley	31	31	32	32	33
Central	32	32	32	33	33
Eastern Inland	32	32	32	33	33
Boston Harbor	31	31	32	32	33
North & South Shores	31	31	32	32	33
Cape, Islands, & South Coast	31	31	32	32	33
Statewide	**31**	**31**	**31**	**32**	**33**
Statewide Percent Change	**0%**	**1%**	**2%**	**4%**	**6%**

Source: Stochastic Weather Generator

Panel B: Annual number of days without rain (days per year)

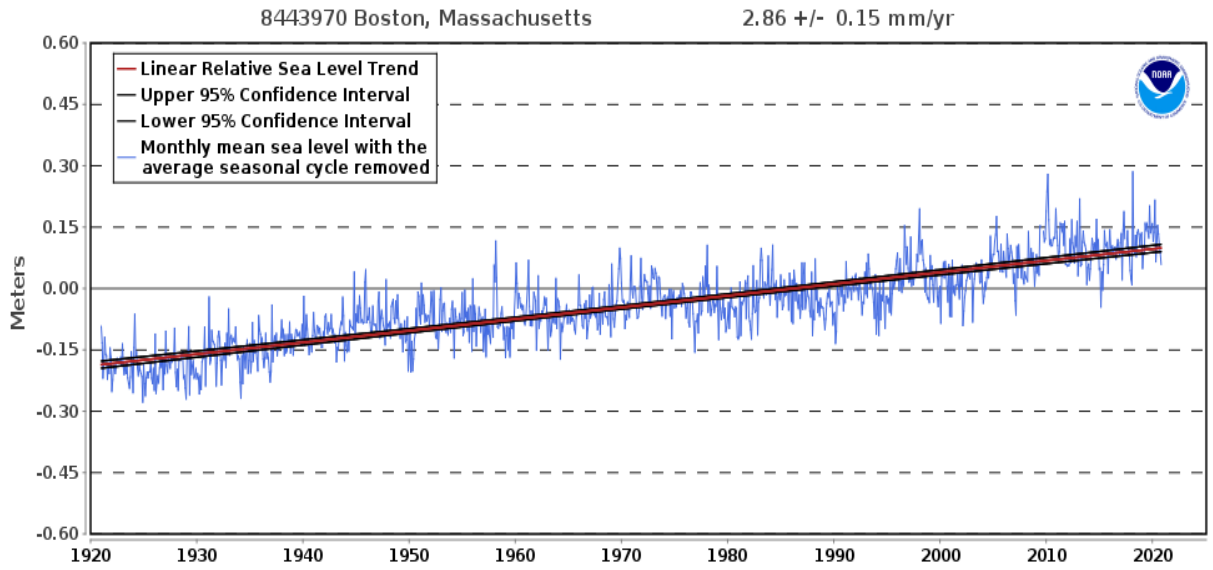
Region	Baseline	2030	2050	2070	2090
Berkshires & Hilltowns	159	161	165	167	170
Greater Connecticut River Valley	171	172	175	178	181
Central	180	182	185	188	192
Eastern Inland	186	181	185	188	193
Boston Harbor	192	185	192	194	198
North & South Shores	184	182	187	190	195
Cape, Islands, & South Coast	186	182	187	191	194
Statewide	**176**	**175**	**179**	**182**	**187**
Statewide Percent Change	**0%**	**-1%**	**2%**	**3%**	**6%**

Source: 2022 MA Climate Change Assessment. The Town of Winthrop is located in the North & South Shores region.

SEA LEVEL RISE

High-level information on sea level rise is discussed here as the town as well as the regional economy of the Boston Metro area may be impacted by sea level rise in the future. Warming temperatures contribute to sea level rise in three 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. NOAA's records from the Boston Tide Station show nearly one foot of sea level rise over the past century. See Figure 11 below for more information.

Figure 11: Observed Increase in Sea Level Rise



Source: NOAA

The sea level rise information in Massachusetts' 2022 Climate Change Assessment considers sea-level changes, land-level changes, and other regional facts that can impact the rate of change. The report includes the following approximate sea level rise projections for the State:

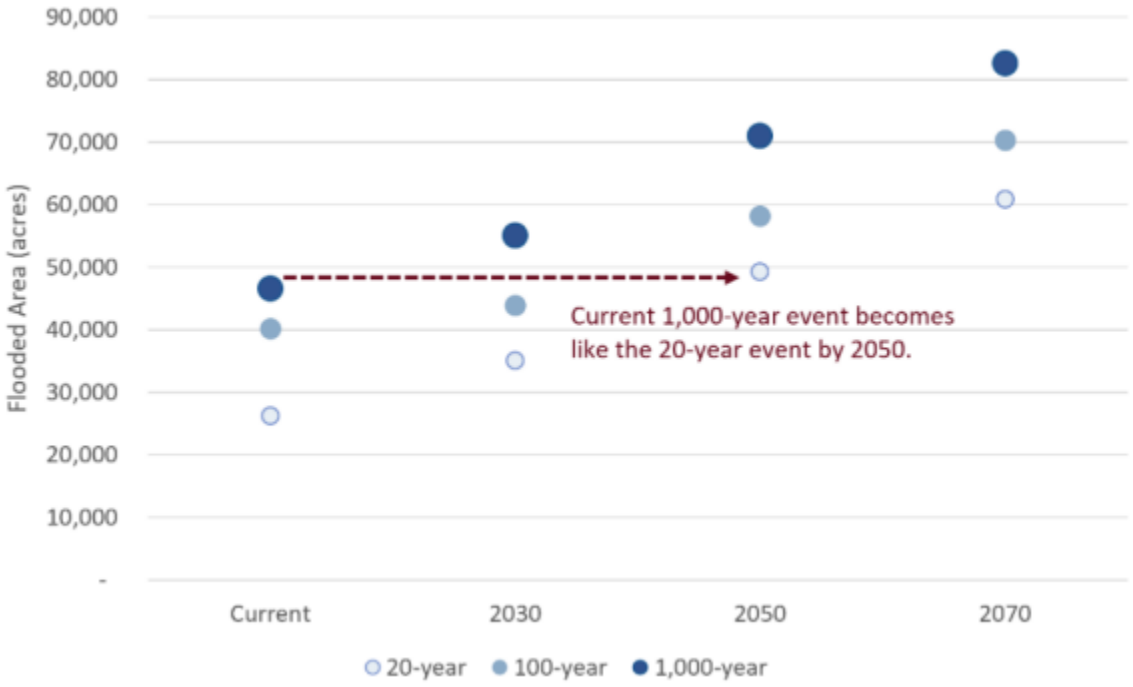
- **Northern Massachusetts:** 21 inches by 2050, and 43 inches by 2070
- **Southern Massachusetts:** 23 inches by 2050 and 45 inches by 2070

The 2022 Climate Change Assessment also quantified the developed land area flooded for events including:

- the 20-year (5% annual probability)
- 100-year (1% probability)
- 1000-year (0.1% probability) events

This approach found that the area flooded by the current 1000-year event is comparable to the area of a 20-year event by 2050. Even more areas could be impacted by the annual probability event by 2070. See Figure 12 below for more information.

Figure 12: Total Flooded Area of the Commonwealth for Selected Events



Source: 2022 MA Climate Change Assessment

CLIMATE CHANGE AND HAZARD MITIGATION

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 8 below, which is originally from the 2018 SHMCAP, summarizes the natural hazards reviewed in this plan, climate interactions, and expected impacts.

Table 8: Climate Change & Natural Hazards

Primary Climate Change Interaction	Natural Hazard	Other Climate Change Interactions	Representative Climate Change Impacts
 **Changes in Precipitation**	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, increased potential for loss of life, 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	
 **Sea Level Rise**	Coastal Flooding	Extreme Weather	Increase in tidal and coastal floods, storm surge, coastal erosion, marsh migration, inundation of coastal and marine ecosystems, loss of wetlands
	Coastal Erosion	Extreme Precipitation	
	Tsunami	Rising Temperatures	
 **Rising Temperatures**	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, increase in vector-borne illnesses (West Nile, Zika, EEE), ecosystem stress, energy brownouts from higher energy demands, more intense heat waves, public health impacts from high heat exposure and poor outdoor air quality, increased potential for loss of life, drying of streams and wetlands, eutrophication of lakes and ponds
	Wildfires	Changes in Precipitation	
	Invasive Species	Changes in Precipitation, Extreme Weather	
 **Extreme Weather**	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		
	Tornadoes		
	Other Severe Weather (Strong Wind & Thunderstorms)		

UPDATE PROCESS

In order to update Winthrop's risk assessment, MAPC gathered the most recently available hazard and land use data from federal and state sources and met with Town's Hazard Mitigation Team to identify changes in local hazard areas and development trends. The local Team also reviewed critical infrastructure with MAPC staff in order to create an up-to-date inventory and accompanying GIS map. MAPC also used the most recently available version of FEMA's HAZUS-MH program (described below) to assessed the potential impacts of Hurricanes, Tornadoes, and Flooding.

OVERVIEW OF HAZARDS AND IMPACTS

The risk assessment analyzes the potential natural hazards that could occur within the Town of Winthrop as well as the relationship between those hazards and current land uses, potential future development, and critical infrastructure. This updated plan also recognizes that climate change is projected to have significant impacts on many natural hazards in Winthrop. The Resilient MA Plan (2023), the Massachusetts Climate Change Assessment (2022), and the SHMCAP (2018) are key planning documents that examine natural hazards and climate trends that have the potential to impact the Commonwealth. The 2013 State HMP set the stage by defining considerations such as frequency and severity and summarizing the frequency and severity of hazards of greatest concern. The 2018 SHMCAP used similar definitions for hazard considerations and expanded on this research by including additional climate projections. Because the 2013 State HMP includes definitions that were not specified in the SHMCAP, both resources are referred to in this report.

Table 9 below summarizes the hazard risks for Winthrop, with reference to the hazards in Massachusetts. This evaluation takes into account the frequency and severity of each hazard for Massachusetts and Winthrop, based on available data, including:

- **State-level data**, including the Resilient MA Plan, the 2022 Climate Change Assessment, and 2018 SHMCAP.

- **County-level data** from NOAA's National Climatic Data Center and Storm Events Database for Suffolk County (where Winthrop is located)

- **Local-level information** including input from the Local Team, the hazard mapping included in Appendix A, and the HAZUS results.

The statewide hazard risk assessment is based on the definitions for hazard frequency and severity listed below. The statewide assessment was modified to reflect local conditions in Winthrop using the same criteria.

Definitions of Hazard Frequency and Severity

Frequency

Very low: Very unlikely; minimal examples of historical occurrences.
Low: Likely to occur at least once by the end of the century; some examples of historical occurrences; anticipated every 100 years.
Medium: Likely to occur at least once every 50 years (two or more occurrences in the next century)
High: Almost certain to occur at least once a year.
Very High: Almost certain to occur multiple times a year.

Severity

Minor: Limited and scattered property damage; limited damage to public infrastructure and essential services not interrupted; limited injuries or fatalities.
Serious: Scattered major property damage; some minor infrastructure damage; essential services are briefly interrupted; some injuries and/or fatalities.
Extensive: Widespread major property damage; major public infrastructure damage (up to several days for repairs); essential services are interrupted from several hours to several days; many injuries and/or fatalities.
Catastrophic: Property and public infrastructure destroyed; essential services stopped; numerous injuries and fatalities.

Table 9 - Hazard Risks Summary

Hazard	Frequency		Severity	
	Massachusetts	Winthrop	Massachusetts	Winthrop
Flooding from Precipitation	Very High	High	Serious	Serious
Dam failures	Very Low	N/A	Extensive	N/A
Coastal Erosion	Very High	Very High	Serious-Extensive	Extensive
Coastal Flooding	Very High	Very High	Serious-Extensive	Extensive
Tsunami	Very Low	Very Low	Extensive-Catastrophic	Extensive-Catastrophic
Hurricane/Tropical Storm	Medium	Medium	Serious - Catastrophic	Extensive
Tornadoes	High	Low	Serious - Extensive	Serious
Other Severe Weather (Thunderstorms/Hail)	Very High	High	Minor - Extensive	Minor-Serious
Severe Winter/ Nor'easter/Blizzards	High	High	Minor - Extensive	Extensive
Winter-Ice Storms	Medium	Medium	Minor - Extensive	Minor
Earthquakes	Medium	Medium	Serious - Catastrophic	Serious
Landslides	High	Very Low	Minor - Extensive	Minor
Wildfire/Brushfires	Very High	Medium	Minor - Extensive	Minor
Extreme Temperatures	Very High	High	Minor -Serious	Minor
Drought	Medium	Medium	Minor - Serious	Minor

Sources: *Resilient MA Plan (Frequency), State Hazard Mitigation Plan 2013 (Severity), HAZUS, Local information.*

Not all hazards listed in the Resilient MA Plan affect the Town of Winthrop The Town considered changing groundwater levels but did not designate that as a hazard in Winthrop. USGS groundwater monitoring records show no trend in lower groundwater levels over the last 50 years. Further, the Town does not use groundwater wells as a source of water supply, as a member of the MWRA regional water system. Landslides, while possible, have never occurred and the town is ranked "Low Susceptibility" for landslides. Current land use regulations govern stabilization of slopes, and the Town did not conclude that further mitigation for landslide is warranted.

FLOODING HAZARDS

FLOODING FROM PRECIPITATION AND COASTAL FLOODING

Flooding was the most prevalent natural hazard identified by local officials in Winthrop. Given the Town's location on Boston Harbor, the Town is subject to two kinds of flooding; coastal flooding, where wind, tide, and storm surges lead to flooding in low-lying areas along the shore and tidal waterways, and flooding from precipitation, or stormwater flooding, where the rate of precipitation or amount of stormwater runoff overwhelms the capacity of natural and structured drainage systems to convey water causing it to overflow the system. These two types of flooding are often combined as inland flooding is prevented from draining by the push of wind and tide driven water.

FLOODING FROM PRECIPITATION

Flooding is generally caused by severe rainstorms, hurricanes, nor'easters, and thunderstorms. Severe rainstorms can occur year-round. Hurricanes are most common in the summer and early fall while Nor'easters are most common in winter. Spring snowmelt may exacerbate flooding during storm events. 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.

Regionally Significant Floods

There have been a number of major floods that have affected the Metro Boston region over the last fifty years. Significant historic flood events have included those listed below (NOAA, 2024)

- The Blizzard of 1978
- January 1979
- April 1987
- October 1991
- December 1992
- October 1996
- June 1998
- March 2001
- April 2004
- May 2006
- April 2007
- March 2010
- December 2010
- March 2013
- January 2018
- March 2018
- June 2020

Most severe flooding event within last 15 years

The most severe flooding event in Eastern Massachusetts in the last 15 years occurred during March 2010, when a total of 17.7 inches of rainfall was recorded by the Blue Hills Observatory from three storms over 19 days from March 13 to 31. The weather pattern that consisted of early springtime prevailing westerly winds that moved three successive storms, combined with tropical moisture from the Gulf of Mexico, across New England. Torrential rainfall caused March 2010 to be the wettest month on record.

The March 2010 rainstorms fit the profile of a type of severe precipitation event expected to increase in frequency as the climate warms. That is, significant precipitation, falling in late winter as rain rather than snow, on frozen ground, and while vegetation is still dormant.

One indication of the extent of flooding is the gage height at the nearest USGS streamflow gauging station, which is on the Saugus River in Saugus, MA. The USGS gage height, shown in Figure 13, reached 6.41 feet on March 15, 2010 during the first storm, and rose again to 6.21 feet on March 31, 2010 during the second storm. Normal gage height in March is about 3 feet.

Figure 13- Saugus River Gage Heights, March-April 2010

Source, US Geological Service, National Water Information System

Previous Inland/Stormwater Flooding Events

The best available local data on previous inland flooding events in Winthrop is from NOAA's National Centers for Environmental Information Storm Events Database, which provides county-level records of natural hazards (see Table 10). Suffolk County, which includes the Town of Winthrop, experienced 29 flood events from 2005 –2025. There were no deaths or injuries

reported and the total reported property damage in the county was $10.945 million dollars. Damages from the major flooding during the storms of March 2010 totaled $10.7 million. Notably, that represents 98% of total flood damage for Suffolk County over the entire 20-year period from 2005 to 2025. The 2010 storms were a federally declared disaster, making federal assistance available to residents who did not carry flood insurance. That resulted in 25 claims in the Town of Winthrop, totaling $32,447. The HAZUS analysis estimates flooding damages in Winthrop from a 100-year storm at $236.8 million and $334.7 from a 500-year storm (Table 46).

Table 10 Suffolk County Flood Events, 2005 – 2025

Date	Deaths	Injuries	Property Damage
5/13/2006	0	0	0
10/28/2006	0	0	$8,000
/13/2008	0	0	$5,000
3/14/2010	0	0	$10,700,000
8/25/2010	0	0	0
10/29/2012	0	0	$15,000
6/7/2013	0	0	0
9/1/2013	0	0	$5,000
10/23/2014	0	0	$30,000
7/23/2016	0	0	0
7/12/2017	0	0	0
7/18/2017	0	0	0
8/2/2017	0	0	0
9/14/2017	0	0	$25,000
9/30/2017	0	0	$90,000
10/30/2017	0	0	0
5/15/2018	0	0	0
6/25/2018	0	0	0
8/12/2018	0	0	$10,000
9/25/2018	0	0	$3,000
11/3/2018	0	0	0
6/29/2019	0	0	$20,00
7/06/2019	0	0	0
7/31/2019	0	0	$4,000
8/7/2019	0	0	0
6/28/2020	0	0	0
7/9/2021	0	0	0
1/23/2023	0	0	0
7/16/2023	0	0	0
TOTAL	**0**	**0**	**$10,945,000**

Source: NOAA, National Centers for Environmental Information

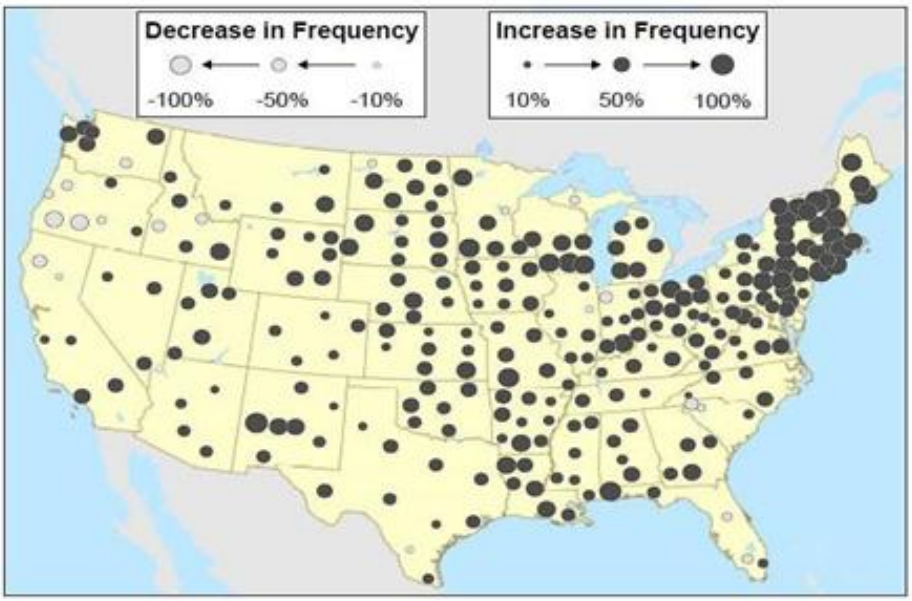
Probability of Future Events

Flooding in Winthrop is a high frequency event as defined by the Massachusetts State Hazard Mitigation Plan. This hazard is almost certain to occur at least once a year.

Inland Flooding and Climate Change

Eastern Massachusetts average annual precipitation is 42 inches. While total annual precipitation has not changed significantly, according to the report *When It Rains It Pours – Global Warming and the Increase in Extreme Precipitation from 1948 to 2011,* intense rainstorms and snowstorms have become more frequent and more severe over the last half century in the northeastern United States. Extreme downpours are now happening 30 percent more nationwide than in 1948 (see Figure 14).

Figure 14 Changes in Frequency of Extreme Downpours, 1948 – 2011



Source: *When It Rains It Pours – Global Warming and the Increase in Extreme Precipitation,* Environment America Research and Policy Center, July 2012

Not only are these intense storm events more frequent, they are also more severe; the largest annual storms now produce 10 percent more precipitation, on average, than in 1948. In particular, the report finds that New England has experienced the greatest change with intense rain and snowstorms occurring 85 percent more often than in 1948.

Data from the 2022 MA Climate Change Assessment related to changes in precipitation patterns is included in an earlier section of this chapter. Those projections suggest that future rain events will be increasingly intense and lengthy, which could lead to increased inland and stormwater flooding.

Precipitation frequency estimates, which are used to derive stormwater design standards, were published in 196l by the U.S. Commerce Department in a document known as TP-40 (Technical Paper 40). The 10-year, 24-hour storm for eastern Massachusetts was calculated as a 4.5-inch

event. Recently the National Oceanic and Atmospheric Administration published updated estimates (NOAA Atlas 14), which increased this design storm by 0.6 inches to 5.14 inches for eastern Massachusetts. Communities should consider future rainfall rates when designing infrastructure.

For example, communities could consider using NOAA Atlas 14 rainfall rates with an additional allowance to account for projected rainfall during the life of projects permitted today when sizing stormwater infrastructure. DEP takes a similar approach to describe current (not future) rainfall rates, called "NOAA14+". Mystic River Watershed Association (MyRWA) communities propose "NOAA14++", which they say reflects 2070 projections. The NOAA 14+ number is calculated by multiplying the NOAA 14 precipitation frequency estimate upper confidence interval by 0.9 (i.e., current but extreme precipitation events reflect 90% of upper confidence intervals). The NOAA 14++ number is the upper confidence interval. A comparison of these numbers is summarized in Table 11 below (NOAA, 2023) .

Table 11: Rainfall rates for the 10-year 24-hour storm

NOAA 14	NOAA 14+	NOAA 14++
5.27 inches	5.90 **inches**	6.56 **inches**

NOAA, 2023

The 2022 MA Climate Change Assessment also highlights the following flooding climate impacts:

- By 2050, the 1 percent annual chance river flood could be two times more likely to occur
- By 2090, the historical 10 percent annual chance daily rainfall event (2.8 to 4 inches) could occur four times more frequently
- Damage could occur to buildings from heavy rainfall and overwhelmed drainage systems
- Damage could occur to transit service due to flooding
- There could be a reduction in the availability of affordably priced housing from direct damage including from flooding (Commonwealth of Massachusetts, 2022)

COASTAL FLOODING

Flooding and coastal storm surges are the primary coastal hazards that lead to the loss of lives or damage to property and infrastructure in developed coastal areas. Coastal flooding is associated with severe coastal storms such as Nor'easters and hurricanes which, through the combination of winds and tides, lead to the inundation of low-lying land areas and damage or overtopping of seawalls and other coastal infrastructure. Coastal flooding can also be associated with routine tidal flooding "King Tides," or higher astronomic tides.

Coastal storms are an intricate combination of events that impact a coastal area. Although most common in the fall and winter seasons, a coastal storm can occur any time of the year and at varying levels of severity. One of the greatest threats from a coastal storm is flooding due to storm surge. This is the inundation of land areas along the coastal and estuarine shoreline by seawaters over and above normal tidal action. Coastal flooding can also be associated with

routine tidal flooding "King Tides," or higher astronomic tides. Also, the high tide and storm surge can limit the ability of stormwater to drain from inland waterways.

Previous Coastal Flooding Events

The best available local data for previous coastal flooding occurrences is provided by the NOAA National Centers for Environmental Information. Suffolk County, which includes the Town of Winthrop, experienced 37 coastal flood events from 2005 through 2025 (see Table 12). No deaths or injuries were reported and the total reported property damage in the county was $39 million dollars.

Table 12 – Suffolk County Coastal Flood/Storm Surges, 2005-2025

Date	Type	Deat	Injurie	Property Da
1/23/2005	Storm Surge	0	0	
5/24/2005	Storm Surge	0	0	
5/25/2005	Storm Surge	0	0	
1/31/2006	Coastal Flood	0	0	
2/12/2006	Storm Surge	0	0	
4/15/2007	Coastal Flood	0	0	
4/16/2007	Coastal Flood	0	0	
4/17/2007	Coastal Flood	0	0	
10/18/2009	Coastal Flood	0	0	
1/2/2010	Coastal Flood	0	0	
3/14/2010	Coastal Flood	0	0	
12/27/2010	Coastal Flood	0	0	
8/27/2011	Storm Surge	0	0	
11/23/2011	Coastal Flood	0	0	
06/03/2012	Coastal Flood	0	0	
06/04/2012	Coastal Flood	0	0	
10/29/2012	Coastal Flood	0	0	
2/9/2013	Coastal Flood	0	0	$
3/7/2013	Coastal Flood	0	0	
1/2/2014	Coastal Flood	0	0	
1/3/2014	Coastal Flood	0	0	
8/13/2014	Coastal Flood	0	0	
10/23/2014	Coastal Flood	0	0	
1/27/2015	Coastal Flood	0	0	
10/28/2015	Coastal Flood	0	0	
1/24/2016	Coastal Flood	0	0	
2/8/2016	Coastal Flood	0	0	
1/4/2018	Coastal Flood	0	0	
1/30/2018	Coastal Flood	0	0	
3/2/2018	Coastal Flood	0	0	
10/27/2018	Coastal Flood	0	0	
11/25/2018	Coastal Flood	0	0	
1/20/2019	Coastal Flood	0	0	
10/28/2019	Coastal Flood	0	0	
4/3/2020	Coastal Flood	0	0	
4/9/2020	Coastal Flood	0	0	
9/22/2020	Coastal Flood	0	0	

12/17/2020	Coastal Flood	0	0	
2/2/2021	Coastal Flood	0	0	
7/23/2021	Coastal Flood	0	0	
1/17/2022	Coastal Flood	0	0	
12/23/2022	Coastal Flood	0	0	
1/23/2023	Coastal Flood	0	0	
1/10/2024	Coastal Flood	0	0	
1/13/2024	Coastal Flood	0	0	
3/10/2024	Coastal Flood	0	0	
4/4/2024	Coastal Flood	0	0	
TOTAL		**0**	**0**	

Source: NOAA, National Centers for Environmental Information

According to the 2024 Flood Insurance Study for Suffolk County, for the areas of Winthrop that are impacted by coastal flooding processes, coastal flood hazard analyses were performed by FEMA to provide estimates of coastal Base Flood Elevations (BFE). Coastal BFEs reflect the increase in water levels during a flood event due to extreme tides and storm surge as well as overland wave effects.

Overland wave hazards were evaluated by FEMA to determine the combined effects of ground elevation, vegetation, and physical features on overland wave propagation and wave runup. These analyses were performed at representative transects along all shoreline for which waves were expected to be present during the floods of the selected recurrence intervals. Table 13 provides the location, stillwater elevations, and starting wave conditions for each Winthrop transect evaluated for overland wave hazards. The results of these analyses were used to determine elevations for the 1% annual chance flood. Eight of the Suffolk County transects are in Winthrop, as shown in Figure 15; these transects are depicted on the FIRM.

Table 15: Coastal Transect Parameters for Winthrop

Flood Source	Coastal Transect	Starting Wave Conditions for the 1% Annual Chance		Starting Stillwater Elevations (ft NAVD88) Range of Stillwater Elevations (ft NAVD88)				
		Significant Wave Height H_s (ft)	Peak Wave Period T_p (sec)	10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
Atlantic Ocean	9	23.09	12.5	*	*	*	9.1	9.9
Atlantic Ocean	10	23.09	12.5	*	*	*	9.7	11.1
Atlantic Ocean	11	23.09	12.5	*	*	*	9.7	11.1
Atlantic Ocean	12	23.09	12.5	*	*	*	9.1	9.9
Atlantic Ocean	13	23.09	12.5	*	*	*	9.1	9.9
Atlantic Ocean	14	23.09	12.5	*	*	*	9.7	11.1
Atlantic Ocean	15	23.09	12.5	*	*	*	9.1	9.9
Boston Harbor	17	2.3	5.6	*	*	*	8.8	9.6

Source: Flood Insurance Study for Suffolk County, 2024

Figure 15: Suffolk County Shoreline Transect Locations for Winthrop

Source: Flood Insurance Study for Suffolk County, 2024

As a peninsula located between Boston Harbor, Belle Isle March, and the Atlantic Ocean, Winthrop has extensive exposure to coastal flooding along most of its shoreline. Measures of the severity of coastal flooding include water level elevation and duration of the event. The extent of flooding in Winthrop is indicated by recorded high water marks documented by the US Geological Survey for the Blizzard of 1978, the highest coastal flood on record. The USGS, in cooperation with the Army Corps of Engineers and the Massachusetts Department of Public Works, inventoried high water marks along the New England coast, including seven locations in the Town of Winthrop. The high water levels for these locations area summarized in table 14.

Table 14 High Water Marks in Winthrop, Blizzard of 1978

Site No.	Elevation (ft-NGVD29)	Description
248	12.45	Lat 42°22'41", long 70058'22", Winthrop, Mass., Winthrop Beach, good wash line on seventh clapboard from ground at 65 Beach Street, halfway between seventh and eighth clapboard. Waves over seawall.
249	7	Lat 42°22'16", long 70°58'12", Winthrop, Mass., Cottage Hill, good drift line 1.8ft above base of chain link fence across street from Hadassah Way and Temple Tifreth Israel. Waves over seawall.
250	12.67	Lat 42°21'33", long 70°58'16", Winthrop, Mass., Point Shirley, good to fair debris line 1.8ft above sidewalk on chain link fence at 965 Bayview on corner. Waves over seawall.

251	11.04	Lot 42°21'26", long 70°58'16", Point Shirley, Mass., Boston Harbor, right side" of garage, brick ranch, at 25 Maryland Avenue. High-water-mark description and elevation furnished by the Massachusetts Department of Public Works.
252	11.1	Lat 42°21'27", long 70°58'20", Point Shirley, Mass., Boston Harbor, foundation and mail box at 80 Otis Street. High-water-mark description and elevation furnished by the Massachusetts Department of Public Works.
253	11.09	Lat 42021'27", long 70°58'20", Point Shirley, Mass., Boston Harbor, mail box near driveway of 82 Otis Street. High-water-mark description and elevation furnished by the Massachusetts Department of Public Works.
254	10.38	Lat 42°22'06", long 70°58'20", Cottage Hill, Mass., Crystal Cove, debris line at lower locker deck of Winthrop Yacht Club, 649 Shirley Street. High-water-mark description and elevation furnished by the Massachusetts Department of Public Works.

Source: Coastal Flood of Feb. 7, 1978 in ME, MA & NH, Russell A Gadoury, USGS Water Resources Investigations 79-61

Probability of Future Occurrence

Based on the record of previous occurrences coastal flooding events in Winthrop are a high frequency event as defined by the Resilient MA Plan. This hazard is almost certain to occur at least once a year.

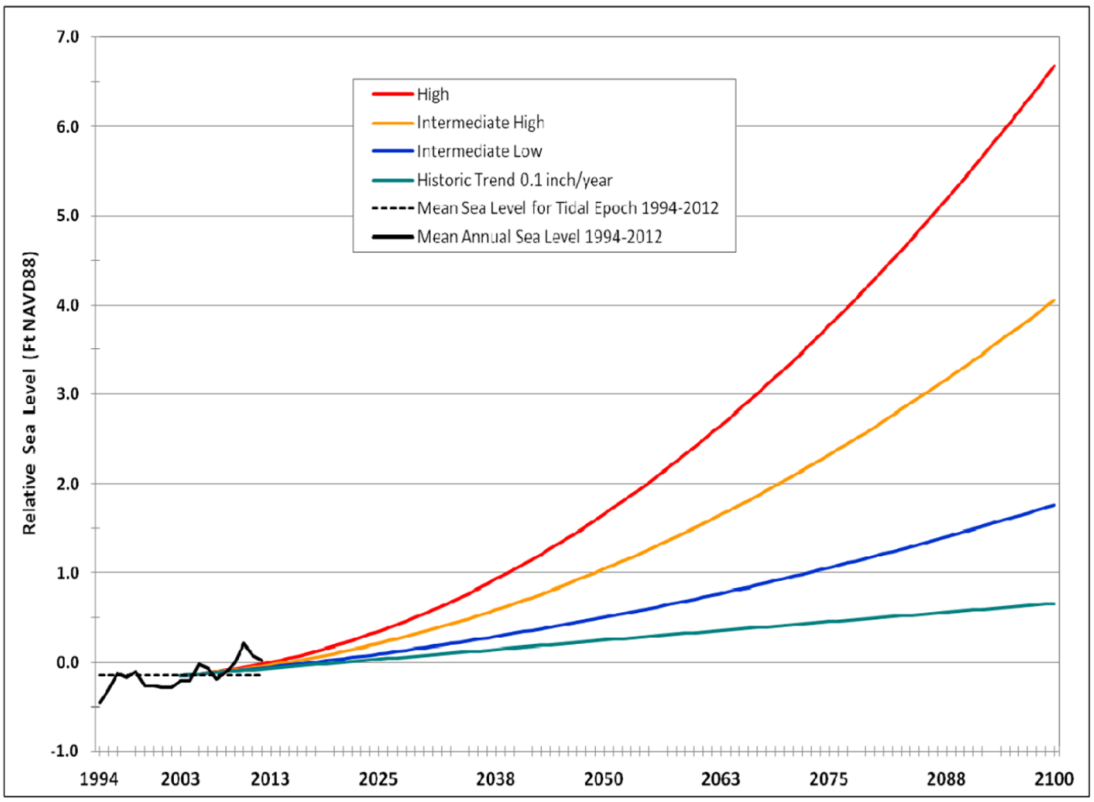
Coastal Flooding and Climate Change

Of all the impacts of climate change, Winthrop is most susceptible to the impacts of sea level rise, as it will magnify the flooding associated with coastal storms. As shown by records from the Boston Tide Station (see Figure 11) seas have risen the equivalent of 11 inches over 100 years, based on monitoring data from 1921.

The Massachusetts Office of Coastal Zone Management (CZM) adjusted global predictions for future sea level rise, taking into account local subsidence (see Figure 16). The range of projections for the future is quite wide, particularly approaching the end of this century. The High scenario includes ocean warming and a calculation of maximum glacier and ice sheet melt. The Intermediate High scenario averages higher predictions but includes lesser ice sheet melting. The Intermediate Low considers lower sea level rise scenarios and limited ice melt. The Historic Trend reflects a continuation of the current rate of sea level rise.

The CZM estimate for the Boston Harbor does not take into account more recent research that suggests the Boston Harbor is included in a region that may experience greater than average sea level rise. CZM cautions that the Historic and Intermediate Low scenarios may “considerably underestimate actual sea level rise”, particularly for time horizons beyond 25 years.

Figure 16 Projected Sea Level Rise for Greater Boston Harbor

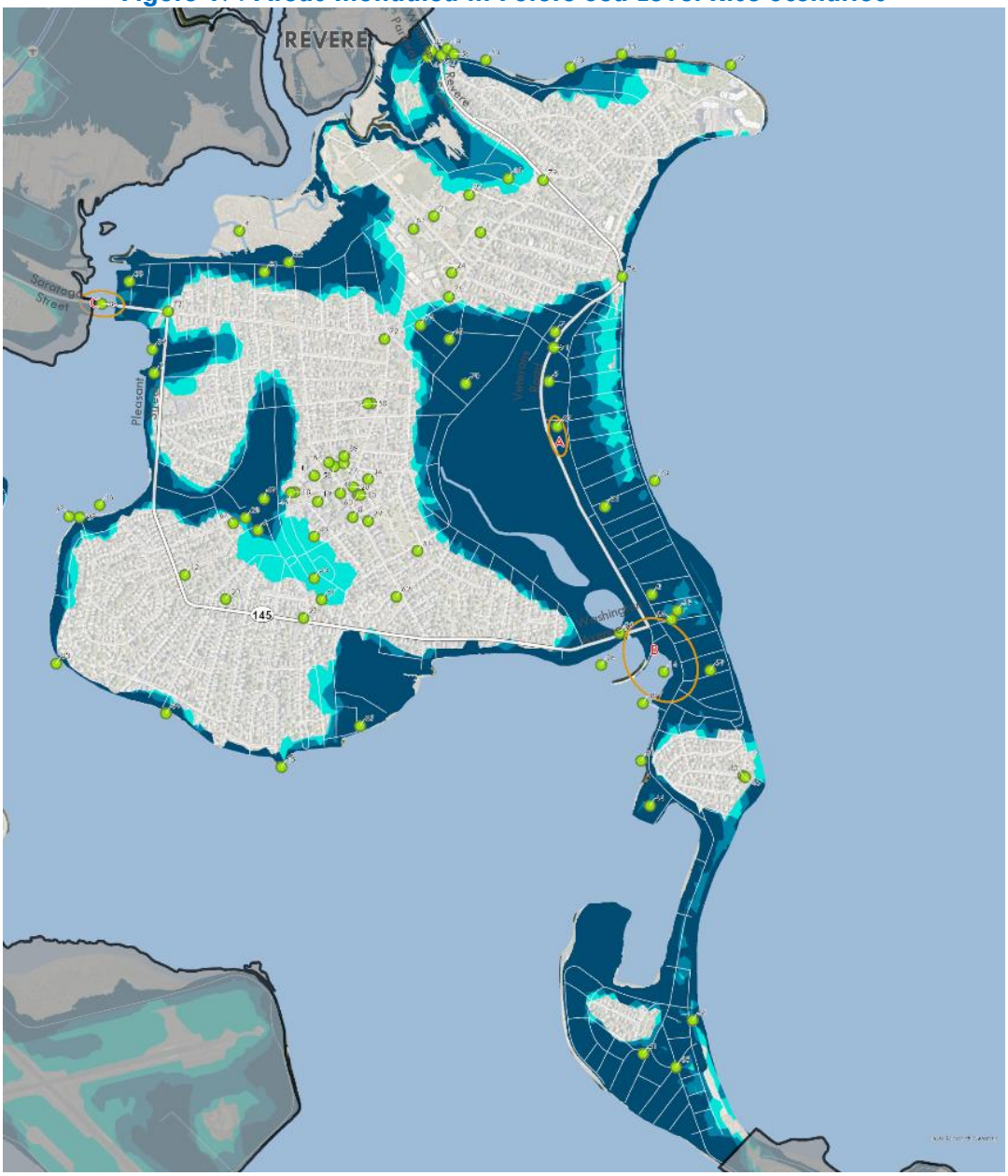


Source: Sea Level Rise: Understanding and Applying Trends and Future Scenarios for Analysis and Planning, Massachusetts Office of Coastal Zone Management, December 2013.

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. 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.

Figure 17 shows projections of flood inundation area in Winthrop related to three future sea level rise scenarios developed for the Massachusetts Coastal Flood Risk Model (MC-FRM) by the Wood Hole Group. The map shows the extent of flood inundation for a 1% annual chance storm for projected sea level rise scenarios of 1.2 feet, 2.4 feet, and 4.2 feet. These scenarios are approximately equivalent to the levels of sea level rise projected for the years 2030, 2050, and 2070, respectively. This map is also included in the hazard map series in Appendix A.

Figure 17: Areas Inundated in Future Sea Level Rise Scenarios



Source: Woods Hole Group, Massachusetts Coastal Flood Risk Model

INLAND AND COASTAL FLOOD HAZARD AREAS IN WINTHROP

Information on potential flood hazard areas was taken from two sources. The first was the National Flood Insurance Rate Maps. The FIRM flood zones are shown on Map 3 in Appendix A and their definitions are listed below. The most significant areas of Zone A (1% annual chance of flooding) are across the Belle Isle Marsh and Winthrop's shoreline, both facing the Atlantic Ocean and Boston Harbor, with the most extensive areas on the ocean side. There are no flood hazard areas in Winthrop associated with rivers and streams; all of the town's exposure to flooding is from coastal sources.

Flood Insurance Rate Map Zone Definitions

Zone A (1% annual chance): Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs (base flood elevations) or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

Zone AE and A1-A30 (1% annual chance): Zones AE and A1-A30 are the flood insurance rate zones that correspond to the 100-year floodplains that are determined in the FIS by detailed methods. In most instances, BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

Zone X500 (0.2% annual chance): Zone X500 is the flood insurance rate zone that corresponds to the 500-year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs (base flood elevations) or depths are shown within this zone.

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.

Locally Identified Areas of Inland and Coastal Flooding

The second source of information on local flooding was the Winthrop Hazard Mitigation Team. The locally identified areas of flooding described below were identified by town staff as areas where flooding occurs.

The 15 locally identified areas of flood hazard described below and shown on Map 8 in Appendix A were identified by the Winthrop Hazard Mitigation Team as areas where flooding is known to occur. Sites 12 through 15 were added to the plan for this 2025 update. These areas do not necessarily coincide with the flood zones from the FIRM maps. They may be areas that flood due to inadequate drainage systems or other local conditions rather than location within a flood zone, or areas subject to coastal flooding in part due to infrastructure that may require upgrading. The site numbers correspond to the numbers on Map 8, "Hazard Areas". The numbers do not reflect priority order.

Locally Identified Areas of Flooding

1) Yirrell Beach: coastal surge and flooding during storm events

2) Shirley Street Neighborhood: low-lying street area and adjacent seawall experience wave overtopping and flooding during storm events

3) Lewis Lake: Serves as drainage area for large part of downtown area. Lake overflows during storm events and causes flooding in adjacent areas.

4) Ingleside Park: Backup and flooding due to lack of storm water storage capacity and undersized drains. Floods during high tide events coinciding with high precipitation events of greater than 1 inch.

5) Lower Nahant Avenue: coastal surge, high tide and high precipitation events all cause backup in undersized drain lines and flooding within the adjacent neighborhood.

6A) Woodside seawall and headwall on Boston Harbor: coastal surge flooding during storm events

6B) Somerset seawall and headwall on Boston Harbor: coastal surge flooding during storm events.

6C) Sargent Street seawall and headwall on Boston Harbor: coastal surge flooding during storm events.

6D) Cottage Park seawall and headwall on Boston Harbor: coastal surge flooding during storm events.

7) Coughlin Park: coastal erosion and flooding during higher northwest wind events and coastal storms.

8) Bayou Street Neighborhood- flooding due to undersized drainage line that backs up in high precipitation events.

12)Pico Avenue off of Sunnyside – seawall needs to be raised for 13-foot tide.

13) Morton Street and Banks.

14) Washington Street and River Road – floods during every large rain event.

15) Pleasant Street and Girdlestone Road – low-lying area floods,

The area of Winthrop that floods the most frequently is Point Shirley. In addition to the eastern side of Point Shirley being directly impacted by ocean waves and storm surge, the western side of the Point is often impacted by the what local residents describe as the “Boston Harbor bathroom effect” in which tidal driven storm surge causes water build-up in the Harbor and causes flooding on the western side of Point Shirley. Another area that floods frequently is the residential area surrounding Lewis Lake. Lewis Lake drains approximately half of the Town. Homes in this area flood because the lake is silted up which reduces its capacity.

Flooding also occurs in the vicinity of Ingleside Park. The park is at sea level with a pipe that drains to the bay. There is a valve that shuts during heavy tides but the area may need a pump station as well. To help with flooding in this area, the Town has constructed dikes around two homes as a temporary solution. The south end of Yirrell Beach, in the vicinity of Wyman Street also experiences flooding because the seawall does not extend far enough. The road leading to the MWRA Deer Island wastewater facility is also prone to flooding during larger storm events.

The seawall at Yirrell Beach to Deer Island remains one of the Town's top priority hazard mitigation measures. This seawall is occasionally breached which results in sand coming up over the wall. Because the seawall ends at Wyman Street, this street floods, which can affect up to 40 homes. In 2003 the Town had to remove four feet of gravel that had washed up on Wyman Street.

Repetitive Loss and Severe Repetitive Loss Properties

As defined by the National Flood Insurance Program (NFIP), a repetitive loss property is any property which the NFIP has paid two or more flood claims of $1,000 or more in any given 10-year period since 1978. A Severe Repetitive Loss property consists of any NFIP-insured residential property that has met at least one of the following flood loss criteria since 1978:

- 4 or more separate claim payments of more than $5,000 each (including building and contents payments); or
- 2 or more separate claim payments (building payments only) where the total of the payments exceeds the current value of the property.

There are 153 repetitive loss properties in Winthrop. These properties had a total of 489 losses, totaling $3,772,415 in building and contents damages. In addition there are 11 Severe Repetitive Loss properties that have had 11 losses totaling $654,231. The total of all losses for RL and SRL properties in Winthrop is $4,426,646. Table 15 summarizes the number of repetitive loss and severe repetitive loss properties in Winthrop and the number of losses and insurance payments for building losses and building contents losses.

Table 15. Summary of Repetitive Losses and Claims

	Repetitive Loss Properties	Severe Repetitive Loss Properties	Total
Number of Properties	153	11	164
Number of Losses	489	63	552
Building Claim Payments	$3,476,995	$588,955	$4,065,950
Contents Claim Payments	$294,777	$65,202	$359,979
Total Claim Payments	$3,772,415	$654,231	$4,426,646

Source: Massachusetts Emergency Management Agency

COASTAL EROSION

Coastal shorelines change constantly in response to storms, seasons, sea level, and human alterations. Rising seas and more frequent and intense storms will tend to increase erosion, although some areas may actually accrete material due to localized variation in coastal dynamics. 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.

Coastal landforms such as coastal banks are essential to maintaining a supply of sediment to beaches and dunes. Where engineered structures are used to stabilize shorelines, the natural process of erosion is interrupted, decreasing the amount of sediment available and causing erosion to adjacent areas. Under conditions of reduced sediment, the ability of coastal resource areas such as dunes and beaches to provide storm damage prevention and flood control benefits is continually reduced. A major challenge is to ensure that regional sediment supplies are managed effectively and in ways that allow the beneficial storm damage prevention and flood control functions of natural coastal processes to continue— both for future projects and, where possible, existing coastal development.

In Winthrop, there are many examples of both public and private infrastructure that are impacting sediment supplies to beaches. One area is the seawall along Winthrop Shore Drive and another is the private seawall along both sides of Shirley Street. Other areas with hard engineered infrastructure that may be impacting the supply of sediment to coastal beaches include Brewster and Grandview Avenues, Faunbar Avenue and Terrace Avenue.

Coastal Erosion and Shoreline Change

Coastal shorelines change constantly in response to wind, waves, tides, sea level fluctuation, seasonal and climatic variations, human alteration, and other factors that influence the movement of sand and material within a shoreline system. The loss (erosion) and gain (accretion) of coastal land is a visible result of the way shorelines are reshaped in the face of these dynamic conditions. Shorelines tend to change seasonally, accreting slowly during the summer months when sediments are deposited by relatively low energy waves and eroding dramatically during the winter when sediments are moved offshore by high-energy storm waves, such as those generated by nor'easters. Regardless of the season, coastal storms typically cause erosion.

Coastal erosion and shoreline change can result in significant economic loss through the destruction of buildings, roads, infrastructure, natural resources, and wildlife habitats. Damage often results from the combination of an episodic event with severe storm waves and dune or bluff erosion.

Some of the methods used by property owners to stop, or slow down, coastal erosion or shoreline change can actually exacerbate the problem. Attempting to halt the natural process of erosion with seawalls and other hard structures typically worsens the erosion in front of the structure, prevents any sediment behind the structure from supplying down drift properties with sediment and subjects down drift beaches to increased erosion. Without the sediment transport associated with erosion, some of the Commonwealth's and Winthrop's greatest assets and attractions – beaches, dunes, barrier beaches, salt marshes, and estuaries are threatened and could be slowly diminished as the sediment sources that feed and sustain them are eliminated.

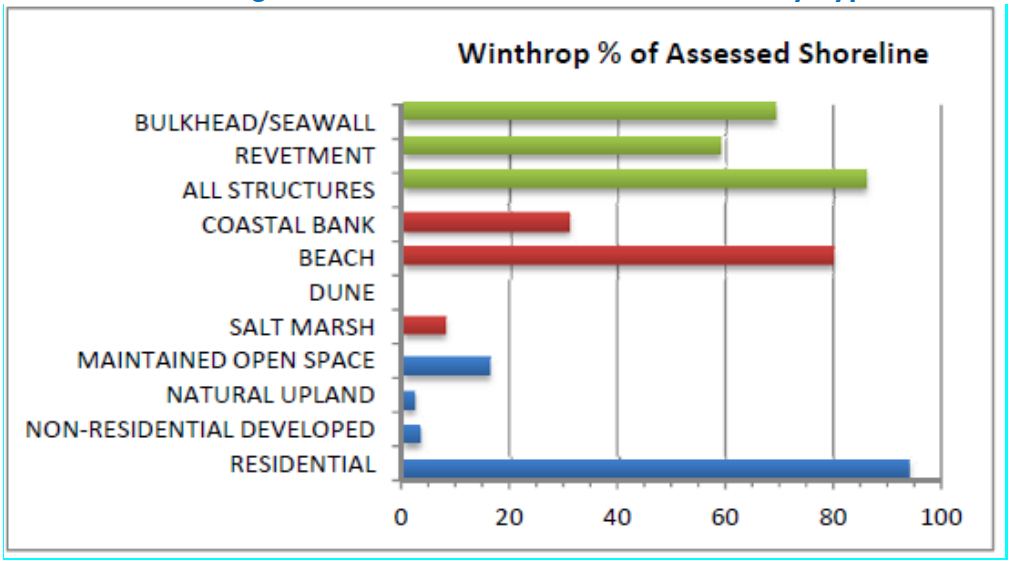
Extent and Previous Occurrences

The Massachusetts Coastal Erosion Commission published an assessment of coastal erosion in 2015. A shoreline characterization project was implemented to categorize the land uses and natural resources potentially at risk from coastal erosion. The results of the characterization provide a baseline from which to monitor and identify landscape-level trends and patterns for evaluating adaptation and hazard mitigation strategies for a particular location or region.

The Commission assessed the trends of coastal erosion by examining the results of the Massachusetts Shoreline Change Project and providing a summary assessment of past shoreline changes. Launched in 1989, the Shoreline Change Project analyzed data from historical and modern sources, mapping local high water line and developing shoreline change rates over both a long-term period (from the mid-1800s to 2009) and a short-term period (from 1970-2009) These data provide insight into the historical migration of the shoreline and erosional hot spots.

The results of the shoreline characterization were used to analyze shoreline change rates for Winthrop, including long-term and short-term erosion and accretion trends The analysis took into account various types of shoreline, which are displayed in Figure 18, showing the percent of each type.

Figure 18: Percent of Assessed Shoreline by Type



Source: Report of the Mass. Coastal Erosion Commission, 2015

The rates of shoreline erosion or accretion for Winthrop are shown in Table 16. The long-term accretion rate since the mid-1800's was 0.4 feet/year. The short-term accretion rate from 1970 to 2009 was the same.

Table 16: Average shoreline change and Uncertainty

Town	Town Sub-region	Short-Term Rate		Long-Term Rate	
		Mean (ft/yr)	Std Dev (ft/yr)	Mean (ft/yr)	Std Dev (ft/yr)
Winthrop		0.4	1.9	0.4	1.1

Source: Report of the Mass. Coastal Erosion Commission, 2015

Table 17 shows both long-term and short-term rates of change for three types of shoreline in Winthrop. The highest rate of accretion is associated with Beach, over long-term. The erosion rates for Bank ranged from -0.10 feet/year short-term to 0.15 feet/year In the long-term.

Table 17 Average shoreline change by shoreline type

Town	Shoreline Type	Long-Term Rate		Short-Term Rate	
		Mean (ft/yr)	Std Dev (ft/yr)	Mean (ft/yr)	Std Dev (ft/yr)
Winthrop	Beach	2.84	2.59	0.85	1.38
	Bank	-0.15	0.21	-0.10	0.25
	Structure	0.05	0.54	0.18	1.32

Source: Report of the Mass. Coastal Erosion Commission, 2015

CZM Coastal Erosion Viewer

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. The analysis for Winthrop shows somewhat different patterns of erosion from the long-term to the short-term records. see Figures 19A and 19B). This illustrates the effects of climate trends along some parts of the shoreline, as erosion rates in some areas have generally increased since the 19th and 20th centuries.

The CZM Coastal Erosion Viewer provides more detailed views of historic shoreline changes along a series of transects of the shoreline. A detailed transects for Winthrop is shown in Figure 20. The yellow transects indicate no statistical change while the red transects indicate net shoreline loss. This is the section of Winthrop's shoreline that has experienced the most significant change.

Coastal Erosion and Climate Change

As sea level continues to rise, coastal erosion will increase over time most likely with increasing frequency and severity. This represents a significant long-term hazard for the Town of Winthrop.

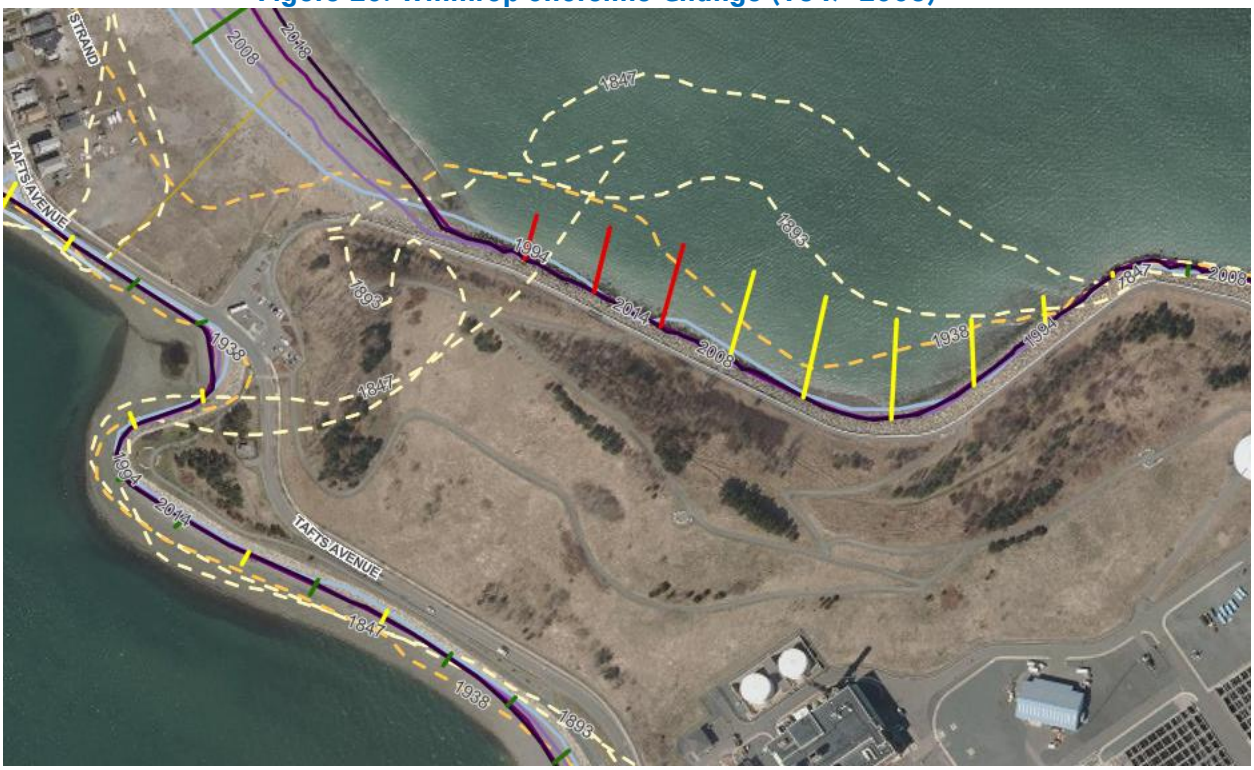
Figure 19A: Long-Term Coastal Erosion in Winthrop, 1840s-2018

Source : MA Coastal Zone Management, Coastal Erosion Viewer

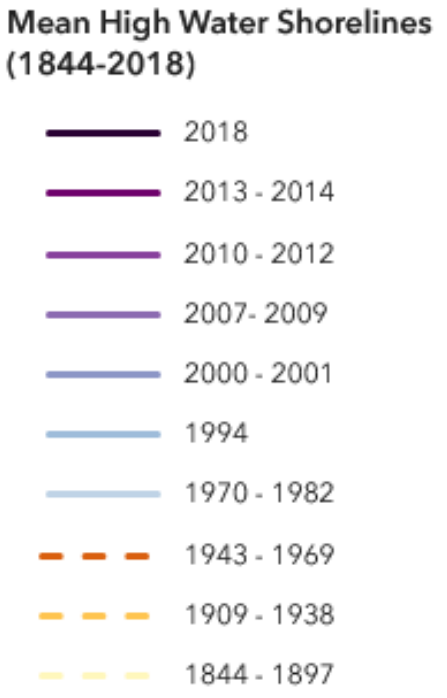
Figure 19B: Short-Term Coastal Erosion in Winthrop, 1970-2019

Source : MA Coastal Zone Management, Coastal Erosion Viewer

Figure 20: Winthrop Shoreline Change (1847-2008)



Source : MA Coastal Zone Management, Coastal Erosion Viewer



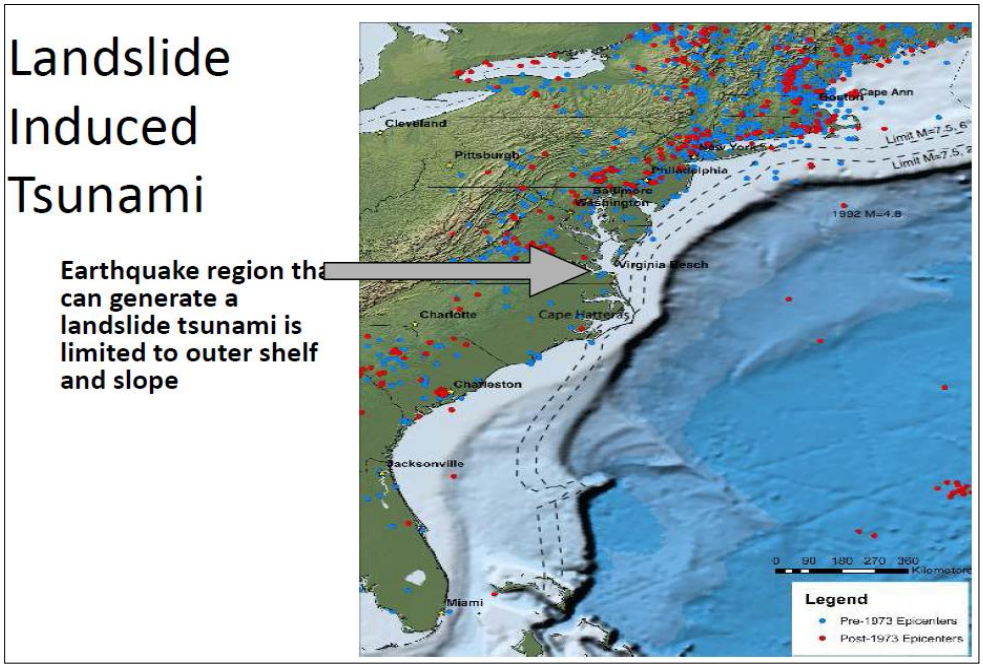
TSUNAMIS

A tsunami is a surge of ocean water typically caused by an offshore earthquake. FEMA defines tsunami as a series of large seismic sea waves created by an underwater disturbance caused by geologic activity such as earthquakes, volcanic eruptions, or underwater landslides. The severity of a tsunami is related to its wave height at the shore, and the extent of runup. Tsunami wave action over the shore is variable and mainly dependent of the combination of both submarine and land topography and the orientation of the arriving waves. The extent of damage and impact from tsunami depends upon the source and severity of onset on the tide cycle. Coastal areas that are potentially at greater risk are less than 25 feet above sea level and within a mile of the shoreline. As such, Winthrop would be considered vulnerable to coastal inundation from tsunami. While all of the coast of Massachusetts could potentially be subject to a tsunami, Massachusetts has never experienced a significant tsunami.

Probability of Future Occurrence

According to the West Coast and Alaska Tsunami Warning Center, an Atlantic based tsunami threat level for the US Atlantic coast is low when compared to the Pacific and Caribbean coasts. Geophysics specialists from the U.S. Geologic Survey and the Woods Hole Oceanographic Institute have researched the Georges Bank Lower Slope of the North Atlantic Ocean and the relationship between submarine landslides and earthquakes (see Figure 21).

Figure 21 - Atlantic Based Tsunami- Potential Threat



The most likely source would be a landslide that happens underwater about 215 miles offshore in an area known as the Continental Slope. The US Geologic Survey has researched the probability of a landslide on the Continental Shelf, and the likelihood that a tsunami will hit the Atlantic coast

is considered to be fairly low. Based on the record of previous occurrences, Tsunami in Winthrop is a Very Low frequency event as defined by the Resilient MA Plan

Tsunamis and Climate Change

Unlike most other coastal hazards, Tsunamis are events driven by geological processes, principally earthquakes and undersea landslides, which are not likely to be related to climate change. However. according to the Resilient MA Plan, collapse of glaciers resulting from a warming climate could cause landslides that could generate tsunamis more powerful than those caused by earthquakes.

DAM HAZARDS

Dam failure can occur as a result of structural failure, independent of a hazard event, or as the result of the impacts of a hazard event such as flooding associated with storms or an earthquake. 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 area in the path of the dam's floodwaters.

Dam failure is a highly infrequent occurrence, but a severe incident could result in loss of lives and significant property damage. Since 1984, three dams have failed in or very near to Massachusetts, one of which resulted in a death.

There are no publicly or privately owned dams in Winthrop listed by the Department of Conservation Dam Safety Office.

HURRICANES AND TROPICAL STORMS

Wind-related hazards include hurricanes, tropical storms, and tornadoes as well as high winds during Nor'easters and thunderstorms. Information on wind related hazards can be found on Map 5 in Appendix A, which indicates that the 100-year wind speed in Winthrop is 110 miles per hour.

Hurricanes begin as tropical storms over the warm moist waters of the Atlantic, off the coast of West Africa near the equator. As the moisture evaporates, it rises until enormous amounts of heated, moist air are twisted high in the atmosphere. The winds begin to circle counterclockwise north of the equator or clockwise south of the equator. The center of the hurricane is called the eye.

Tropical cyclones (Tropical Depressions, Tropical Storms, and Hurricanes) form over the warm, moist waters of the Atlantic, Caribbean, and Gulf of Mexico. When water temperatures are at least 80° F, hurricanes can grow and thrive, generating enormous amounts of energy, which is released in the form of numerous thunderstorms, flooding rainfall, and, very damaging winds.

The damaging winds help create a dangerous storm surge (rise in the water above the normal astronomical tide).

A Tropical Depression is declared when there is a low pressure center in the tropics with sustained winds of 25-33 mph. A Tropical Storm, which is given a name, is defined as having sustained winds from 34-73 mph. If sustained winds reach 74 mph or greater, it becomes a Hurricane.

Hurricanes can range from compact storms only 50 miles across, to huge storms, as much as 500 miles wide -- Hurricane Allen in 1980 took up the entire Gulf of Mexico. There generally are two source regions for the storms that have the potential to strike New England: 1) off the Cape Verde Islands near the west coast of Africa and 2) in the Bahamas. The Cape Verde storms tend to be very large in diameter, since they have a week or more to traverse the Atlantic Ocean and grow. Bahamas' storms tend to be smaller, but they can also be just as powerful and their effects can reach New England in only a day or two.

A hurricane is strongest as it travels over the ocean and is particularly destructive to coastal property as the storm hits the land. The Town's entire area is vulnerable to hurricanes. Hurricanes occur between June and November.

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:

Scale No. (Ca	Winds(mph) S	Surge (ft)	Potential Damage
1	74 – 95	4 - 5	Minimal
2	96 – 110	6 - 8	Moderate
3	111 – 13	9 - 12	Extensive
4	131 – 15	13 - 18	Extreme
5	> 155	>18	Catastrophic

Source: NOAA

Previous Occurrences

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. A hurricane or storm track is the line that delineates the path of the eye of a hurricane or tropical storm.

A hurricane or tropical storm track is the line that delineates the path of the eye of the hurricane or storm. As shown in Map 5 in Appendix A, no hurricanes or tropical storms have tracked directly over Winthrop, but several passed very close to the town, one in 1902, and two more in 1923. However, hurricanes have regional impacts, and Winthrop experiences the impacts of hurricanes and tropical storms regardless of whether the storm track passes directly through the Town. Storms that track west of the town result in stronger winds, while those that pass to the east may bring

more rainfall. Numerous hurricanes have affected the communities of eastern Massachusetts over the last century(see Table 18).

Table 18 Hurricane Records for Massachusetts, 1908 - 2025

Hurricane Event	Date
Hurricane of 1908	May 24-31, 1908
Hurricane of 1915	July 31, 1915
Hurricane of 1916	July 10-22, 1916
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 Bertha	July 5 - 17, 1996
Hurricane Hanna	August 28, 2008
Hurricane Earl	September 4, 2010
Tropical Storm Irene	August 28, 2011
Hurricane Sandy	October 29-30, 2012

Source: National Oceanic and Atmospheric Administration

The two most recent hurricanes, Irene from August 21–30, 2011and Sandy from October 22–31, 2012 fortunately did not track directly over Winthrop). Hurricane Sandy was a Category 3 hurricane at its peak intensity and weakened to a Category 2 off the northeastern Atlantic coast. Hurricane Sandy became the largest Atlantic hurricane on record with winds spanning 1,100 miles. Strong tropical force winds from the northeast quadrant of the post tropical cyclone, Sandy developed into a super storm nor'easter that impacted Winthrop and Suffolk County (Figure 22). Winthrop closed the tidal gate on Winthrop Shore Drive at 7 A.M. on the morning of Sandy's arrival.

News reports for Hurricane Sandy indicated key findings, as reported by the *Winthrop Transcript* on November 1, 2012: "(Fire Chief) Flanagan said there was some personal property damage such as electrical services being dismantled from homes and four boats breaking loose in the harbor. The chief also reported that at the peak of the storm 2,100 customers were without electrical power.

The Winthrop Fire Department staged fire apparatus and ambulances on Point Shirley during periods of high tides. Shirley Street at Tewksbury Street became impassable for a period of a few hours during Monday morning's high tide. The chief also said that two telephone poles went down on Putnam Street while another pole broke off at the base on Veterans Road. At 10 a.m. on Monday, Flanagan had the Medical Reserve Corps (MRC) open a shelter at the Cummings School in case of tidal concerns."

Figure 22: Winthrop Shore Drive, October 28, 2012, Hurricane Sandy

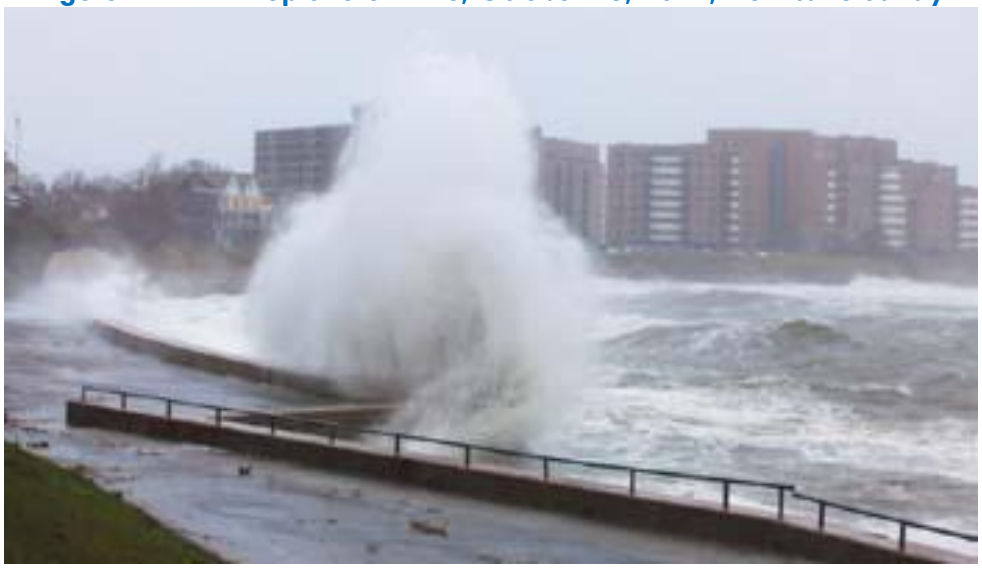


Photo: courtesy of *Winthrop Transcript*

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 Winthrop. Potential hurricane damages to Winthrop have been estimated using HAZUS-MH. Total damages are estimated at $7.2 million for a100-year frequency hurricane and $30.9 million for a 500-year frequency hurricane. Other potential impacts such as debris and evacuation needs are detailed in Table xx.

Probability of Future Occurrence

Based on records of previous occurrences, hurricanes in Winthrop are a medium frequency event as defined by the Resilient MA Plan. This hazard occurs from once in 5 years to once in 50 years, or a 2% to 20% chance per year.

Hurricanes and Climate Change

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

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 Fujita Tornado Scale, in which wind speed is not measured directly but rather estimated from the amount of damage. As of February 01, 2007, the National Weather Service began rating tornados using the Enhanced Fujita-scale (EF-scale). It is considerably more complicated than the original F-scale, and it allows surveyors to create more precise assessments of tornado severity. The EF-scale is summarized in Table 19.

Table 19: 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.	

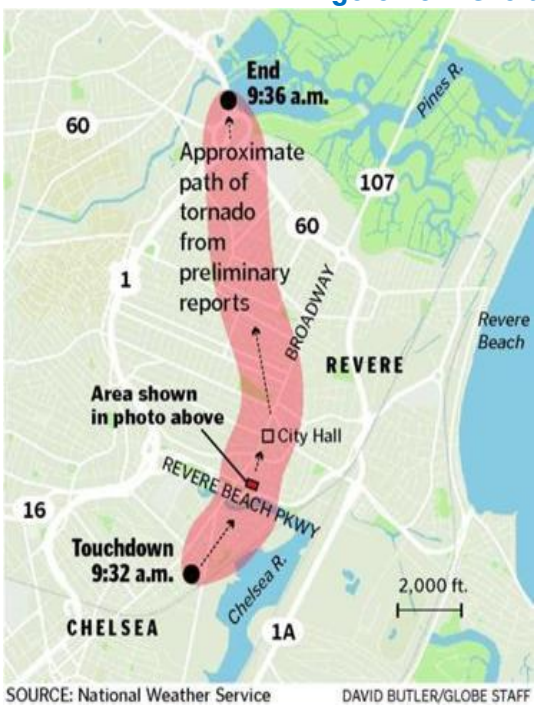
Source: SHMCAP 2018

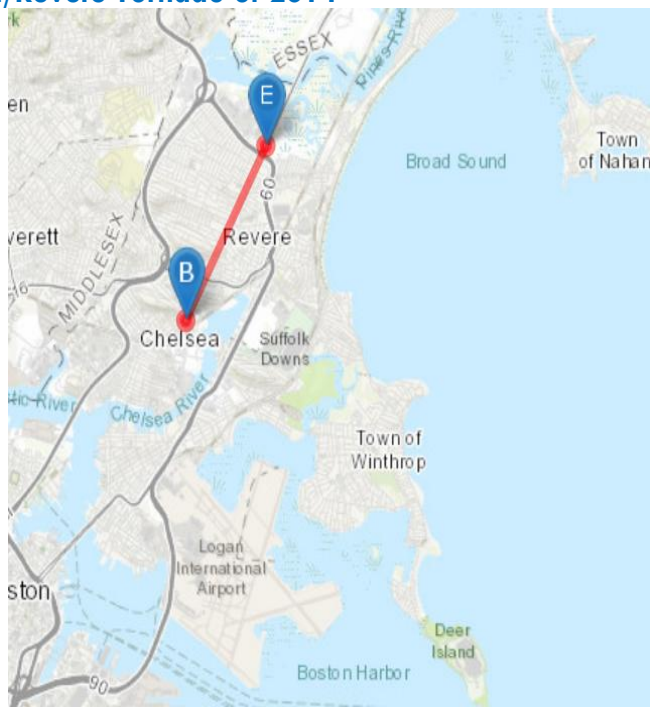
The frequency of tornadoes in eastern Massachusetts is relatively low; on average, there are six tornadoes that touchdown somewhere in the Northeast region every year. The strongest tornado in Massachusetts history was the Worcester Tornado in 1953 (NESEC).

The most recent significant tornado event in Massachusetts was in Springfield in 2011. This tornado caused significant damage and resulted in 4 deaths in June of 2011. Although there have been no recorded tornadoes within the Town of Winthrop, a tornado struck nearby Chelsea and Revere in 2014. The tornado touched down in Chelsea just south of Route 16 and 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. Figure 23 shows the tornado's track in Chelea and Revere and illustrates its proximity to Winthrop. This is the only tornado recorded for Suffolk County from 1950 to 2025.

This tornado resulted in $4 million in damage, two injuries, and no fatalities, as summarized in Table 20. Most of the damage was rated EF-1, but EF-2 rated damage did occur near Revere Beach Parkway. Windows were blown out of Revere City Hall and the roof was damaged. Sixty-four structures sustained damage that ranged from siding torn off to roofs lifted or blown off. Thirteen of these structures were deemed uninhabitable.. Trees fell on cars, a few of these crushed. Revere High School also sustained damage. Police reported a car that had been overturned at the intersection of Revere Street and Carleton Avenue. Near the rotary at Route 60 and Broadway, a billboard was blown onto several cars. The city set up a shelter at a local school for displaced residents. National Grid reported that 3,000 homes were without power.

Figure 23 – Chelsea/Revere Tornado of 2014





Source: National Centers for Environmental Information

Table 20 - Tornado Records for Suffolk County

Date	Fujita	Fatalities	Injuries	Damage
70/28/2014	EF2	0	2	$4,000,000

Source: National Centers for Environmental Information

Buildings constructed prior to current building codes may be somewhat 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, which in Winthrop could be a significant hazard since there are only two routes connecting the Town to the mainland. Power outages are also typically associated with tornadoes.

Although tornadoes are a potential Town-wide hazard in Winthrop, tornado impacts are relatively localized compared to severe storms and hurricanes, as the Rever tornado illustrates. Damages from any tornado in Winthrop would greatly depend on the track of the tornado. Generally, the more densely developed areas in the northern part of town could sustain more building damage in the event of a tornado in Winthrop.

Probability of Future Occurrence

Based on the record of previous occurrences since 1950, Tornado events in Winthrop are a Low frequency event as defined by the Resilient MA Plan. This hazard is likely to occur at least once by the end of the century.

Tornadoes and Climate Change

According to the Resilient MA Plan, it is possible that severe thunderstorms which can include tornadoes may increase in frequency and intensity. However, scientists have less confidence in the models that seek to project future changes in tornado activity. The Massachusetts 2022 Climate Change Assessment does not include information related to tornadoes.

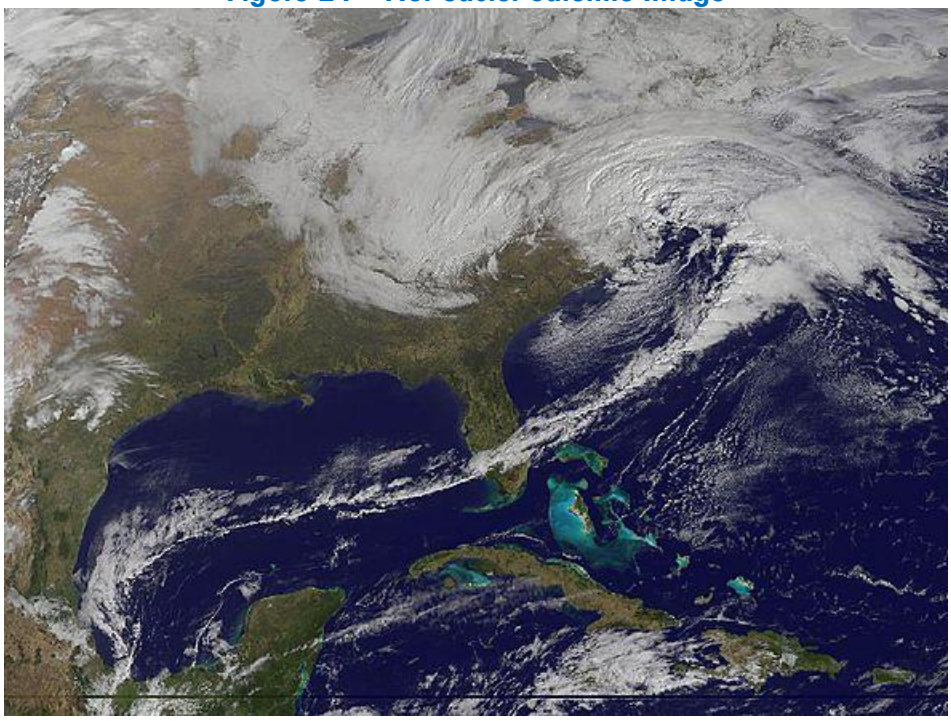
SEVERE WINTER STORMS (NOR'EASTERS / BLIZZARDS)

Winter storms, including nor'easters, 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 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 strongest among these are typically nor'easters.

NOR'EASTERS

A northeast coastal 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 20 to 40 mph with gusts of up to 70 mph (Figure 24). These storms are accompanied by heavy rains or snows, depending on temperatures.

Figure 24 – Nor'easter Satellite Image



Source: The Geostationary Operational Environmental Satellite Program (GOES), A joint effort of NASA and NOAA..

The Dolan-Davis classification system for Nor'easters was developed to complement the Saffir-Simpson scale used for hurricanes. The scale is based on mean wave height caused by the Nor'easter – different from the Saffir-Simpson classification of hurricanes based on wind speed. The scale was developed using data from 1,347 Nor'easters over a forty-year time frame. Robert Dolan and Robert Davis developed the scale to classify Nor'easters from Class I through Class V. Table 21 below summarizes each class of storm.

Table 21. Dolan-Davis Classification System for Nor'easters

Storm Class	***Mean Wave Heig***	***Beach Erosion***	***Property Damage***
Class I (weak)	2.0	Minor	None
Class II (moderate)	2.5	Moderate	None
Class III (significant)	3.2	Extends across beac	Moderate
Class IV (severe)	5.0	Severe with recessio	Loss of structures at com scale
Class V (extreme)	6.8	Extreme	Extensive regional scale lo millions of dollars

Landsea, C. (2009, February 6). FAQ: Hurricanes, Typhoons, and Tropical Cyclones and Williams, J. (2005, May 17). Hurricane scale invented to communicate storm danger.

Previous occurrences of nor'easters include the storm events included in Table 22. 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, large nor'easters in 2015 and 2018 caused significant damage across the coast.

Table 22: Nor'easter Events for Massachusetts, 1978 - 2024

Date	Nor'easter Event
February 1978	Blizzard of 1978
October 1991	Severe Coastal Storm ("Perfect Storm")
December 1992	Great Nor'easter of 1992
January 2005	Blizzard/Nor'easter
October 2005	Coastal Storm/Nor'easter
April 2007	Severe Storms, Inland & Coastal Flooding/Nor'easter
January 2011	Winter Storm/Nor'easter
October 2011	Severe Storm/Nor'easter
February 2013	Blizzard of 2013
January 2015	Blizzard of 2015
March 2015	March 2015 Nor'easters
January 2018	January 2018
March 2018	March 2018

Winthrop is vulnerable to both the wind and precipitation that accompanies 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 streets as well as localized flooding of residential and business structures. Fallen tree limbs as well as heavy snow accumulation and intense rainfall can impede local transportation corridors, and block access for emergency vehicles. Due to its location on the coast, the entire Town is at risk from the wind, rain or snow impacts from a nor'easter, depending on the track and radius of the storm.

Based on the record of previous occurrences, nor'easters in Winthrop are high frequency events as defined by the Resilient MA Plan. This hazard is almost certain to occur at least once a year.

BLIZZARDS & HEAVY SNOW

Winter storms are a combination hazard because they often involve wind, ice, and heavy snow fall. The National Weather Service defines "heavy snow fall" as an event generating at least four inches of snowfall within a 12-hour period (NOAA, 2009). Blizzards and winter storms are often associated with a nor'easter event (see nor'easters section above).

A blizzard is a winter snowstorm 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 conditions 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 storm, 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 shown in Table 23.

Table 23: 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: 2018 SHMCAP

The best available local data on past occurrences and impacts of winter storm events are reported for Suffolk County by the National Centers for Environmental Information (NCEI). From 2010 through 2024, Suffolk County experienced 51 winter storm events, including three blizzards, resulting in one injury, no deaths, and $703,100 in property damage, as shown in Table 24.

Table 24: Winter Storms, Heavy Snow and Blizzards in Suffolk County, 2010 - 2024

Date	Event	Death	Injurie	Property Damag
12/26/201	Winter Storm	0	0	0
1/12/201	Winter Storm	0	0	50000
1/21/201	Winter Storm	0	0	0
1/26/201	Heavy Snow	0	0	0
2/1/2011	Winter Storm	0	0	432000
1/21/201	Winter Storm	0	0	0
2/8/2013	Heavy Snow	0	0	0
2/8/2013	Blizzard	0	0	0
2/17/201	Winter Storm	0	0	0
3/7/2013	Heavy Snow	0	0	0
3/18/201	Heavy Snow	0	0	0
12/17/201	Heavy Snow	0	0	0
1/2/2014	Heavy Snow	0	0	0
2/5/2014	Heavy Snow	0	0	0
1/24/201	Heavy Snow	0	0	0
1/26/201	Blizzard	0	0	0
2/2/2015	Heavy Snow	0	0	0
2/8/2015	Heavy Snow	0	0	0
2/14/201	Heavy Snow	0	0	0

1/23/201	Heavy Snow	0	0	0
2/5/2016	Heavy Snow	0	0	10000
2/8/2016	Heavy Snow	0	0	0
3/21/201	Winter Storm	0	0	0
4/4/2016	Winter Storm	0	0	0
12/17/201	Winter Storm	0	0	0
1/7/2017	Winter Storm	0	0	0
2/8/2017	Winter Storm	0	0	150000
2/9/2017	Winter Storm	0	0	0
3/14/201	Heavy Snow	0	0	0
12/9/201	Winter Storm	0	0	0
12/22/201	Winter Storm	0	1	5000
12/25/201	Winter Storm	0	0	2000
1/4/2018	Winter Storm	0	0	0
2/7/2018	Winter Storm	0	0	40000
2/17/201	Winter Storm	0	0	0
3/7/2018	Winter Storm	0	0	0
3/13/201	Blizzard	0	0	10000
1/19/201	Winter Storm	0	0	0
2/18/201	Winter Storm	0	0	0
3/3/2019	Winter Storm	0	0	0
10/30/202	Winter Storm	0	0	2000
12/16/202	Heavy Snow	0	0	0
2/7/2021	Heavy Snow	0	0	0
1/7/2022	Heavy Snow	0	0	0
1/28/2022	Heavy Snow	0	0	500
2/25/2022	Heavy Snow	0	0	0
1/20/2023	Heavy Snow	0	0	0
1/23/2023	Heavy Snow	0	0	600
2/23/2023	Heavy Snow	0	0	0
3/3/2023	Heavy Snow	0	0	0
3/14/2023	Heavy Snow	0	0	1000
TOTAL		**0**	**1**	**$703,100**

Source: NOAA, National Centers for Environmental Information

Another indication of previous severe winter events is the list of Presidentially declared disasters for blizzards and snowstorms. There have been 14 in Massachusetts since 1978, as shown in Table 25. The most significant single winter storm was the "Blizzard of 1978," which resulted in over three feet of snowfall and multiple day closures of roadways, businesses, and schools. The record snowfall of January 2015 resulted from a series of storms over that month. The most recent significant winter event was Winter Storm Kenan (January 29, 2022), which resulted in 30.9" of snow in Massachusetts (Stucker, 2022).

Table 25: Winter-Related Federal Disaster Declarations, 1978-2023

Disaster Name	Date of Event
Coastal Storms, Flood, Ice & Snow	February 1978
Winter Coastal Storm	December 199
Blizzard	March 1993
Blizzard	January 1996
Snowstorm	March 2001
Snowstorm	February 2003
Snowstorm	December 200
Snowstorm	January 2005
Severe Winter Storm, Snowstorm	January 2011
Severe Winter Storm, Snowstorm, Flooding	February 2013
Severe winter storm, snowstorm, flooding	January 2015
Severe winter storm and Snowstorm	March 2018
Severe winter storm and flooding	March 2018
Severe winter storm and snowstorm	January 2022

Sources: OpenFEMA Dataset: Disaster Declarations and FEMA Declared Disasters

Winter storms are a community-wide hazard in Winthrop. Map 6 in Appendix A illustrates the average annual average snowfall in Winthrop, which is between 48 to 72 inches.

The majority of blizzards and ice storms in the region cause more inconvenience than 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.

A number of public safety issues can arise during snowstorms. Impassible streets are a challenge for emergency vehicles and affect residents and employers. 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.

Managing snow removal can be an expensive and challenging task for a community like Winthrop. Narrow streets, lack of off-street parking options and limited areas to store plowed snow can hinder plowing and emergency vehicle access. The Winthrop DPW works to clear roads as requested by emergency service providers and carries on general snow removal operations.

Probability of Future Occurrences

Blizzards are considered high frequency events based on past occurrences, as defined by the Resilient MA Plan. This hazard is almost certain to occur at least once a year.

WINTER ICE STOMS

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. Ice storm conditions are defined by liquid rain falling and freezing on contact with cold objects, creating ice buildups of one-fourth of an inch or more. An ice storm warning, which is now included in the criteria for a winter storm warning, is issued when a half inch or more of accretion of freezing rain is expected.

Sleet and hail are other forms of frozen precipitation. Sleet occurs when raindrops fall into subfreezing air thick enough that the raindrops refreeze into ice before hitting the ground. The difference between sleet and hail is that sleet is a wintertime phenomenon whereas hail falls from convective clouds (usually thunderstorms), often during the warm spring and summer months (a description of hail is included in a subsequent report section). Another form of freezing precipitation is ice pellets, which occur when snowflakes melt into raindrops as they pass through a thin layer of warmer air. The raindrops then refreeze into particles of ice when they fall into a layer of sub-freezing air near the surface of the earth.

The extent of ice storms is measured by the Sperry-Piltz Ice Accumulation Index (SPIA®); see Table 23. The SPIA Index is to ice storms what the Enhanced Fujita Scale is to tornadoes, and what the Saffir–Simpson Scale is to hurricanes. The SPIA® Index, is a forward-looking, ice accumulation and ice damage prediction index that uses an algorithm based on three key parameters:

1) Storm total rainfall, converted to ice accumulation
2) Wind
3) Temperatures during the event period

These parameters, when used in conjunction with digital forecasts from local NWS Weather Forecast Offices (WFOs), have been shown to accurately predict the duration, intensity and damage capability of ice storms. The SPIA® Index predicts the projected footprint, total ice accumulation, and resulting potential damage from approaching ice storms. It is a tool to be used for risk management and/or winter weather preparedness Table 26).

The best available data on previous ice storm events are recorded for Suffolk County by NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. Suffolk County, which includes the Town of Winthrop, does not have any ice storms recorded since 2000. The Town's location in the milder coastal region makes it less vulnerable to ice storms than adjacent inland areas at higher elevations such as Middlesex County and central to western Massachusetts.

Table 26: Sperry-Piltz Ice Accumulation Index (SPIA®)

ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

Source: SPIA® Index, www.spia-index.com/

Should an ice storm occur in Winthrop, 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 causing power outages and blocking roadways. The impacts of winter storms may also include roof collapses and property damage and injuries related to the weight of snow and ice.

Probability of Future Occurrence

In Winthrop, ice storms are considered to be low frequency events based on past occurrences, as defined by the Resilient MA Plan. This hazard may occur once in 5 years to once in 50 years, with 2% to 20% chance of occurring each year.

Winter Weather and Climate Change

As with hurricanes, warmer ocean water and air will provide more fuel for winter storms. According to the 2018 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. There is also some indication that as winters warm, temperatures may be more likely to produce icing conditions. Massachusetts' 2022 Climate Change Assessment predicts more mild winters, increased precipitation in the winter months, and multiple freeze-thaw cycles every winter due to warming temperatures .

OTHER SEVERE WEATHER (THUNDERSTOMS / HAIL)

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, and 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 extent of damages from high winds is described by the Beaufort Wind Scale (Table 27), which was developed in 1805 by Sir Francis Beaufort of the U.K. Royal Navy.

Table 27 Beaufort Wind Scale

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	< 1	Calm	Sea surface smooth and mirror-lik	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind dire still wind vanes
2	4-6	Light Bree	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle begin to move
3	7-10	Gentle Bre	Large wavelets, crests begin to br scattered whitecaps	Leaves and small twigs constar moving, light flags extended
4	11-16	Moderate	Small waves 1-4 ft. becoming lon numerous whitecaps	Dust, leaves, and loose paper small tree branches move
5	17-21	Fresh Bree	Moderate waves 4-8 ft taking lor form, many whitecaps, some spra	Small trees in leaf begin to sw

6	22-27	Strong Bre	Larger waves 8-13 ft, whitecaps common, more spray	Larger tree branches moving, v in wires
7	28-33	Near Gale	Sea heaps up, waves 13-19 ft, w foam streaks off breakers	Whole trees moving, resistance walking against wind
8	34-40	Gale	Moderately high (18-25 ft) wave greater length, edges of crests be break into spindrift, foam blown i streaks	Twigs breaking off trees, gene impedes progress
9	41-47	Strong Ga	High waves (23-32 ft), sea begin dense streaks of foam, spray may reduce visibility	Slight structural damage occurs blows off roofs
10	48-55	Storm	Very high waves (29-41 ft) with overhanging crests, sea white with densely blown foam, heavy rolling lowered visibility	Seldom experienced on land, t broken or uprooted, "considera structural damage"
11	56-63	Violent Sto	Exceptionally high (37-52 ft) wav foam patches cover sea, visibility reduced	
12	64+	Hurricane	Air filled with foam, waves over 4 sea completely white with driving visibility greatly reduced	

Source: NOAA Storm Prediction Center

In the National Risk Index, a Lightning Risk Index score and rating represent a community's relative risk for Lightning when compared to the rest of the United States. A Lightning Expected Annual Loss score and rating represent a community's relative level of expected building and population loss each year due to Lightning when compared to the rest of the United States. Winthrop is in the Low to Relatively Low categories of Lightning Risk as shown in Figure 25.

The amount of rainfall expected for storms of various durations and recurrence intervals, from 5 minutes to 60 days, and from annual recurrence to 1,000 years, is provided by NOAA's Atlas 14. The Depth-Duration-Frequency curves are shown in Figure 26.

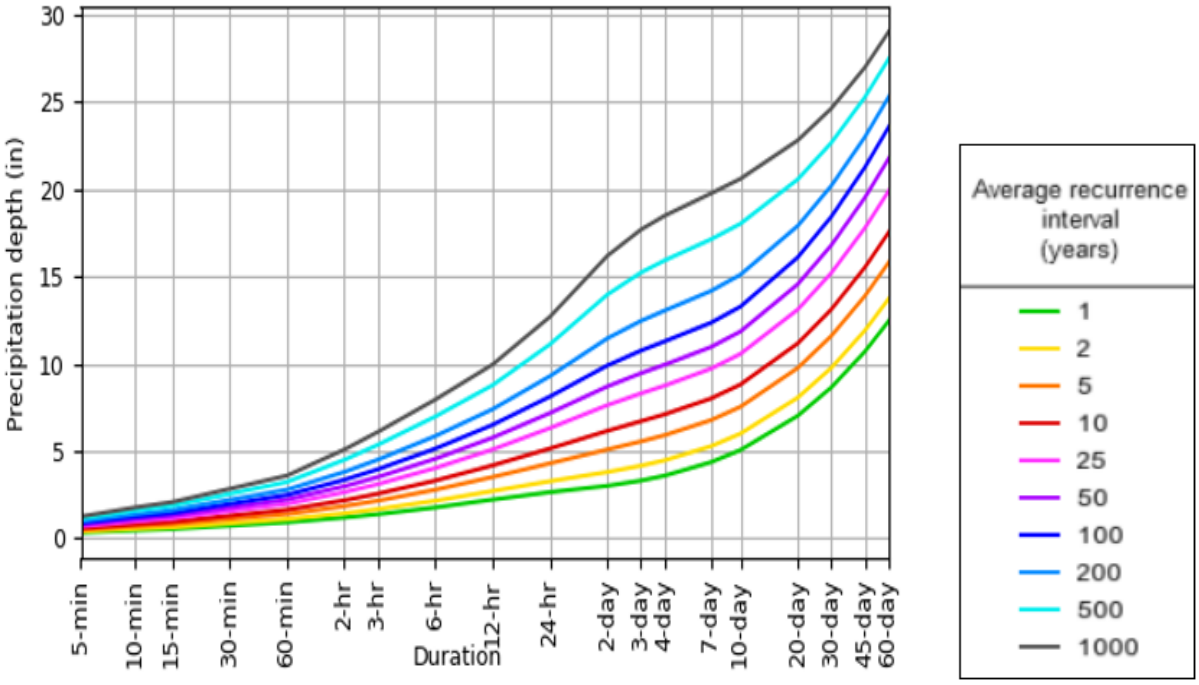
For example, the chart shows the range of expected precipitation for a 12-hour rainfall ranges from about 2 inches for annual storm and 10 inches for a storm of 100-year frequency.

The best available data on previous occurrences of thunderstorms in Winthrop are from the NOAA National Centers for Environmental Information (NCDC) for Suffolk County. Between the years 2010 and 2024 NCEI records show 34 thunderstorm events in Suffolk County (Table 28). These storms resulted in a total of $678,200 in property damages. There were no injuries or deaths.

Figure 25: National Risk Index for Lightning

Source: FEMA National Risk Index

Figure 26: Depth-Duration-Frequency Curve



Source: NOAA Atlas 14

Table 28: Suffolk County Thunderstorm Events, 2010 through 2024

Date	Max. Wind Speed (mph)	Deaths	Injuries	Property Damage
6/1/20	50	0	0	10000
6/3/20	50	0	0	500
6/6/20	50	0	0	14500
6/24/20	50	0	0	15000
6/1/20	50	0	0	20000
8/19/20	50	0	0	15000
6/8/20	50	0	0	30000
9/8/20	50	0	0	5000
7/3/20	50	0	0	15000
8/4/20	50	0	0	50000
2/25/20	60	0	0	20000
6/29/20	50	0	0	15000
7/18/20	50	0	0	70000
7/23/20	50	0	0	83000
6/27/20	50	0	0	1000
7/12/20	50	0	0	1000
8/2/20	50	0	0	1000
9/14/20	57	0	0	25000
7/17/20	45	0	0	1300
7/31/20	65	0	0	39500
8/7/20	50	0	0	300
5/15/20	50	0	0	3500
6/28/20	50	0	0	1800
7/23/20	50	0	0	800
10/7/20	57	0	0	0
6/29/20	50	0	0	500
6/30/20	50	0	0	1800
7/7/20	55	0	0	1000
7/27/20	61	0	0	86900
5/22/20	50	0	0	11800
8/7/202	50	0	0	0
7/25/20	50	0	0	0
7/27/20	50	0	0	5000
6/14/20	50	0	0	2500
TOTAL		**0**	**0**	**$678.20**

Source: NOAA, National Centers for Environmental Information
Magnitude refers to maximum wind speed in knots.

Severe thunderstorms are a Town-wide hazard for Winthrop. 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.

Probability of Future Occurrence

Based on the record of previous occurrences, severe thunderstorms in Winthrop are high frequency events as defined by the Resilient MA Plan. This hazard occurs more frequently than once in 5 years (greater than 20% per year).

Thunderstorms and Climate Change

As noted previously, the intensity of rainfall events has increased significantly, and those trends are expected to continue. Neither the SHMCAP, nor the 2022 Massachusetts Climate Change Assessment, specifically address whether climate will affect the intensity or frequency of thunderstorms.

HAIL

Hail and sleet are forms of frozen precipitation. Hail occurs when precipitation falls through subfreezing air thick enough that the raindrops freeze into ice before hitting the ground. While sleet is a wintertime phenomenon, hail falls from convective clouds (usually thunderstorms), often during the warm spring and summer months.

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, shown in Table 29.

Table 29: 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
Tea cup	3.00
Grapefruit	4.00
Softball	4.50

Source: NOAA

The best available local data for previous hailstorm events in Winthrop are for Suffolk County through the National Centers for Environmental Information. Suffolk County experienced five hail

events from 2010-2025 shown in Table 39. There were no injuries, deaths, or property damage reported for these hail events.

Table 30: Suffolk County Hail Events, 2010-2025

Date	Max. Wind Speed (mph)	Deaths	Injuries	Property Damage
5/8/201	1	0	0	0
6/5/201	0.75	0	0	0
8/19/20	0.75	0	0	0
8/19/20	1	0	0	0
6/8/201	0.75	0	0	0
7/18/20	1.25	0	0	0
7/18/20	0.75	0	0	0
6/17/20	0.75	0	0	0
8/4/201	1.5	0	0	0
8/4/201	2	0	0	0
7/23/20	0.75	0	0	0
6/13/20	0.75	0	0	0
6/28/20	0.75	0	0	0
8/23/20	0.75	0	0	0
TOTAL		**0**	**0**	**0**

s for Environmental Information
*Magnitude refers to diameter of hail stones in inches

Hail events are a potential town-wide hazard in Winthrop however the town has not reported any local damage associated with hail. Should a significant hail event occur, the most likely damage would be to vehicles, both town-owned and privately owned, windows, roofs, and other structures, as well as some utility facilities. Damage to vegetation could cause power outages, and damage to some buildings. People outdoors directly exposed to large hail could be at risk of injuries in a severe hail event. Should solar energy facilitates be sited in Winthrop in the future, they could be vulnerable to the impacts of hail.

Probability of Future Occurrences

Based on the record of previous occurrences, hail events in Winthrop are a Medium frequency event. This hazard may occur once in five years to once in 50 years, with a 2% to 20% chance of occurring each year.

WILDFIRE/BRUSHFIRE

A brush fire is an uncontrolled fire occurring in a forested, shrub, or grassland area. In the Boston Metro region these fires do not grow to the size of a wildfire as seen more typically in the western U.S. 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.

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.

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.

The National Wildfire Coordinating Group (NWCG) classifies the severity of wildfires based on their acreage as follows. Winthrop falls into Class B.

- Class A - one-fourth acre or less;
- Class B - more than one-fourth acre, but less than 10 acres;
- Class C - 10 acres or more, but less than 100 acres;
- Class D - 100 acres or more, but less than 300 acres;
- Class E - 300 acres or more, but less than 1,000 acres;
- Class F - 1,000 acres or more, but less than 5,000 acres;
- Class G - 5,000 acres or more (NWCG, 2023).

Wildfires can present a hazard where there is the potential for them to spread into developed or inhabited areas, particularly residential areas where sufficient fuel materials might exist to allow the fire to spread into homes. The Wildland Urban Interface (WUI) is the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. Urban and suburban development in or near wildland vegetation poses a threat of wildfire damages.

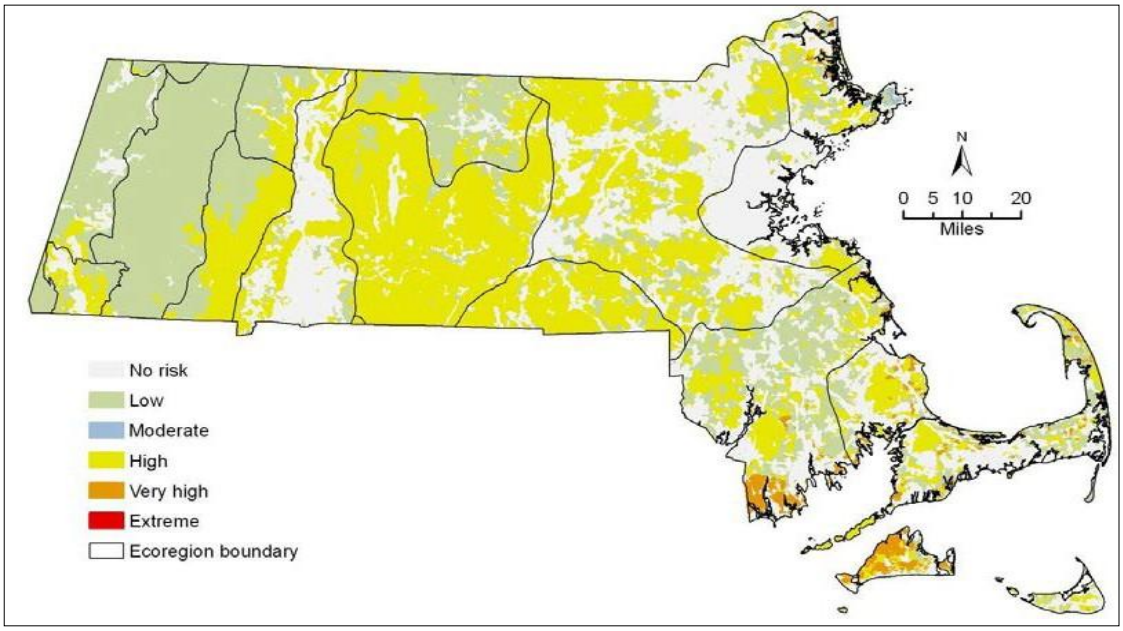
Potential Wildfire Hazard Areas

The Massachusetts State Hazard Mitigation and Climate Action Plan includes a map that depicts statewide fire risk incorporating three risk components: fuel, wildland-urban interface, and topography (Figure 27). The wildland-urban interface reflects communities where housing and vegetation intermingle, and fire can spread from structures to vegetated areas. Winthrop is in an area designated as “no risk” of risk on this map.

The Town of Winthrop averages less than five small grass and brush fires each year, with a loss of less than one acre per year due to wild fires. In many years the town does not even have any brush fires and in the years when they do, they are small and quickly contained.

Winthrop is almost completely built out and all new development consists of the redevelopment of existing properties, with no Wildland Urban Interface areas in the community. Outdoor burning is allowed from January to April with a permit from the Fire Department. The Town listed no specific areas of concern for fire-related hazards.

Figure 27: Wildfire Risk Areas in Massachusetts



Source: MA State Hazard Mitigation and Climate Action Plan, 2018

Although of low severity and frequency, wildfires would be considered a potential Town-wide hazard in Winthrop due to its small size and relatively high density of development, if a wildfire were to occur and not be contained.

Probability of Future Occurrence

There are no recorded wildfire events for Suffolk County in NOAA's NCEI database for the last 75 years. Based on a lack of past occurrences, wildfires are of very low frequency events in Winthrop, very unlikely, with minimal examples of historical occurrences.

Wildfires and Climate Change

As the climate warms, drought and warmer temperatures may increase the risk of wildfire as vegetation dries out and becomes more flammable. Increasing frequency of lightning and increasing damage to trees from pests, can also lead to greater fire risk. The 2022 Assessment cites anticipated forest health degradation from increasing wildfire frequency for the Eastern Inland Region, where Millis is located.

EARTHQUAKES

An earthquake is the vibration, sometimes violent, of the earth's surface that follows a release of energy in the earth's crust due to fault fracture and movement. A fault is a fracture in the earth's crust along which two blocks of the crust have slipped with respect to each other. Faults are divided into three main groups, depending on how they move.
Normal faults occur in response to pulling or tension: the overlying block moves down the inclined dip of the fault plane. Thrust (reverse) faults occur in response to squeezing or compression: the overlying block moves up the inclined dip of the fault plane. Strike-slip (lateral) faults occur in response to either type of stress; the blocks move horizontally along a vertical fault past one another. Most faulting along spreading zones is normal, along subduction zones is thrust, and along transform faults is strike-slip.

The cause of earthquakes in eastern North America is the forces moving the tectonic plates over the surface of the Earth. New England is located in the middle of the North American Plate. One edge of the North American plate is along the west coast where the plate is pushing against the Pacific Ocean plate. The eastern edge of the North American plate is at the middle of the Atlantic Ocean, where the plate is spreading away from the European and African plates. New England's earthquakes appear to be the result of the cracking of the crustal rocks due to compression as the North American plate is being slowly squeezed by the global plate movements.

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 in Table 31.

Table 31: 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 peopl
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 hund meters across.

Source: Nevada Seismological Library (NSL), 2005

According to the MA Hazard Mitigation Plan, New England experiences an average of five earthquakes per year. From 1668 to 2007, 355 earthquakes were recorded in Massachusetts (NESEC). 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, 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, and a 4.0 earthquake centered in Hollis, Maine in October 2012 was felt in the Boston area. Historical records of some of the more significant earthquakes in the region are shown in Table 32.

Table 32: 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
MA - Off Cape Cod	2/2/1766	NA
MA – Offshore	1/2/1785	5.4
MA - Wareham/Taunto	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

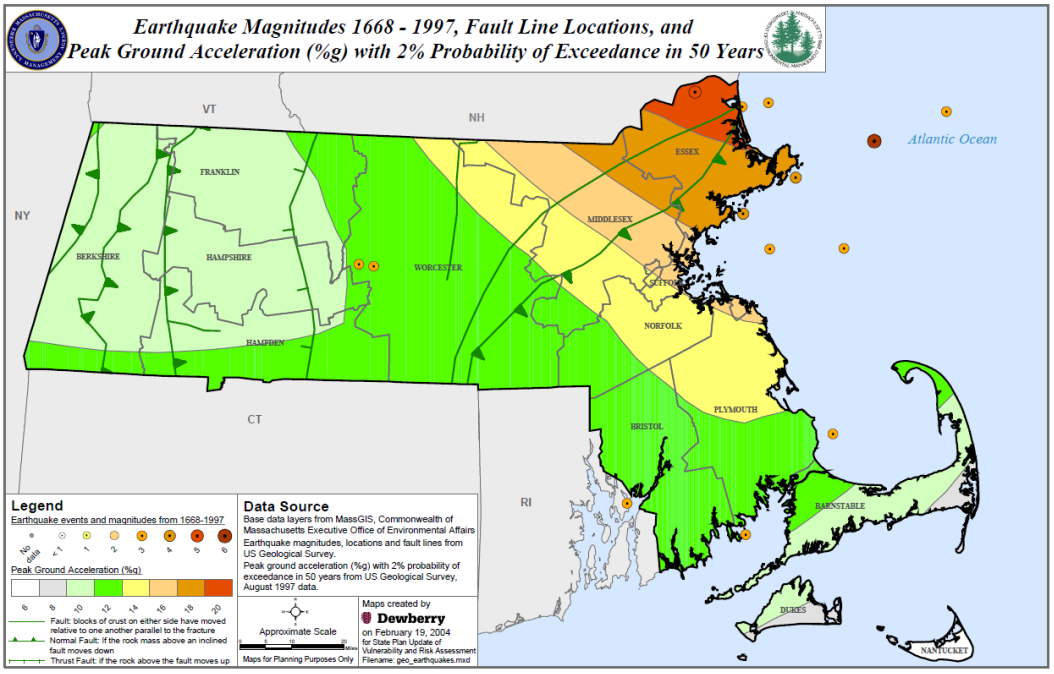
Winthrop experienced a small, 2.3 magnitude earthquake located 2 km from it on April 10, 2009. There was no data that indicated any impacts associated with this event. On October 16,

1963 an earthquake occurred in eastern Massachusetts of magnitude 6.3 that caused a window to crack in Winthrop. (USGS)

One measure of earthquake extent is ground motion, which is measured as maximum peak horizontal acceleration, expressed as a percentage of gravity (1 g). The range of peak ground acceleration in Massachusetts is from 10g to 20g, with a 2% probability of exceedance in 50 years, as shown in Figure 28. Winthrop is in the middle part of the range for Massachusetts making it a moderately low 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.

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. Most older buildings and infrastructure were constructed without specific earthquake resistant design features. Town officials noted it would be useful to map the Cape Ann fault to increase public awareness of that significant earthquakes have occurred in the North Shore area historically, that the Town could be subject to earthquake damage and that it should be included in capital facilities planning.

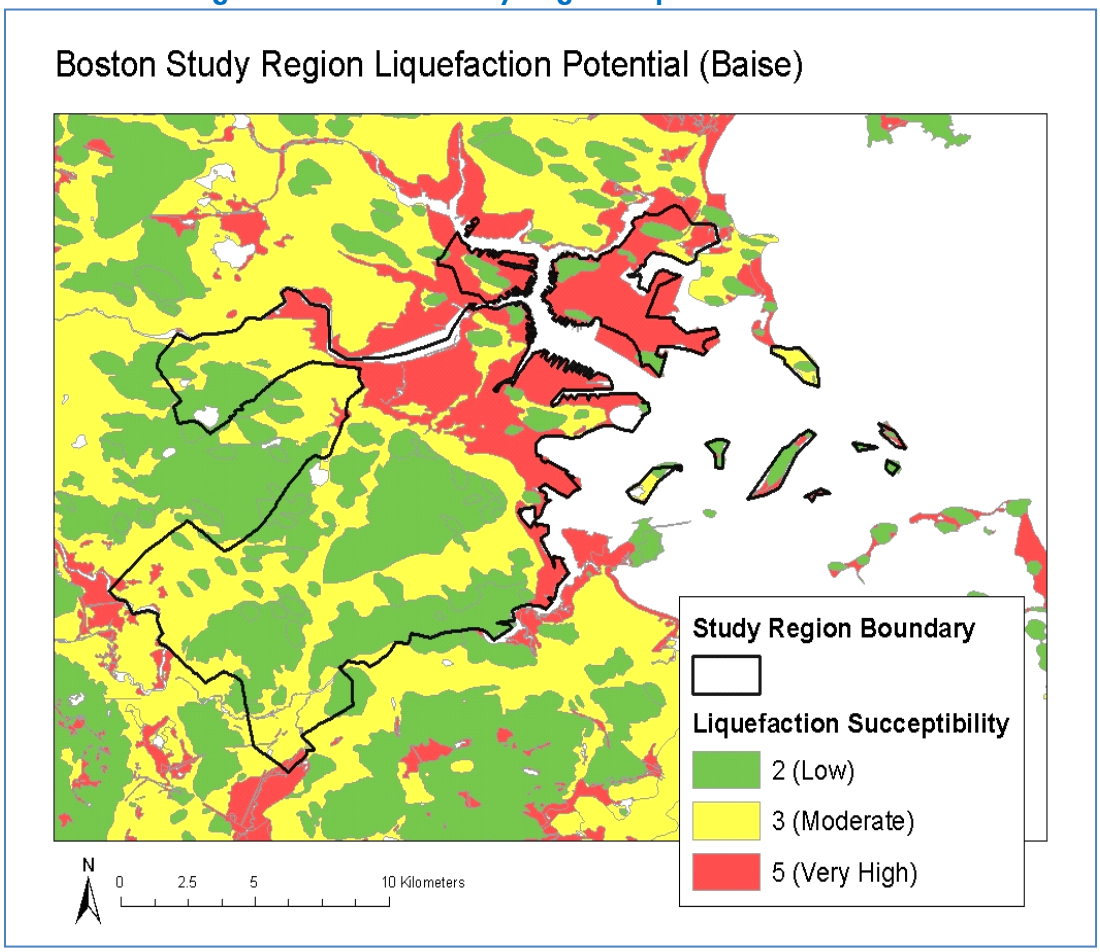
Figure 28: Massachusetts Earthquake Probability Map



Source: 2018 SHMCAP

Another factor related to earthquake hazards in the greater Boston area is the process of liquefaction, which can exacerbate the damage from an earthquake. Liquefaction may occur in areas of soft clays or filled land, which are found in the northern portion of Winthrop (Figure 29). During an earthquake event these soils may become unstable, effectively liquefying, destabilizing the buildings above and potentially leading to ruptured utilities, and other related impacts.

Figure 29 - Boston Study Region Liquefaction Potential



Source: Baise, Laurie G., Rebecca B. Higgins ; and Charles M. Brankman, Tufts University

Earthquakes are a hazard with multiple impacts beyond the obvious building collapse. Buildings may suffer structural damage which may or may not be readily apparent. Earthquakes can cause major damage to roadways, making emergency response difficult. Water lines and gas lines can break, causing flooding and fires. Another potential vulnerability is equipment within structures. For example, a hospital may be structurally engineered to withstand an earthquake, but if the equipment inside the building is not properly secured, the operations at the hospital could be severely impacted during an earthquake. Earthquakes can also trigger landslides.

Earthquakes are a potential Town-wide hazard in Winthrop. Although new construction under the current Massachusetts Building Code will be built to higher seismic standards, there are older structures in Winthrop that pre-date the most recent building code. Potential earthquake damages to Winthrop have been estimated using HAZUS-MH. Total building damages, including business interruption losses are estimated at $375 million for a 5.0 magnitude earthquake and $2.1 billion million for a 7.0 magnitude earthquake. Other potential impacts are detailed in Table 45. In addition, information on geologic hazards in Winthrop can be found on Map 4 in Appendix A.

Probability of Future Occurrence

There are several ways the probability of future occurrences of earthquakes has been estimated. According to the Boston College Weston Observatory, in most parts of New England there is a one in ten chance that a potentially damaging earthquake will occur in a 50-year time period. Earthquakes in Winthrop are a low frequency event as defined by the Resilient MA Plan. This hazard is likely to occur at least once by the end of the century; anticipated every 100 years.

LANDSLIDES

According to the USGS, "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; earthquakes create stresses that make weak slopes fail; and excess weight from accumulation of rain or snow, and stockpiling of rock or ore, from waste piles, or from man-made structures.

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. The lack of vegetation and root structure that stabilizes soil can destabilize hilly terrain.

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.

There is no universally accepted measure of landslide extent, but it has been represented as a measure of destructiveness. Table 33 summarizes the estimated intensity for a range of landslides. For a given landslide volume, fast moving rock falls have the highest intensity while slow moving landslides have the lowest intensity.

Table 33: Landslide Volume and Velocity

Estimated Volume	Expected Landslide Velocity		
(m^3)	Fast moving landslide (Re	Rapid moving landslide (Debris f	Slow moving landslide (Sl
<0.001	Slight intensity		
<0.5	Medium intensity		
>0.5	High intensity		
<500	High intensity	Slight intensity	
500-10,000	High intensity	Medium intensity	Slight intensity
10,000 – 50,000	Very high intensity	High intensity	Medium intensity
>500,000		Very high intensity	High intensity
>>500,000			Very high intensity

A Geomorphological Approach to the Estimation of Landslide Hazards and Risks in Umbria, Central Italy, M. Cardinali et al, 2002

The SHMCAP utilized data from the MA Department of Transportation from 1986 to 2006 to estimate that, on average, roughly one to three known landslides have occurred each year in the state. 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.

The entire Town has been classified as having a low incidence risk for landslides, less than 1.5 % of the area is involved in land sliding. (Map 4, Appendix A). The best available data on previous incidences of landslides in Winthrop is for Suffolk County through NOAA's National Center For Environmental Information. For the 75 years from 1950 to 2025, no landslides were recorded for Suffolk County. According to the Town, no acreage in Winthrop has historically been lost to landslides, and there is no record of any damage caused by landslides.

Should a landslide occur in the future, the type and degree of impacts would be highly localized, and 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 Winthrop.

Potential damages would depend on how many properties were affected. Given the relatively high assessed value of property in Winthrop, damages affecting a single residence could exceed $500,000, and damages affecting several homes or business properties could theoretically exceed several million dollars. However, there are no records of such landslide damages in Winthrop.

Probability of Future Occurrences

Although the Resilient MA Plan classifies landslides as high likelihood events statewide, based on past occurrences and topographic conditions in Winthrop, landslides are very low frequency events in the town. This hazard is very unlikely to occur and there are minimal examples of historical occurrences.

Climate Change and Landslides

Changes in precipitation may increase the chance of landslides, as extreme rain events could result in more frequent saturated soils which are conducive to landslides. Drought may also increase the likelihood of landslides if loss of vegetation decreases soil stability.

EXTREME TEMPERATURE HAZARDS

AVERAGE AND EXTREME TEMPERATURES

Extreme temperatures occur when either high temperature 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 prolonged period of excessively hot or cold weather. Winthrop 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 which are far outside of the normal seasonal ranges for Massachusetts. The average seasonal temperatures for Massachusetts are: Winter (Dec-Feb) Average = 31.8°F and Summer (Jun-Aug) Average = 71°F. The lowest recorded temperature was -19°F in 1934. The highest recorded temperature for Winthrop was 104°F in 1911, and the lowest recorded temperature was -19°F in 1934. Extreme temperatures are a town-wide hazard in Winthrop.

EXTREME HEAT

While a heat wave for Massachusetts is defined as three or more consecutive days above 90°F, another measure used for identifying extreme heat events is through a Heat Advisory from the NWS. These advisories are issued when the heat index (Figure 30) is forecast to exceed 100-degree Fahrenheit (F) for 2 or more hours; an excessive heat advisory is issued if forecast predicts the temperature to rise above105 degree F.

Figure 30 Heat Index Chart

Relative Humidity (%) \ Temperature (°F)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
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.

Source: National Weather Service

The best available data on past occurrences of extreme heat events is from NOAA's National Centers for Environmental Information (NCEI) for Suffolk County, which includes Winthrop. The NCEI records indicate that since 2010, there have been six excessive heat events recorded, with no reported death, no injuries, and no property damage (Table 34). The hottest single day temperature recorded in Eastern Massachusetts by the National Weather Service's Norton/Boston regional office was 104 degrees (F) on July 4, 1911.

Table 34: Suffolk County Extreme Heat Occurrences 2000 - 2025

Date	Deat	Injuri	Damag
12/17/2000	0	0	0
5/3/2001	0	0	0
5/4/2001	0	0	0
5/12/2001	0	0	0
7/22/2011	0	0	0
7/3/2018	0	0	0

Source: NOAA, National Centers for Environmental Information

Extreme heat poses a potentially greater risk to the elderly, children, and people with certain medical conditions. However, even young and healthy individuals can succumb to heat if they participate in strenuous physical activities during hot weather. Older adults are often at elevated risk due to a high prevalence of pre-existing and chronic conditions; in Winthrop, approximately 20.2% of the population is over age 65. People who live in older housing stock and in housing without air conditioning have increased vulnerability to heat-related illnesses. Areas with less shade and darker 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 9 in Appendix A 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. There are three "hot spot" areas in Winthrop, the largest in the Winthrop Center area, as shown on Map 9.

Hot summer days can worsen air pollution. With increased extreme heat, urban areas are likely to experience more days that fail to meet air quality standards. Power failures are more likely to occur during heat waves, affecting the ability of residents to remain cool. Individuals with pre-existing conditions and those who require electric medical equipment may be at increased risk during a power outage. Key health risks of extreme heat are summarized in Figure 31.

Figure 31 Health Risks Associated with Extreme Heat

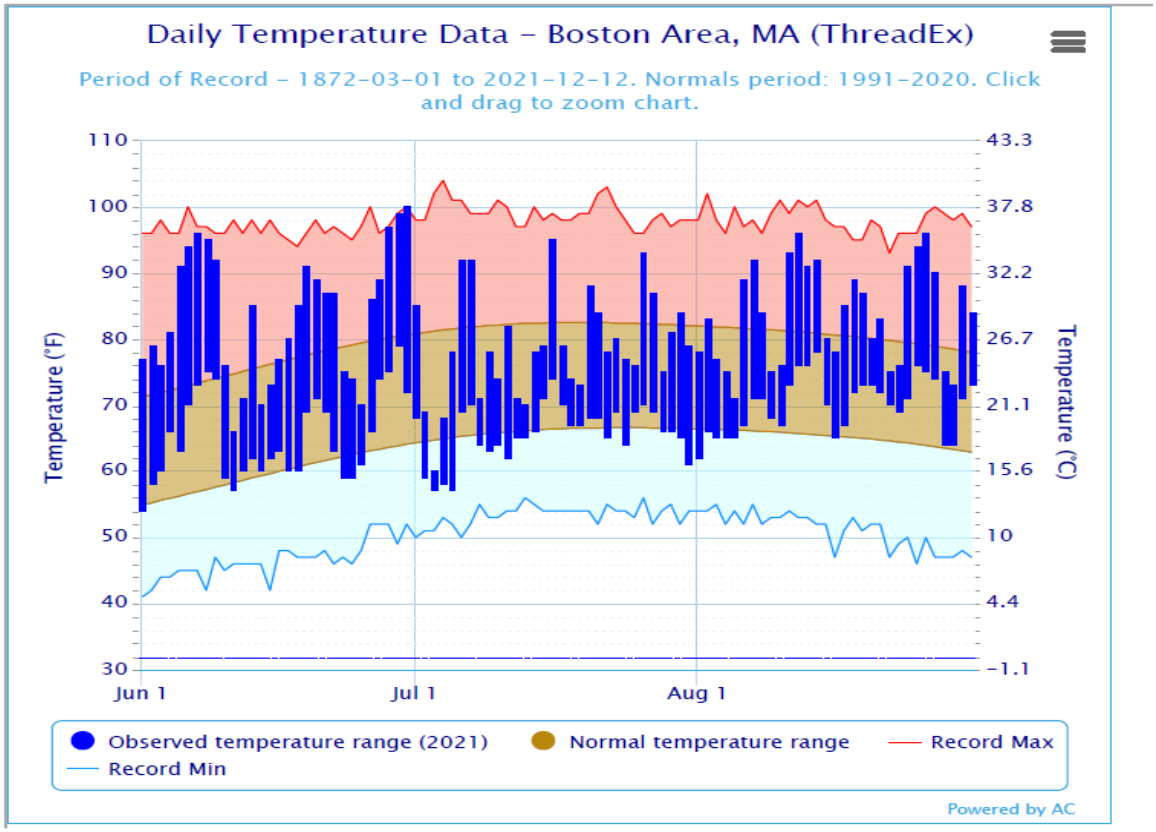
Source: Killer Heat in the United States, Union of Concerned Scientists

The 2018 SHMCAP identifies ecosystems that are expected to be particularly vulnerable to warming temperatures. These include cold-water fisheries, vernal pools, spruce-fir forests, northern hardwood forests (Maple, Beach, Birch), Hemlock forests, and urban forests (due to heat island impacts). Other Impacts on natural resources include a longer growing season and northern migration of plants and animals, including invasive species.

Heat Waves

While the number of 90F+ days per year is a broad indication of extreme temperatures, an indicator that relates more directly to public health impacts is the occurrence of multiple-day heat waves, defined at three or more consecutive days with high temperatures 90F or higher. The summer of 2021 was an example of this, as shown in Figure 32.

Figure 32: Summer 2021 Temperatures, Boston Area



Source: NOAA

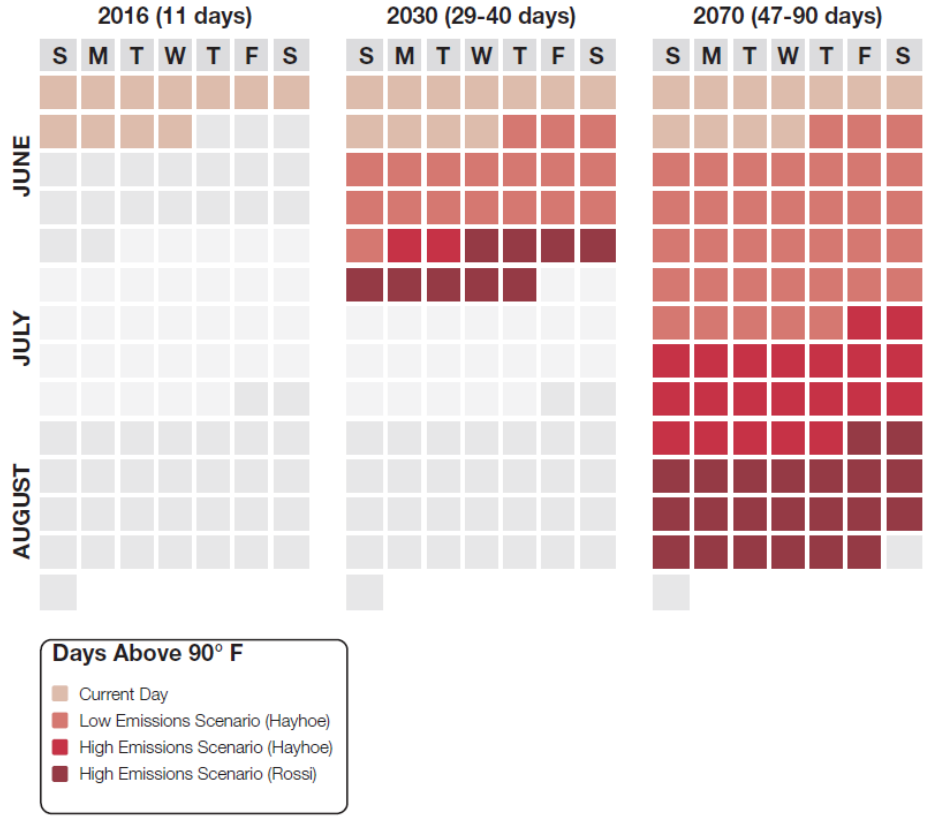
The summer of 2021 was particularly hot, with four heat waves.. Two of these lasted for five days, one lasted four days, and one lasted three days. Overall, there were 24 days 90F or more, 17 of which occurred during the four heat waves.

Extreme Heat and Climate Change

The 2022 MA Climate Change Assessment includes projections of climate-driven future increases in average temperature and in the number of extreme heat days. The assessment also highlights the following climate impacts related to temperatures.

The number of days per year over 90°F is projected to increase over the next several decades, with the amount of increase depending on whether a lower or higher greenhouse gas emission (GHG) scenario is met. By 2070 the difference between the low and high GHG emissions scenarios could be a doubling of the annual number of 90°F days, from 47 to 90 days. By then, it is possible that the entire summer will be marked by temperatures above 90°F (Figure 33). This compares to the current average of 10 to 15 days per year. With changes of this magnitude, over the course of the next several decades, the Massachusetts climate could become more similar to areas well to the south of New England (Figure 34).

Figure 33: Comparison of Days Above 90F for Low and High Emission Scenarios



Source: Somerville Climate Change Vulnerability Assessment

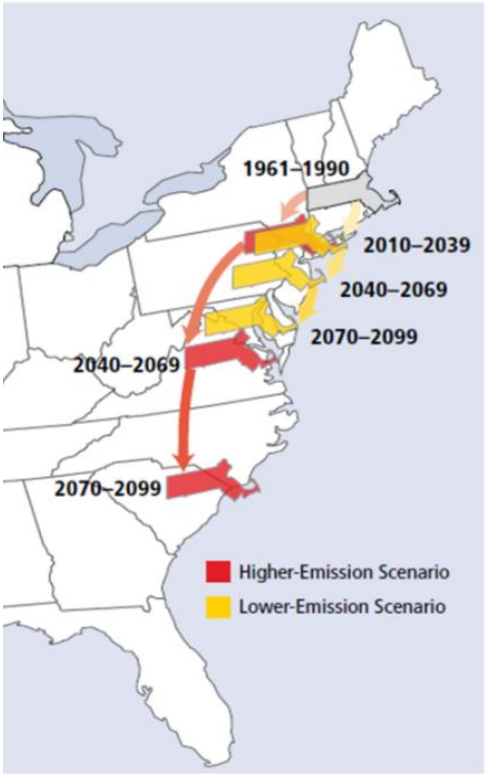
Probability of Future Occurrences

Extreme heat events are classified as very high frequency events as defined by the Resilient MA Plan. Extreme temperature events are almost certain to occur multiple times a year.

Warmer temperatures and more frequent heat waves are connected to impaired human health, increased droughts, reduced agriculture yields, species range shifts, and damaged infrastructure.

- By 2030, the summer mean temperature could increase by 3.6°F from the historical period (1950-2013), worsening stress on electric transmission and utility distribution infrastructure.
- By 2070, there could be 58 fewer days below freezing, increasing the chance of ticks overwintering and reducing winter recreation opportunities.
- Increase in vector borne diseases and bacterial infections, including West Nile Virus and Lyme disease due to more favorable conditions for ticks and mosquitoes.
- Damage to electric transmission and utility distribution infrastructure associated with heat stress
- Damage to rails and loss of rail/transit service, including flooding and track buckling during high heat events.

Figure 34: Temperature Scenarios



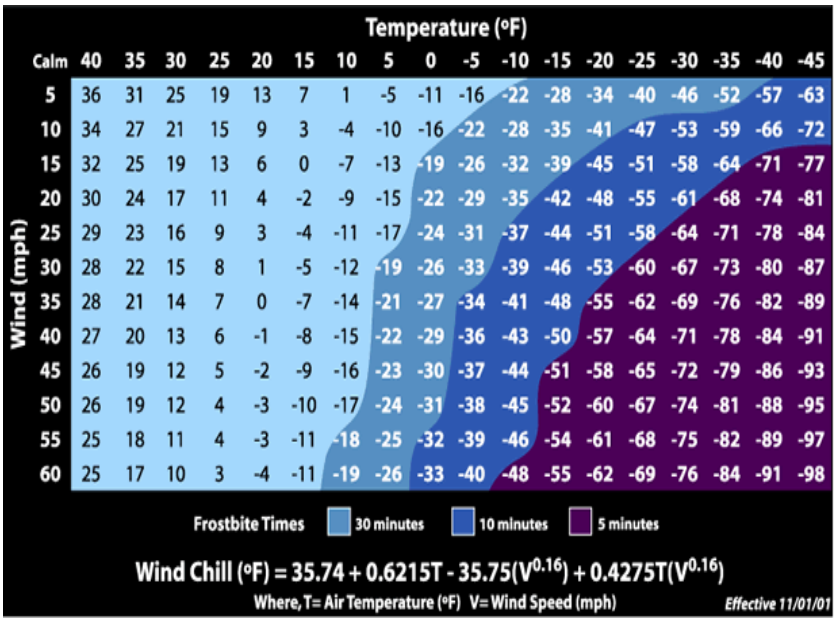
Source: Union of Concerned Scientists

- Reduced ability to work, particularly for outdoor workers during extreme heat, as well as commute delays due to damaged infrastructure.
- Freshwater ecosystem degradation due to warming waters.
- Forest health degradation from warming temperatures and increasing pest occurrence

EXTREME COLD

Extreme cold is relative to the normal climatic lows in a region. Temperatures that drop decidedly below normal and wind speeds that increase can cause harmful wind-chill factors. 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 35. A Wind Chill warning is issued when the Wind Chill Index is forecast to fall below -25 degrees F for at least 3 hours.

Figure 35. Wind Chill Temperature Index and Frostbite Risk



Source: National Weather Service

The best available data on past occurrences of extreme cold events are from NOAA's National Centers for Environmental Information (NCEI) for Suffolk County, which includes the Town of Winthrop. There were three extreme cold events recorded by NCEI since 2005 (Table 35), which caused one deaths, no injuries, and no property damage. The coldest single day temperature recorded in Eastern Massachusetts by the National Weather Service's Norton/Boston regional office was -18 degrees (F) on February 9, 1933.

Table 35: Suffolk County Extreme Cold Occurrences 2005 -2025

Date	Deat	Injuri	Damag
2/3/200	1	0	0
2/16/201	0	0	0
2/14/201	0	0	0

Source: NOAA, National Centers for Environmental Information

Extreme cold is a dangerous situation that can result in health emergencies for susceptible people, such as those without shelter or who are stranded or who live in homes that are poorly insulated or without heat. The greatest vulnerability to the Town would be a power outage during a winter storm, which could temporarily leave many residents without heat. The elderly and people with disabilities are often most vulnerable. In Winthrop, 20.2% of residents are 65 years old and over, and 29.8% have a disability.

Probability of Future Occurrences

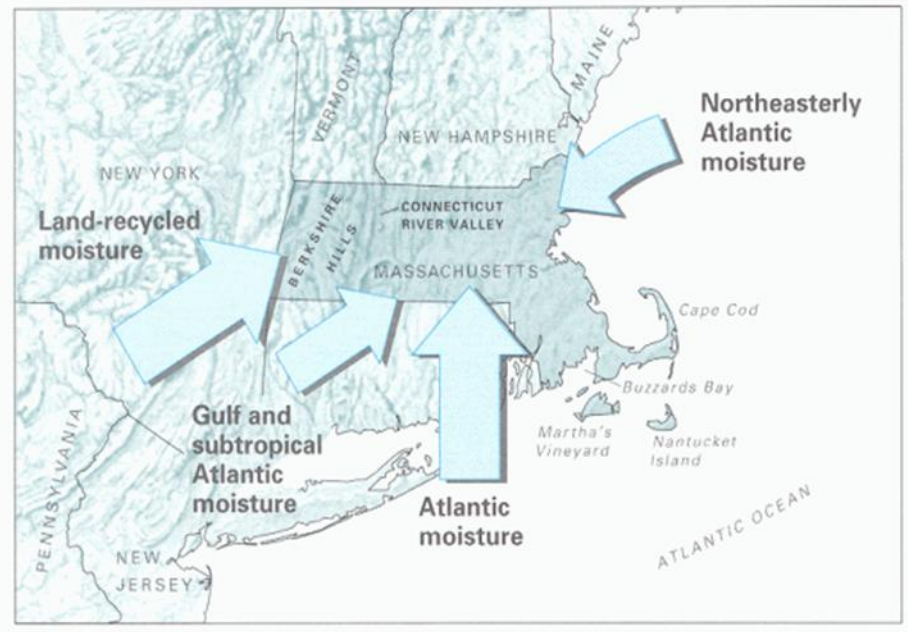
Extreme cold events are classified as very high frequency events as defined by the Resilient MA Plan. Extreme temperature events are almost certain to occur multiple times a year.

DROUGHT HAZARDS

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.

In Massachusetts, droughts are caused by the prevalence of dry northern continental air and a decrease in coastal- and tropical-cyclone activity. During the 1960's, a cool drought occurred because dry air from the north caused lower temperatures in the spring and summer of 1962-65. The northerly winds drove frontal systems to sea along the Southeast Coast and prevented the Northeastern States from receiving the normal sources of moisture (see Figure 36). This is considered the drought of record in Massachusetts.

Figure 36: Principal Sources and Pattern of Moisture Delivery to Massachusetts



U.S. Geological Survey Water-Supply Paper 2375, National Water Summary 1988-89

Average annual precipitation in Massachusetts is 44 inches per year, with approximately 3-to-4-inch average amounts for each month of the year. Regional monthly precipitation ranges from zero to 17 inches. Statewide annual precipitation ranges from 30 to 61 inches. Thus, in the driest calendar year (1965), the statewide precipitation total of 30 inches was 68 percent of average.

Although Massachusetts is relatively small, it has a number of distinct regions that experience significantly different weather patterns and react differently to the amounts of precipitation they receive. The DCR precipitation index divides the state into seven regions: Western, Central,

Connecticut River Valley, Northeast, Southeast, Cape Cod, and Islands. Marlborough is located in the Northeast Region. In Marlborough drought is a potential city-wide hazard.
The Massachusetts Drought Management Plan was revised in 2019 to change the state's classification of droughts by establishing four levels to characterize drought severity beyond normal conditions:

- Level 0-Normal Conditions (no drought)
- Level 1-Mild Drought (formerly Advisory)
- Level 2-Significant Drought (formerly Watch)
- Level 3-Critical Drought (formerly Warning)
- Level 4-Emergency Drought (formerly Emergency)

The Massachusetts drought levels are shown in comparison to the U.S. Drought Monitor levels in Table 36. The two sets of drought indices are similar, but Massachusetts combines the USDM's level D2 and D3 into one category, Critical Droughts.

Table 36: US Drought Monitor Compared to MA Statewide Drought Levels

USDM Names	Recurrence	Percentile Ranges	MA DMP Levels	MA Percentile Ranges	MA DMP Names
D0: Abnormally Dry	once per 3 to 5 years	21 to 30	1	>20 and ≤30%	Mild Drought
D1: Moderate	once per 5 to 10 years	11 to 20	2	>10 and ≤20%	Significant Drought
D2: Severe Drought	once per 10 to 20 years	6 to 10	3	>2 and ≤10%	Critical Drought
D3: Extreme Drought	once per 20 to 50 years	3 to 5			
D4: Exceptional Drought	once per 50 to 100 years	0 to 2	4	≤2%	Emergency

Source: Massachusetts Drought Management Plan, 2019

These levels are based on the conditions of natural resources and provide information on the current status of water resources. As dry conditions can have a range of different impacts, a number of drought indices are available to assess these impacts. Massachusetts uses a multi-index system that takes advantage of several of these indices to determine the severity of a given drought or extended period of dry conditions. Drought level is determined monthly based on the number of indices which have reached a given drought level. Drought levels are declared on a regional basis for each of seven regions in Massachusetts. County by county or watershed-specific determinations may also be made. A determination of drought level is based on seven indices:

1. The Standardized Precipitation Index (SPI) reflects soil moisture and precipitation.
2. Crop Moisture Index: (CMI) reflects soil moisture conditions for agriculture.
3. Keetch Byram Drought Index (KBDI) is designed for fire potential assessment.

4. The Precipitation Index is a comparison of measured precipitation amounts to historic normal precipitation.
5. The Groundwater Level Index is based on the number of consecutive month's groundwater levels are below normal (lowest 25% of period of record).
6. The Stream flow Index is based on the number of consecutive months that stream flow levels are below normal (lowest 25% of period of record).
7. The Reservoir Index is based on the water levels of small, medium and large index reservoirs across the state, relative to normal conditions for each month.

Table 37 shows the range of values for each of the indices associated with the drought levels. Because drought tends to be a regional natural hazard, this plan references state data as the best available data for previous drought occurrences.

Determinations regarding the end of a drought or reduction of a drought level focus on precipitation and groundwater levels. These factors have the greatest long-term impact on stream flow, water supply, reservoir levels, soil moisture, and forest fire potential.

Table 37: Indices Values Corresponding to Drought Index Severity Levels

Index Severity Level	Standardized Precipitation Index	Streamflow	Lakes and Impoundments	Groundwater	Keetch-Byram Drought Index	Crop Moisture Index
0	>30th percentile				< 200	> -1.0
1	≤30 and >20				200-400	≤-1.0 and > -2.0
2	≤20 and >10				400-600	≤-2.0 and < -3.0
3	≤10 and >2				600-700	≤ -3.0 and > -4.0
4	≤2				700-800	≤-4.0

Source: Massachusetts Drought Management Plan, 2019

The drought levels provide a framework from which to take actions to assess, communicate, and respond to drought conditions. Drought levels are used to coordinate both state agency and local response to drought situations. Water restrictions might be appropriate at the significant drought stage, depending on the capacity of each individual water supply system. A critical drought level indicates a severe situation and the possibility that a drought emergency may be necessary. A drought emergency is one in which mandatory water restrictions or use of emergency supplies is necessary.

Previous Occurrences

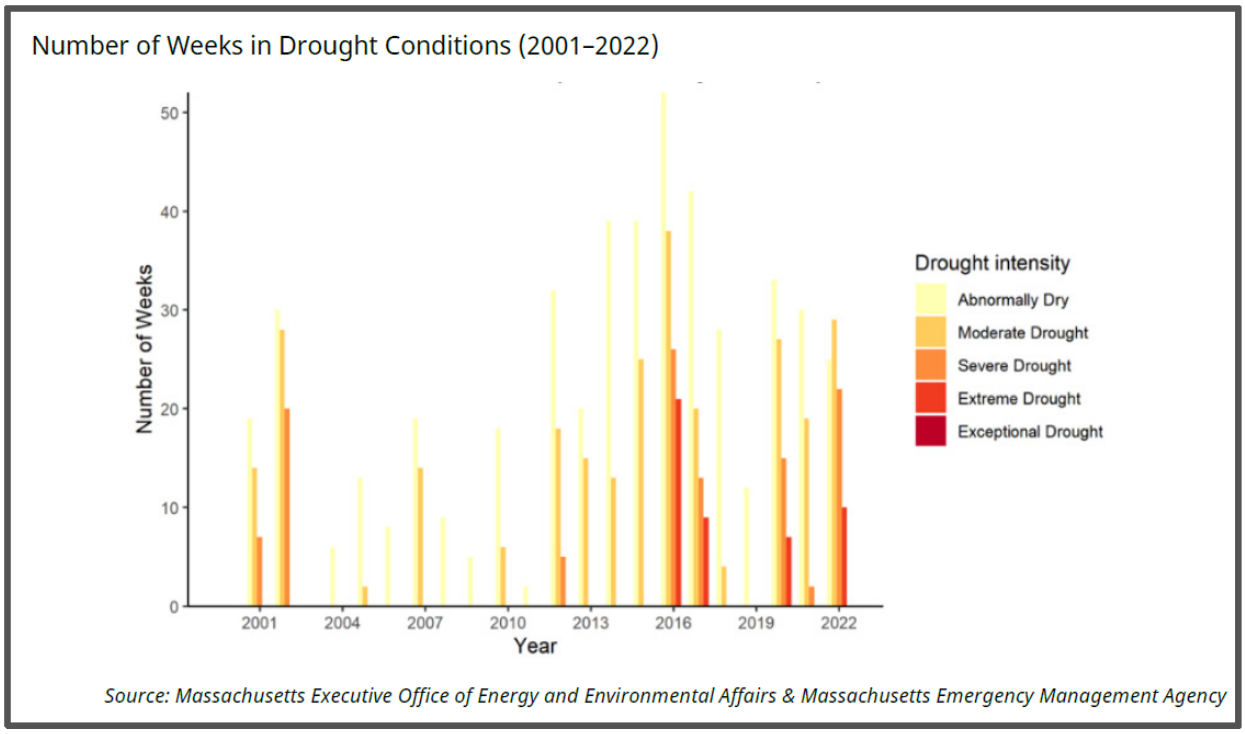
Because drought tends to be a regional natural hazard, the best available date on previous drought occurrences is state-wide data, summarized below. The Executive Office of Energy and

Environment's Drought Management Task Force also provides information on historic drought status for each drought level in Massachusetts. That information is summarized below.

Mild Drought/Advisory	2001, 2002, 2007, 2014, 2016, 2017, 2020, 2021, 2022
Significant Drought/Watch	2002, 2016, 2017, 2020, 2021, 2022
Critical Drought/Warning	2016, 2017, 2020, 2022
Emergency Drought/Emergency	None

Figure 37 shows the frequency and extent of drought events in Massachusetts since the year 2001. The graphic clearly shows an increase in severe drought events in the most recent years of this 21-year period. In just the last seven years there have been four droughts at the extreme level in Massachusetts, in 2016, 2017. 2020, and 2022.

Figure 37: Weeks of Extreme Drought (2001-2022)



Source:

A summary of Massachusetts long term historic drought events from 1879 to 2019 is shown in Table 30. This table was prepared for the 2019 Massachusetts Drought Management Plan, so it does not include the more recent droughts of 2020 (Level 3) and 2021(Level 2).

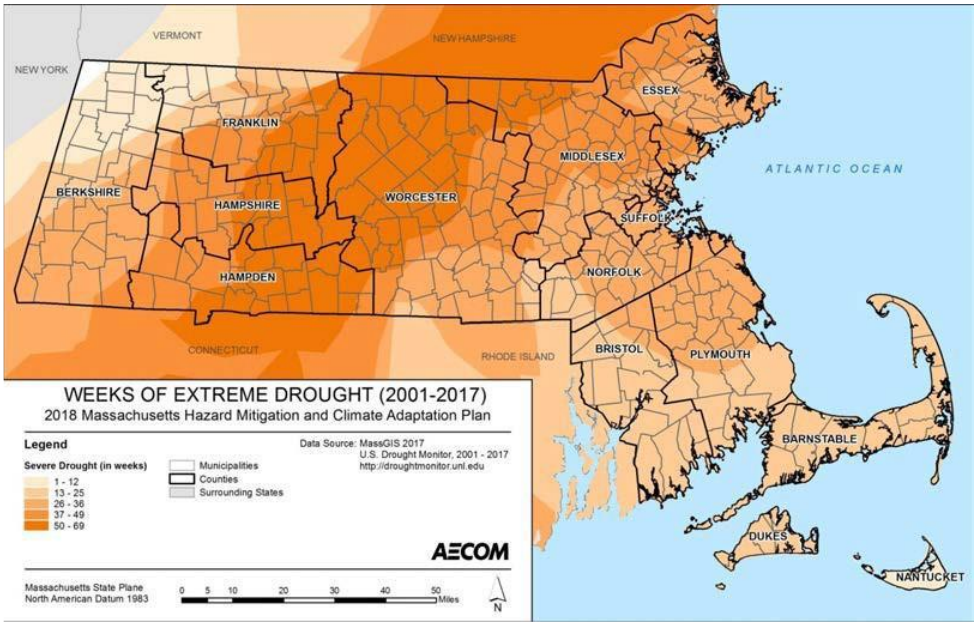
Table 38 - Chronology of major droughts in Massachusetts since 1879

Date	Area affected	Recurrence interval (years)	Remarks	Reference
1879-83	–	–	Kinnison 1931 referenced these periods as two of three worst droughts on record in 1931, the third being the then current drought of 1929-1932.	Kinnison 1931
1908-12	–	–		
1929-32	Statewide	10 to >50	Water-supply sources altered in 13 communities. Multistate.	USGS 1989
1939-44	Statewide	15 to >50	More severe in eastern and extreme western Massachusetts. Multistate.	USGS 1989
1957-59	Statewide	5 to 25	Record low water levels in observation wells, northeastern Massachusetts.	USGS 1989
1961-69	Statewide	35 to >50	Water-supply shortages common. Record drought. Multistate.	USGS 1989
1980-83	Statewide	10 to 30	Most severe in Ipswich and Taunton River basins; minimal effect in Nashua River basin. Multistate.	USGS 1989
1985-88	Housatonic River Basin	25	Duration and severity as yet unknown. Streamflow showed mixed trends elsewhere.	USGS 1989
1995	–	–	Based on statewide average precipitation	DMP 2013
1998-1999	–	–	Based on statewide average precipitation	DMP 2013
Dec 2001 - Jan 2003	Statewide	–	Level 2 drought (out of 4 levels) was reached statewide for several months	DCR 2017
Oct 2007 - Mar 2008	Statewide except West and Cape & Islands regions	-	Level 1 drought (out of 4 levels)	DCR 2017
Aug 2010 - Nov 2010	Connecticut River Valley, Central and Northeast regions	–	Level 1 drought (out of 4 levels)	DCR 2017
Oct 2014 - Nov 2014	Southeast and Cape & Islands regions	–	Level 1 drought (out of 4 levels)	DCR 2017
Jul 2016 - Apr 2017	Statewide	–	Level 3 drought (out of 4 levels)	DCR 2017

Source: Massachusetts Drought Management Plan, 2019

As shown in Figure 38, the geographic extent of droughts from 2001 to 2017 varied greatly in different parts of the state. Winthrop experienced between 26 and 36 weeks of severe drought between 2001 and 2017.

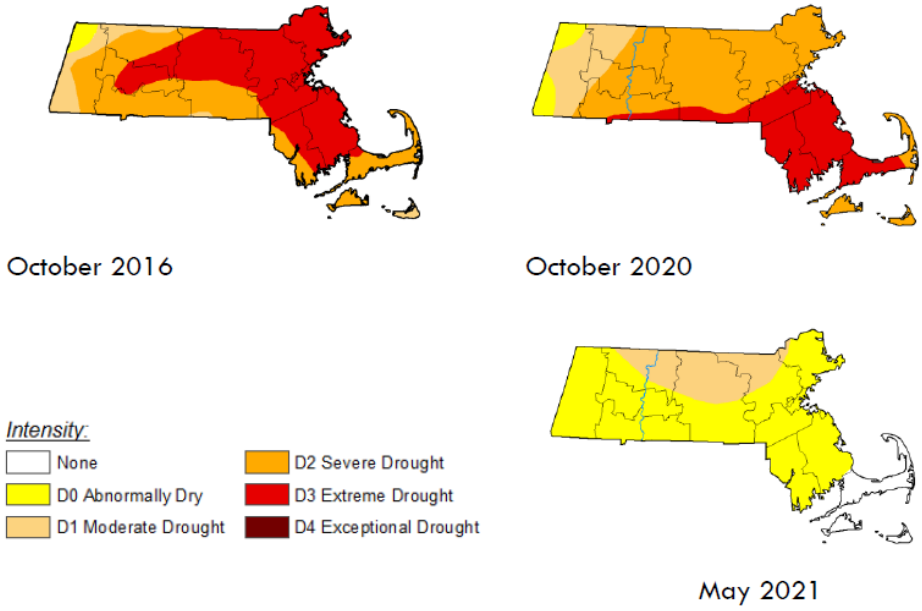
Figure 38: Weeks of Extreme Drought Mapped by Region (2001-2017)



Source: SHMCAP 2018

Figure 39 shows the geographic extent of each of the droughts in 2016, 2020, and 2021. The drought of 2016 was the worst one since 1985, with more than half of the state reaching the Extreme Drought stage for several months. This was followed by another drought four years later in 2020, which was the most severe in Southeastern Massachusetts. Finally, in the early spring of 2021 a third, milder, drought was declared. By the summer of 2021 conditions in the northeast region improved.

Figure 39: Recent Massachusetts Drought Events (2016-2021)



Source: US Drought Monitor, 2016-2021

Potential Drought Vulnerability

The entire Town of Winthrop is potentially vulnerable to the impacts of drought. Under a severe long-term drought, Winthrop could be vulnerable to restrictions on water supply. However, the Town's water supply comes from the Massachusetts Water Resources Authority, which operates two large reservoirs, Quabbin and Wachusett, which have multiple years of storage available to offset drought impacts. The system was able to meet water demands even in the drought of record in the 1960s. It's possible the MWRA system could be impacted by a more severe multi-year drought, but such a drought has not occurred since records have been kept.

Potential damages of a severe drought could include losses of landscaped areas on private properties as well as public facilities if outdoor watering is severely restricted. Losses could also include potential loss of business revenues if water supplies were severely restricted for a prolonged period. As this hazard of this severity has never occurred in Winthrop, there are no data or estimates of potential damages, but under a severe drought scenario it would be reasonable to expect a range of potential damages up to several million dollars due to business interruption.

Probability of Future Occurrence

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. See Table 391 for more information.

Table 39: Frequency of Massachusetts Drought Levels

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

Source: 2018 SHMCAP

Droughts are a medium frequency event as defined by the Resilient MA Plan, likely to occur at least once every 50 years (two or more occurrences in the next century)

Droughts And Climate Change

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. Information from the 2022 Massachusetts Climate Change Assessment related to drought is included in the "Climate Change Observations and Projections" section of this report. Additionally, the 2022 Assessment highlights the following drought-related impacts to the Eastern Inland region where Marlborough is located:

- Freshwater ecosystem degradation due to drought and other impacts
- Increased contaminant concentrations in freshwater during drought conditions
- Loss of tree cover due to drought and other impacts

LAND USE AND DEVELOPMENT TRENDS

WINTHROP LAND USE

Land use mapping is available for communities statewide from Mass GIS. Map 2 in Appendix A shows the land use map for Winthrop, and Table 40 shows the acreage and percentage of land in 20 categories. The largest single land use category by far in Winthrop is residential, with 712.2 acres 48.9% of the Town in the high density and multifamily residential categories combined. The next largest land use is transportation, at 19.4 acres or 13.7% of the Town, followed by saltwater beach at 9.2% and saltwater wetlands at 7.2%, underscoring the Town's coastal location. Commercial and industrial uses have a relatively small area of 73.3 acres, or 5.0% of the total

Table 40: Winthrop Land Use

Land Type	Acres	Perce
Forest	2.10	0.1
Wetland	6.47	0.4
Open Land	42.1	2.8
Participation Recreation	43.17	2.9
Multifamily Residential	371.9	25.5
High Density Residential	340.2	23.3
Saltwater Wetland	106.9	7.3
Commercial	71.58	4.9
Industrial	2.19	0.1
Transportation	199.4	13.6
Waste Disposal	2.32	0.1
Water	7.87	0.5
Saltwater Beach	133.7	9.1
Golf Course	52.04	3.5
Marina	16.90	1.1
Urban Public	34.96	2.4
Cemetery	15.77	1.0
Nursery	0.27	0.0
Forested Wetland	0.23	.01
Brush land/Succession	6.62	0.4
TOTAL	1,456.9	100

Source: MA GIS Land Use Statistics

ECONOMIC ELEMENTS

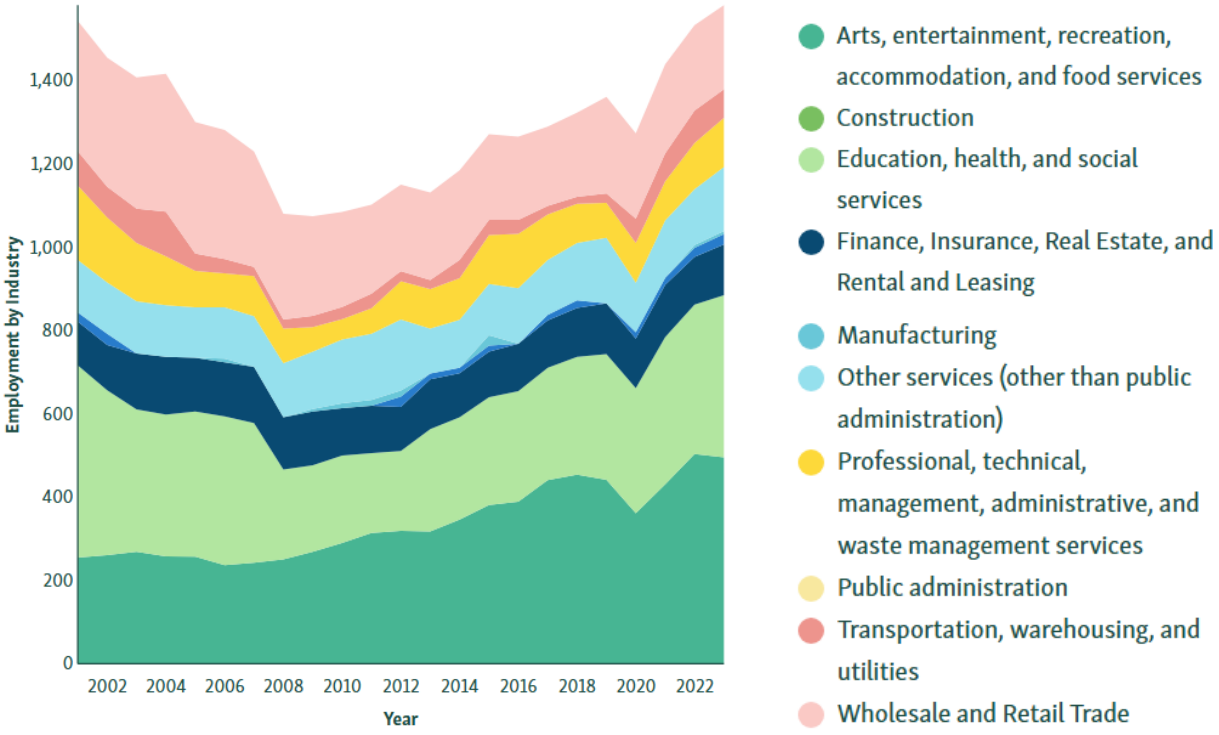
The economy of Winthrop employed 10,132 people in 2023., the largest employment sectors were Health Care & Social Assistance (1,299 people), Professional, Scientific, & Technical Services (1,085 people), and Educational Services (956 people). The breakdown of employment in 19 categories is shown in Table 41. Figure 40 shows the trends in employment over the period 2002 to 2022.

Table 41 Winthrop Employment by Category, 2023

Industry	Workforce	Percent
Agriculture, Forestry, Fishing & Hunting	15	0.15%
Mining, Quarrying, & Oil & Gas Extraction	9	0.09%
Construction	524	5.17%
Manufacturing	695	6.86%
Wholesale Trade	256	2.53%
Retail Trade	573	5.66%
Transportation & Warehousing	901	8.89%
Utilities	20	0.20%
Information	411	4.06%
Finance & Insurance	679	6.70%
Real Estate & Rental & Leasing	202	1.99%
Professional, Scientific, & Technical Services	1085	10.71%
Administrative & Support & Waste Management	462	4.56%
Educational Services	956	9.44%
Health Care & Social Assistance	1299	12.82%
Arts, Entertainment, & Recreation	357	3.52%
Accommodation & Food Services	688	6.79%
Other Services, Except Public Administration	437	4.31%
Public Administration	563	5.56%
TOTAL	10,132	

Source: U.S. Census Bureau, ACS 5-year Estimate

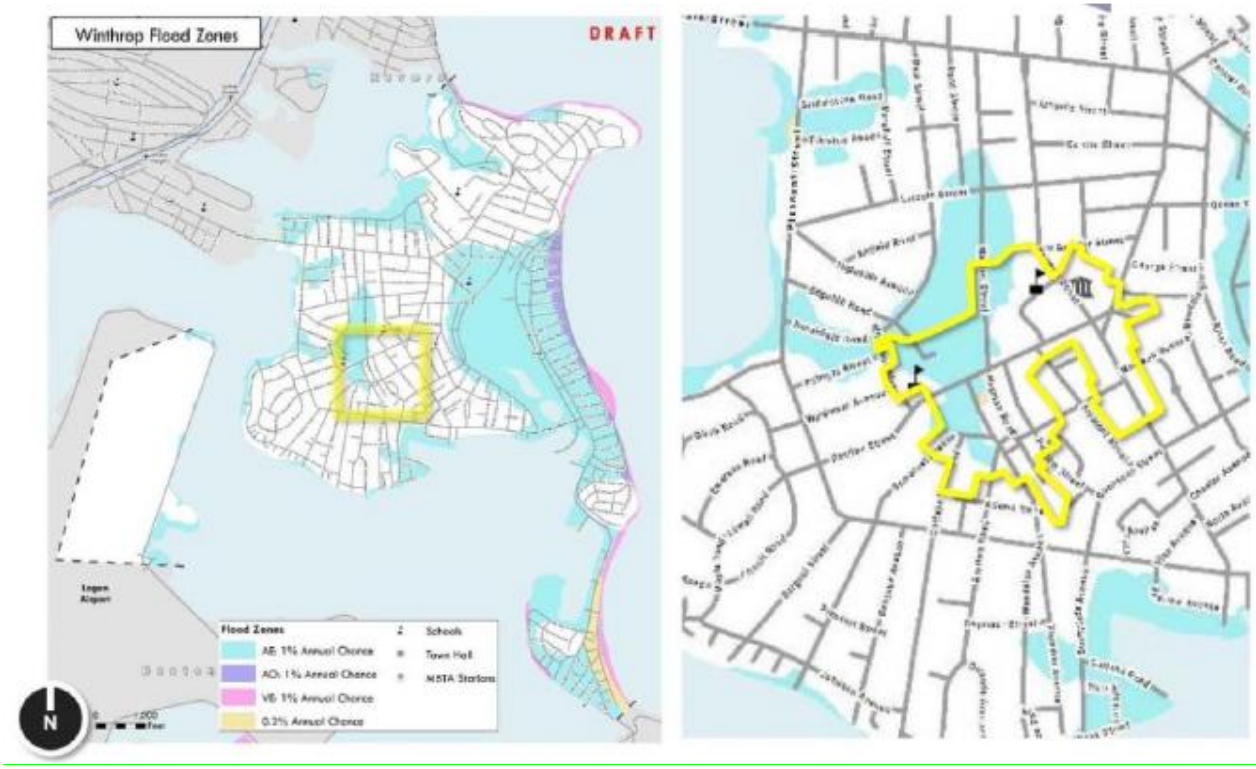
Figure 40 Winthrop Employment by Category, 2023



Source: Executive MA Office of Labor and Workforce Development,-2023

Although primarily a residential community, the Town features several unique business areas: the Shirley Street Business District, the Highlands District, Magee's Corner District, and the Winthrop Center District. The Town has a modestly vibrant business community, however, in recent decades large shopping malls in the nearby North Shore region began to impact businesses in Winthrop, In 2017 the Town undertook the Winthrop Center Business District to focus on the key center of business in the Town. The study assesses the strengths and challenges facing local businesses, and provides recommendations to support and revitalize the district. The plan also notes concerns for potential flooding risks. As with the predominantly residential areas of Winthrop, a portion of the Winthrop Center business district faces flooding risks. An area along the western side of the district is located with the FEMA AE mapped flood zone (Figure 41). The Master Plan concludes that " As a community surrounded by water, Winthrop must be particularly vigilant in adhering to resiliency standards that address threats pose by sea level rise."

Figure 41 Winthrop Center Business District



Source: Winthrop Center Business District Master Plan, 2017

DEVELOPMENT TRENDS

With limited land area, Winthrop is largely built out, so new growth in the Town consists of redevelopment of existing developed sites. New developments in the MAPC region are tracked on Mass Builds. The following developments shown in Table 42 are listed in Mass Builds as completed since the previous Hazard Mitigation Plan in 2015.

Table 42: Winthrop Developments Completed Since 2015

Site#	DEVELOPMENT	DEVELOPMENT TYPE	Res. Units	STATUS
A	Temple Israel	40 unit assisted living development	40	Completed
C	Belle Isle Bridge	Bridge repair under the MA Accelerated Bridge Replacement program, elevated foot in height	---	Completed
D	142 Pleasant St	Conversion of former nursing home in condominiums	16	Completed
E	Winthrop Hospital	Pizzuti Development Age restricted	74	Completed
F	Dalrymple School redevelopment	Renovation of abandoned school into affordable age restricted housing.	27	Completed
G	60 Hermon Street	Reuse of former religious facility, 5 u	5	Completed
H	15-17 Walden St	Conversion of commercial property in condominiums	16	Completed
I	413-415 Shirley St.	Redevelopment for 25 residential un	25	Completed
J	5 Fremont Street	Redevelopment of office building int mixed-use residential and commercia Existing offices will remain.	22	Completed
K	10-26 Somerset Ave	Projected 30 residential units	30	Completed
L	20 Main St	Restoration to the existing structure f mixed-use commercial development.	---	projected

Source: Mass Builds

CRITCAL FACILITIES

Critical Infrastructure in Hazard Areas

Critical infrastructure includes three categories of facilities that are important to the Town:

- Critical Infrastructure such as water and wastewater pumps, communications,
- Facilities that provide utility for disaster response and evacuation such as emergency operations centers, fire and police stations, public works facilities,
- Facilities where additional assistance might be needed during an emergency, such as nursing homes, elderly housing, schools, day care centers, etc..

The Winthrop Hazard Mitigation Team updated the Critical Facilities inventory and map from the previous Hazard Mitigation Plan, adding additional facilities to the list and updating existing facilities as needed. The Team identified re are xx Critical Facilities, xx of which were newly added sites for this plan update. These are listed in Table 43x and are shown on the maps in Appendix A.

Table 43– Winthrop Critical Facilities

MAP#	FACILITY NAME	ADDRESS	FACILITY TYPE
1	11 - 54 Overlook Drive	11 - 54 Overlook Drive	Elder Housing
2	Atlantis Marina	550 Pleasant St	Marina
3	Beach Fire Station	416 Shirley St.	Fire Station
4	Belle Isle Marsh		Water Feature
5	Bright Beginnings Learning Center	89 Veterans Road	Child Care
7	CVS	3 Woodside Ave.	Pharmacy
8	Cell Tower At Expert Auto	120 Shirly Street	Communication Tower
9	Cell Tower At Fellows Hall	198 Winthrop Street	Communication Tower
10	Cell Tower At St. Johns the Evangelist Church	320 Winthrop Street	Communication Tower
11	Cell Tower At United Methodist Church	217 Winthrop Street	Communication Tower
12	Arthur Cummings School	40 Hermon St	School
13	Children's Corner Preschool	210 Pauline St.	Child Care
14	Concrete Seawall	Seal Harbor Condo	Flood Protection
15	Concrete Seawall	Revere Street	Flood Protection
16	Cottage Park Yacht Club	76 Orlando Ave	Marina
17	Crystal Cove Marina	529 Shirley St	Marina
18	Deer Island Waste Water Treatment	190 Tafts Ave	Waste Water Treatment
19	E B Newton	45 Pauline Street	School
21	Fire Headquarters	40 Pauline St.	Fire Station
22	For Kids Only Extended Day in Parish School	233 Winthrop	Child Care
23	Gorman/ Fort Banks Elementary School	101 Kennedy Road	School
24	Golden Drive	1 - 22 Golden Drive	Special Needs
26	John Clark House (N Suffolk Mental Health)	152 Pleasant St	Assisted Living
27	King Gardens	2 Kennedy Road	Elder Housing
28	Lewis Lake Tidal Gate	Washington Ave	Flood Prevention
29	Lodge Elks Marina	191 Washington Ave	Marina
30	Loring Rd Boat Ramp	Loring Rd	Boat Ramp

MAP#	FACILITY NAME	ADDRESS	FACILITY TYPE
31	Memorial Auditorium	149 Pauline Street	School
32	Mrs. Marley's Nursery School	415 Shirley Street	Child Care
33	North Suffolk Mental Health	225 Pleasant St.	Special Needs
34	North Suffolk Mental Health	133 Morton St.	Assisted Living
35	North Suffolk Mental Health	138 Morton St.	Assisted Living
36	North Suffolk Mental Health	11 Pearl Ave	Assisted Living
37	Old Town Garage	233R Winthrop Street	Kennel
38	Pico Sewer Pump Station	Pico Ave	Sewer Pump Station
39	Pier	Off Court Rd	Recreation
40	Private Pier	Off Court Rd	Recreation
41	Pleasant Court Sewer Pump Station	Pleasant Ct	Sewer Pump Station
42	Pleasant Park Yacht Club	562 Pleasant St	Marina
43	Pleasant Times Day Care	65 Putnam St	Child Care
44	Point Shirley Association	1032 Shirley St	Shelter
45	Police Station	3 Metcalf Sq.	Police Station
46	Post Office	5 Michaels Mall	Post Office
47	Public Landing	700 Shirley St	Water Access
48	Public Safety Communication Tower	Faun Bar Ave	Communication Tower
49	Recreation Center	45 Pauline St	After School Program
50	Revere St Sewer Pump Station	Revere St	Sewer Pump Station
51	Rice’s Wharf	585R Shirley St	Marina
54	Skatting Rink	Pauline St.	Place of Assembly
55	St John The Evangelist Church	320 Winthrop St	Church
56	St John's Episcopal Church	225 Bowdoin St	Church
57	Stone Breakwater	Winthrop Shore Dr.	Flood Prevention
58	Stone Revetment	Forth Heath	Revetment
59	Stone Revetment	Winthrop Shore Dr.	Revetment
60	Stone Revetment	Grovers Ave.	Revetment
61	Stone Revetment	Winthrop Highlands	Revetment
62	Temple Tifereth Israel	93 Veteran's Rd	Church
64	Town Hall	1 Metcalf Sq.	Municipal
65	Union Congregational Church	22 Tewksbury St	Church
66	United Methodist Church	217 Winthrop St	Church

MAP#	FACILITY NAME	ADDRESS	FACILITY TYPE
67	Viking Gardens	107 Putnam St.	Elder Housing
68	Winthrop Country Day Learning Ctr.	96 Winthrop St.	Child Care
69	Winthrop DPW Building	100 Kennedy Rd.	Municipal
70	Winthrop Traffic Control Point	Main St && Revere St	Traffic Control Point
70	Winthrop EOC	30 Herman St	Emergency Operations Center
71	Winthrop Traffic Control Point	Shirley St & Washington Ave	Traffic Control Point
73	Yirrell Beach	Off Shirley St	Water Feature
74	Winthrop Middle School	151 Pauline St	School
75	Winthrop Senior Center	35 Harvard St	Senior Center
76	Winthrop Place	26 Sturgis St	Elder Housing
77	Winthrop Middle/High School	400 Main Street	School
78	Winthrop Traffic Control Point	Shirley St && Veterans Rd	Traffic Control Point
80	Winthrop Traffic Control Point	Main St && Pleasant St.	Traffic Control Point
81	Winthrop Market Place	35 Revere Street	Grocery Store
82	Winthrop Traffic Control Point	Revere St && Shirley St	Traffic Control Point
83	Winthrop Traffic Control Point	Shore Drive && Beach Rd	Traffic Control Point
85	Winthrop Library	2 Metcalf Sq	Library
86	Winthrop Reservation	Winthrop Shore Drive	Water Feature
87	Winthrop Traffic Control Point	Revere St && Crest Ave	Traffic Control Point
88	Winthrop Water Storage Tank	Faun Bar Ave	Water Storage Tank
89	Winthrop Yacht Club	649 Shirley St	Marina
90	Winthrop Traffic Control Point	Winthrop Parkway & Revere St	Traffic Control Point
91	Private Pier	off 227 Court Rd	Pier
92	Private Pier	68 Johnson Ave	Pier
93	Tafts Avenue TCP	Tafts and Eliott	Traffic Control Point
94	Belle Isle Bridge	Main Street	Bridge
95	Pressure Reducing Valve Station	Revere Street	Water Facility
96	Power Substation	Argile St	Power Substation
97	Power Substation	Winthrop Street	Power Substation

Source: Winthrop Hazard Mitigation Team

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. The methodology used for hurricanes and earthquakes was the HAZUS-MH software. The methodology for flooding was developed specifically to address the issue in many of the communities where flooding was not solely related to location within a floodplain.

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 http://www.fema.gov/plan/prevent/hazus/index.shtm

> "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 Winthrop, they do 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-MH 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 100-year and 500-year return frequency 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. The results are summarized in Table 44.

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 44- Estimated Damages from Hurricanes

	100 Year	500 Year
Building Characteristics		
Estimated total number of buildings	4,686	
Estimated total building replacement value	$ 2,468,595,000	
Millions of dollars		
Building Damages		
# of buildings sustaining no damage	1,622	1,321
# of buildings sustaining minor damage	93	321
# of buildings sustaining moderate damage	9	66
# of buildings sustaining severe damage	0	7
# of buildings destroyed	0	10
Population Needs		
# of households displaced	0	0
# of people seeking public shelter	0	0
Debris		
Building debris generated (tons)	363	1,827
Tree debris generated (tons)	596	1,187
# of truckloads to clear building debris	15	73
Value of Damages (Thousands of dollars)		
Total property damage (buildings and content)	$6,798,370	$28,144,740
Total losses due to business interruption	$452,730	$2,843,260
Total All Losses	$7,251,090	$30,988,000

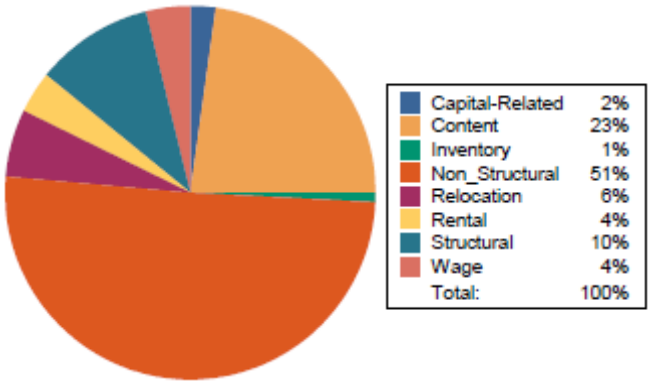
ESTIMATED DAMAGES FROM EARTHQUAKES

The HAZUSs-MH earthquake module allows users to define an earthquake magnitude and model the damages caused 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 magnitude 7.0. Historically, major earthquakes are rare in New England, though a magnitude 5 event occurred in 1963. The results are summarized in Table 45.

Table 45 - Estimated Damages from Earthquakes

	Magnitude 5.0	Magnitude 7.0
3eBuilding Characteristics		
Estimated total number of buildings	4,686	
Estimated total building replacement value	$ 2,468,595,000	
Building Damages		
# of buildings sustaining no damage	1210	192
# of buildings sustaining slight damage	707	510
# of buildings sustaining moderate damage	313	1,167
# of buildings sustaining extensive damage	55	1,120
# of buildings completely damaged	9	1,697
Population Needs		
# of households displaced	442	4,462
# of people seeking public shelter	197	1,959
Debris		
Building debris generated (tons)	53,000	382,000
# of truckloads to clear debris (@ 25 tons/truck)	2,120	15,260
Value of Damages		
Total capital stock losses	$58,189,000	$1,884,082,600
Total losses due to business interruption	$317,123,600	$300,955,800
Total All Losses	$375,3310,000	$2,185,040,000

Winthrop Losses for a 5.0 Magnitude Earthquake



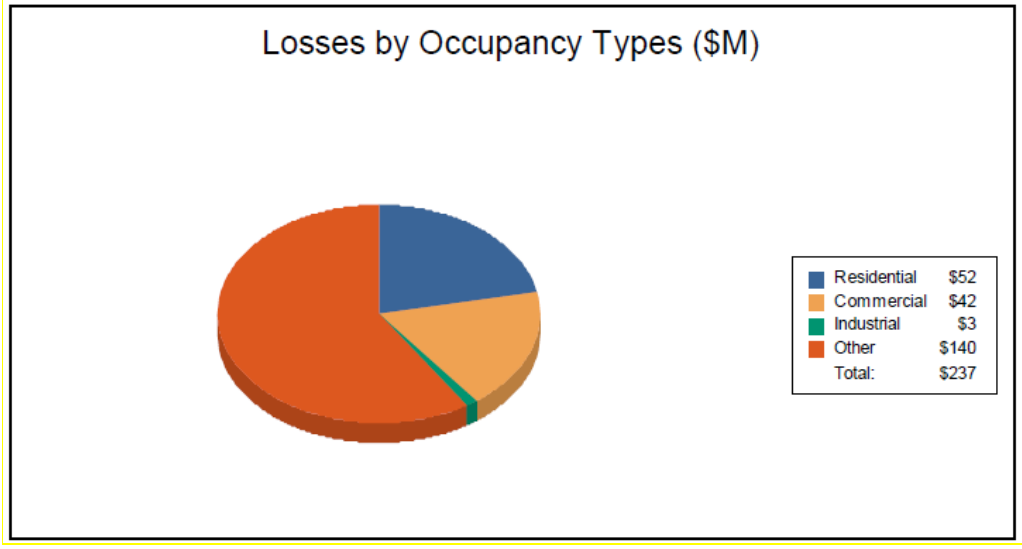
ESTIMATED DAMAGES FROM FLOODING

The HAZUS-MH flood risk module was used to estimate damages to the municipality at the 100 and 500-year return periods. These correspond to flooding events that have a 1% and a 0.2% likelihood of occurring in any given year. The results are shown in Table 46.

Table 46 - Estimated Damages from Flooding

	100 Year	500 Year
Building Characteristics		
Estimated total number of buildings	4,686	
Estimated total building replacement value	$,468,595,000	
Building Damages		
# of buildings sustaining slight damage (1-20%)	45	73
# of buildings sustaining moderate damage (21-50%)	9	14
# of buildings sustaining substantial damage (>50%)	0	5
Population Needs		
# of households displaced	2,597	3,551
# of people seeking public shelter	325	398
Debris		
Building debris generated (tons)	3,.846	6,002
# of truckloads to clear debris (@ 25 tons/truck)	154	241
Value of Damages		
Total property damage	$57,400,000	$86,460,000
Total losses due to business interruption	$179,850,00	$245,280,000
Total All Loses	$236,850,000	$334,740,000

Winthrop Losses for a 100-Year Flood



SECTION 5: HAZARD MITIGATION GOALS

The Winthrop Local Hazard Mitigation Team reviewed and discussed the goals from the previous 2015 Hazard Mitigation Plan. The Team modified the goals to reflect a more comprehensive approach and to incorporate climate resiliency for this 2025 plan update. Goals 10 through 14 were added by the local team for this updated plan. All of the goals are considered critical for the Town, and they are not listed in order of importance.

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 new construction.
6. Encourage future development in areas that are not prone to natural hazards.
7. Educate the public about natural hazards and mitigation measures.
8. Make efficient use of public funds for hazard mitigation.
9. Protect the Town's ability to respond to various natural hazard events.
10: Consider the potential impacts of climate change and incorporate climate sustainability and resiliency into hazard mitigation planning.
11: Incorporate environmental justice considerations into natural hazard mitigation, including outreach to climate vulnerable populations, identification of hazard impacts, and related mitigation measures.
12: Integrate hazard mitigation planning as an integral factor in all relevant municipal departments, committees and boards.
13: Encourage the business community, local institutions and non-profits to work with the Town to develop, review and implement the hazard mitigation plan.
14: Work with surrounding communities, state, regional and federal agencies to ensure regional cooperation and solutions for hazards affecting multiple communities.

SECTION 6: EXISTING MITIGATION MEASURES

The existing protections in the Town of Winthrop are a combination of zoning, land use, and environmental regulations, infrastructure maintenance and drainage infrastructure and coastal protection 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 the completion of some of these.

The Town's existing mitigation measures are listed by hazard type here and are summarized in Table 47 below.

Existing Multi-Hazard Mitigation Measures

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, Tornados, 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 – The Town utilizes the MBTA Police Mobile Command, a mobile communications center available to the Town through the MBTA. The Town has a Reverse 911 system in place, Code Red.

Emergency Management Website- The Town maintains an Emergency Management page on its website. There are links here to chemical emergency information, flood hazard recovery actions, hurricane preparedness and other information, how to enroll and utilize the CodeRed emergency notification system.

Emergency Power Generators – Emergency power generators are in place in the two Red Cross certified emergency shelters- the Fort Banks School and the Cummings School. Both of the fire stations have in-place electrical generating capacity, one using diesel fuel and the other Liquefied Natural Gas (LNG). The Town Hall and Emergency Operations Center (EOC) are served by a generator. All sewer pumps stations have back up generation capacity and the DPW facility has a fixed diesel generator in place.

Massachusetts State Building Code – The Massachusetts State Building Code contains many detailed regulations regarding wind loads, earthquake resistant design, flood-proofing, and snow loads.

Hazardous Facilities Emergency Response Plans- Winthrop is home to the MWRA Deer Island waste water treatment facility. The plant stores and requires the largest amount of

water treatment chemicals on the east coast of the United States, including sodium hyper chloride (bleach) and ammonia. The MWRA's emergency response plan is up to date.

Winthrop is a member of a regional emergency planning committee with Chelsea, Everett, Lynn, Malden, Medford, Melrose, North Reading, Reading, Revere, Saugus, Somerville, Stoneham, Wakefield, Winchester and Woburn. The Town also maintains its own Local Emergency Planning Committee (LEPC).

In 1986, Congress passed the Emergency Planning and Community Right-to-Know Act, Public Law 99-499, commonly known as EPCRA or SARA Title III. Section 301(a) of the legislation required each governor to appoint a state emergency response commission (SERC). Section 301(b) charged the SERCs with the responsibility of dividing the states into planning districts and Section 301(c) for appointing local emergency planning committees (LEPCs). In 1987, the Massachusetts State Emergency Response Commission designated each MEMA sub-area as planning districts and appointed a Local Emergency Planning Committee for each city and Town. The legislation required that the committees have representation from a specified number of interest groups. The mission of the LEPC can be summarized as follows:

- A response plan must be written for responding to a hazardous material incident with the jurisdiction(s). It must also be reviewed annually.
- Emergency responders (police, fire, emergency medical services, public works, etc.) must be trained to levels indicated in the plan. At a minimum, first responders must be trained to the awareness level.
- The emergency response plan must be exercised at least once a year.
- The committee must create a system to collect, store, and respond to public requests.

Existing Flood Hazard and Coastal Hazard Mitigation Measures

National Flood Insurance Program (NFIP) – Winthrop participates in the NFIP with 756 policies in force as of the May 1, 2026.

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. The Winthrop Building Inspector is responsible for enforcing the town's floodplain regulations. The following flood insurance information is provided for the Town of Winthrop:

Flood insurance policies in force (as of May 1, 2025)	756
Total Premiums Paid	$932,718
Coverage amount of flood insurance policies	$194,303,000
Number of Closed Paid Losses	1,254
Number of Substantial Damage Closed Paid Losses	25
Closed Paid Losses	$7,391,198

Since 1978 there have been 25 claims paid for substantial damage in Winthrop (see table above). The Town implements the Substantial Improvements/Substantial Damages provisions of the floodplain management regulations as required per the NFIP (CFR Title 44, Parts 59 through 65) and Massachusetts State Building Code (780CMR). The Town will also coordinate with State Flood Hazard Management Program staff to assure that proper practices are followed and that a post-disaster plan will be in place to implement all Substantial Improvements/Substantial Damages provisions.

Conservation Commission website page – The Town provides on information on wetlands, copies of Flood Insurance Rate Maps, locus maps, wetlands permit filing information, and links to the MA Association of Conservation Commission and then MAP DEP websites. Winthrop also has a page on its Town web site on Emergency Management that offers information on cold and winter weather preparedness, a link to the Local Emergency Planning Committee staffing page, chemical emergency preparedness and response, flooding response and FEMA contact information, hurricane preparedness information and CodeRED information.

Public Services 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.

o Street sweeping – Street sweeping is done by Winthrop, conducted five to seven times annually. The Town used to contract this service out.

o Catch basin cleaning –800 catch basins; each basin is cleaned every four years with clogged basins cleaned as needed. Winthrop has replaced several dysfunctional catch basins with new deep-sump basins over the last 10 years.

o Roadway treatments – Calcium Chloride only is used for snow/ice treatment.

o Drainage maintenance- The Town's catch basins and drain lines are not yet digitally mapped. The DPW tracks and records all catch basin maintenance. The DPW inspects streets and drainage systems once construction is completed. Private covenants for private, off-street drainage facilities are sometimes required through the permitting process. Routine maintenance and systematic replacement of drainage infrastructure part of the DPW's annual operating budget.

Open Space and Recreation Plan- The Winthrop Open Space and Recreation Plan lists among its top priorities actions that can have a significant impact in reducing the impacts of flooding and stormwater. The 2010 Plan includes the following as priority goals: the improvement and upgrading of the Town's neighborhood parks and beaches and the preservation of open space and the expansion of passive recreational opportunities.

Conservation district zoning - The Town has a conservation district zone whose purpose is to protect the Town against the costs which may be incurred when unsuitable development occurs near water. The Town also has an environmental design review provision which includes standards for ensuring that drainage will not adversely affect neighboring properties.

Environmental design review – The zoning bylaw requires that all special permit applications must undergo environmental design review by the Board of Appeals or Planning Board. Review standards include ensuring that removal of surface waters will not adversely affect neighboring properties or the public storm drainage system

Flood Hazard Control Regulations) -The Town also requires compliance with all provisions of the National Flood Insurance program. The Commissioner of Inspectional Services /Building Inspector enforces compliance with the NFIP regulations. The Town has developed a Flood Resilience Checklist for Residential Properties to ensure compliance with building regulations (See Appendix D).

Special Development Overlay District (SDOD)- The SDOD encourages the redevelopment and reuse of existing nonresidential properties in Winthrop, allowing mixed use residential development within a flexible permitting schedule. The district does mandate that 20% of any redevelopment or reuse be retained as open space, making it a factor in being able to treat precipitation and stormwater onsite and prevent stormwater runoff.

Stormwater Management Ordinance – prohibits illicit connections or discharge into the Town's Municipal Separate Stormwater System (MS4)

Other Development Regulations- There are no prohibitions on mobile homes and the subdivision regulations are of limited value in restricting development in flood-prone areas because subdivision activity is limited due to the built-out nature of the community.

Existing Wind Hazard Mitigation Measures

CEMP – The Winthrop Comprehensive Emergency Management Plan contains a section on hurricanes. It lists five generic mitigation measures:

- Develop and disseminate emergency public information and instructions concerning hurricane preparedness and safety.
- Community leaders should ensure that Winthrop is enrolled in the National Flood Insurance Program.
- Develop and enforce local building codes to enhance structural resistance to high winds and flooding. Build new construction in areas that are not vulnerable to direct hurricane effects.

- Review National Flood Insurance Rate Maps and Hurricane Evacuation Maps for possible impact on the community.
- Maintain plans for managing all hurricane emergency response activities.

The Winthrop CEMP outlines three generic mitigation measures for Tornados.

- Develop and disseminate emergency public information and instructions concerning tornado safety, especially guidance regarding in-home protection and evacuation procedures, and locations of public shelters.
- Strict adherence should be paid to building code regulations for all new construction.
- Maintain plans for managing tornado response activities. Refer to the non-institutionalized, special needs and transportation resources listed in the Resource Manual.

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.

Tree-trimming program – The Town performs 100% of its work to trim and remove trees as needed and grind stumps. Winthrop owns a bucket truck and mobile two wood chippers. National Grid maintains its power line corridors.

Existing Winter Hazard Mitigation Measures

Snow disposal – Regular plowing and snow/ice removal. Sodium chloride is used primarily for road treatments. Sand is very rarely used as it creates siltation and clean up problems. The DPW works to clear roads as requested or in an emergency for the Fire and Police Departments.

Existing Wildfire Hazard Mitigation Measures

Burn Permits – The Town fire department does allow outdoor burning by permit only.

Fire Response-Winthrop responds to a brush fire or marsh fire in the same manner as other fire calls. It does not have a dedicated Forestry Division.

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

Existing Geologic Hazard Mitigation Measures

Massachusetts State Building Code – The Town enforces the State Building Code. It 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.

Section 1612.2.5 sets up seismic hazard exposure groups and assigns all buildings to one of these groups according to Table 1612.2.5. Group II includes buildings which have a substantial public hazard due to occupancy or use and Group III are those buildings having essential facilities which are required for post-earthquake recovery, including fire, rescue and police stations, emergency rooms, power-generating facilities, and communications facilities.

In the event of an earthquake and fires caused by it, 100 % of Winthrop is served by fire hydrants. The Town Fire Department has three mobile, 5Kw generators in case of power loss and a mobile light rack.

Existing Drought Hazard Mitigation Measures

Massachusetts Water Resources Authority (MWRA)- The Town purchases its drinking water from the MWRA and its wastewater is also treated by the MWRA at the Deer Island WWTP facility located directly south and adjacent to Winthrop. The MWRA, a public water authority created in 1985, provides water and waste water treatment to 61 communities and 2.5 million people in the Boston metro region. The MWRA provides extensive water demand management for its system, including drought management, under its federal National Pollutant Discharge Elimination System permit.

Existing Extreme Temperature Mitigation Measures

The Town maintains Red Cross-certified emergency shelters at the Senior Center, the High School, the Cummings School and the Fort Banks School. These shelters are available to vulnerable people during power outages when heating or air conditioning is not available.

NEW MITIGATION SINCE THE 2015 PLAN

Since the 2015 Hazard Mitigation Plan, the Town of Winthrop has made significant progress in its capacity to address climate change impacts and increase its resilience. These are summarized below.

CLIMATE ACTION PLAN

Citizens Advisory Commission on Climate

The Town established a Citizens Advisory Commission on Climate (CACC) in 2024, whose mission statement follows:"

Recognizing the immediate need for the creation of a comprehensive, informed, actionable, and dynamic climate resiliency and mitigation strategy to "futureproof" our seaside community of Winthrop, the Citizens Advisory Commission on Climate aims to support the Town of Winthrop ("Town") in accomplishing this task by serving as an advisory board to Town officials through education, awareness, and recommended courses of action with the following goals at the center of its mission:

- Baseline current climate-driven challenges for the Town, including frequent flooding, storm surge, sea level rise, etc., and the resulting financial and other implications for the Town and its residents

- Synthesize recently documented research studies regarding these challenges, and best practice recommendations on how to address them, including but not limited to:

    - "ResilientMass Plan" – 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan

    - The climate section of the 2021 "Win2030 Vision" Community Vision for Planning study

    - The 2017 "Resilient Winthrop - Designing Coastal Community Infrastructure for Climate Change" study that identified and prioritized critical vulnerable infrastructure issues and recommended mitigation and adaptation measures the town can take.

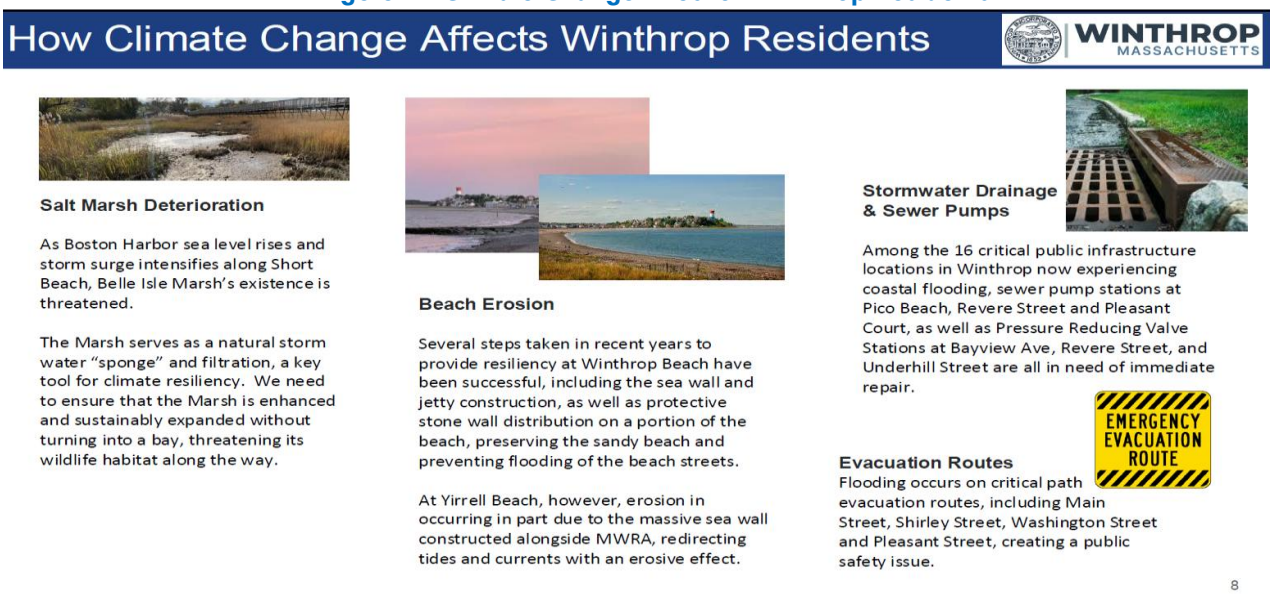
    - Plans established and actions taken by other municipalities in the greater Boston and other areas around the country and the world to integrate climate resiliency, mitigation into their bylaws, sustainable zoning and development laws, etc.

- Synthesize existing Federal and State grants and other funding opportunities as well as agencies and other consultative bodies to support action on these best practice options, including but not limited to:

- Federal Inflation Reduction Act of 2022
- MA Coastal Zone Management (CZM) Grants
- MA Municipal Vulnerability Preparedness (MVP) Program and Department of Energy & Environmental Affairs
- Assist and inform the Town Manager, Town Planner and other such leaders in their efforts to work with federal, state and local agencies to secure current and future grants to support our efforts.

The Commission has summarized how climate change affects Winthrop, as shown in Figure 42.

Figure 42 Climate Change Effect on Winthrop Residents



Source: Winthrop Citizens Advisory Council on Climate

In February 2025 the CCAC presented a Climate Action Plan for Winthrop, working document. The plan presents an overview of the impacts of climate change on the Town, and includes as set of short and long term Goals and Objectives, shown in Figure 43.

Figure 43 Climate Action Plan Goals and Objectives

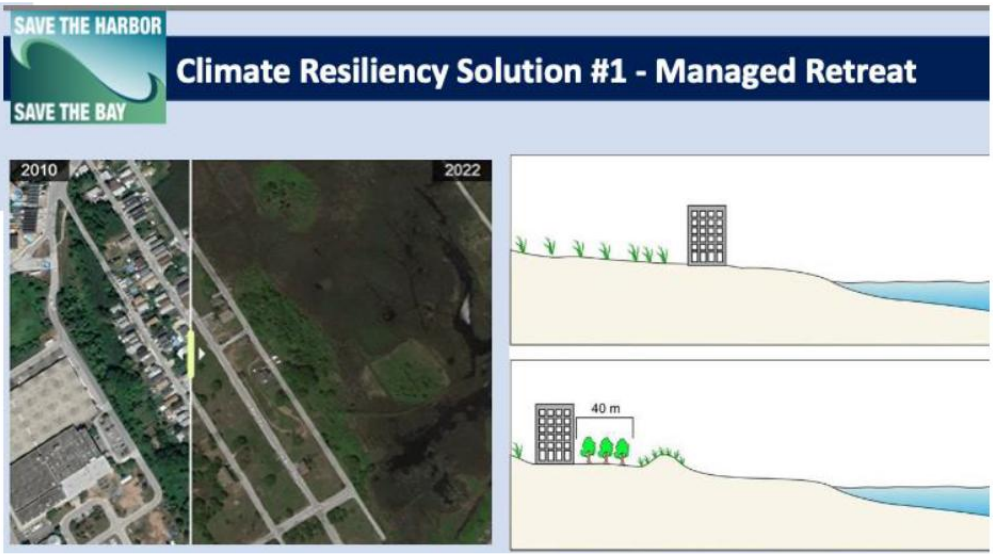
Source: Winthrop Citizens Advisory Council on Climate

The Climate Action Plan highlights several resilience actions for the Town to consider:

1. Managed Retreat
2. Beach Nourishment
3. Hardscape Seawall/Revetment
4. Nature Based Solution - Cobble
5. Nature Based Solution – Stormwater Parks
6. Nature Based Solution – Oyster Reef

Examples of these resilience measures follow in Figures 45A to 45F:

Figure 44A: Managed Retreat



Climate Action Plan for Winthrop

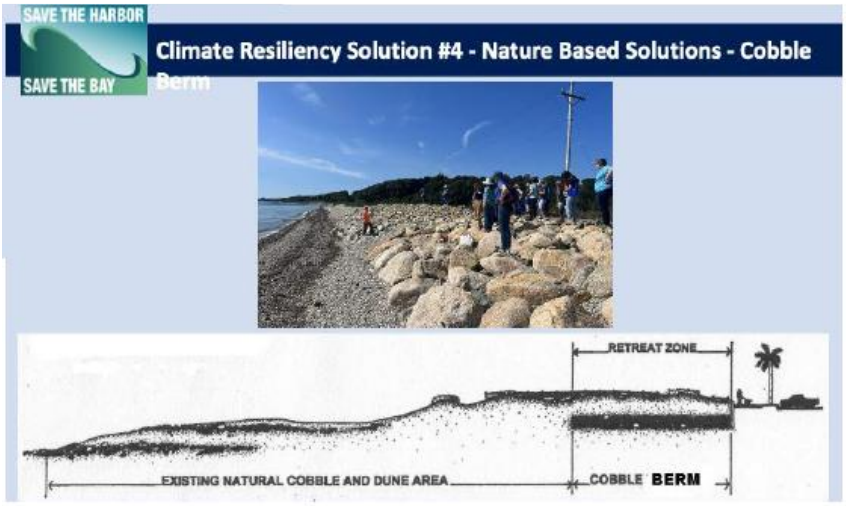
Figure 44B: Beach Nourishment

Climate Action Plan for Winthrop. CACC

Figure 44C: Hardscape Seawall/Revetment

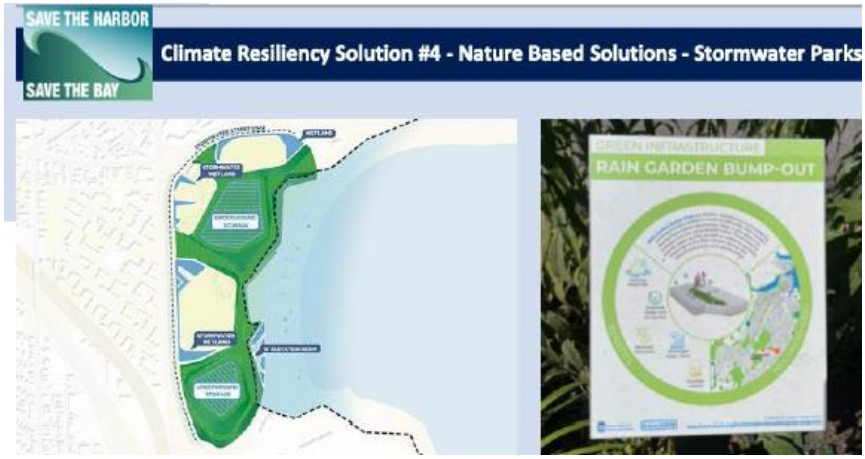
Climate Action Plan for Winthrop. CACC

Figure 44D: Nature Based Solution - Cobble



Climate Action Plan for Winthrop. CACC

Figure 44E: Nature Based Solution – Stormwater Parks



Climate Action Plan for Winthrop. CACC

Figure 44F: Nature Based Solution -Oyster Reefs

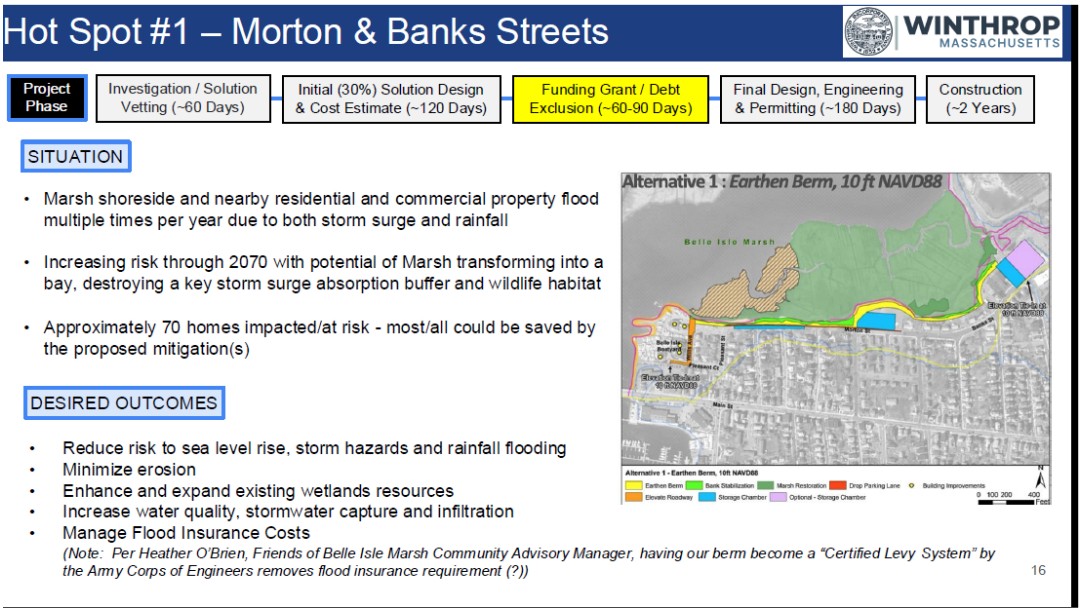
Source: Climate Action Plan for Winthrop. CACC

The CACC's Climate Action Plan identifies six "hot spots" for flooding impacts in Winthrop:

1. Morton and Banks Street
2. Short Beach ? Revere Street
3. Pico Beach / Fishermen's Bend
4. Tileston and Girdlestone Streets
5. Yirrell Beach / Point Shirley
6. Central Business District / Ingleside Park
7. Shirley Street / Delby's Corner

An example of a Hot Spot at Morton and Banks Streets is shown in Figure 46.

Figure 45: Morton and Banks Streets Hot Spot



Source: Climate Action Plan for Winthrop. CACC

RESILIENT WINTHOP

In 2017 the Town prepared ***Resilient Winthrop: Designing Coastal Community Infrastructure for Climate Change*** under a CZM Coastal Resilience Grant. The technical study was completed by the team of Stantec and the Woods Hole Group. The study provides a detailed assessment of coastal flooding risks based on the Boston Harbor Flood Risk Model (BH-FRM) commissioned by the Commonwealth of Massachusetts. The model includes future flooding scenarios for the years 2030, 2050, and 2970 for the communities on Boston Harbor. The study's overall findings are summarized in the Executive Summary:

> Based on the Boston Harbor Flood Risk Model, approximately 480 acres of Winthrop's 1.6 square miles is within a coastal flooding area in present day, 500 acres in 2030, and 800 acres in 2070 at a 1% chance water level. The 1% chance water level depicts the flood impacts of a storm event that occurs every 100 years. While the flood area doesn't expand dramatically in future years due to the geographic and topographic lay of the land (e.g. series of drumlins connected by low lying land), the depth of flooding during a storm event does increase dramatically looking to 2070. From a regional perspective, coastal flooding in Winthrop has the potential for widespread impacts given the Town's geographic location within Boston Harbor and as the only landside connection to the Massachusetts Water Resource Authority's Deer Island Wastewater Treatment Plant.

The vulnerability assessment addressed critical public infrastructure, such as shoreline structures, transportation, roadways, water and wastewater systems, telecommunications, and natural resources and open space (beaches, parks, recreational facilities). The assessment focuses on 16 sites identified in the previous Hazard Mitigation Plan, including the following, which are shown on Figure 46.:

1. Beach Fire Station
2. Belle Isle Bridge
3. Loring Rd. Boat Ramp
4. Main Street (evacuation route)
5. Pico Sewer Pump Station
6. Pleasant Court Sewer Pump Station
7. Pleasant Street (evacuation route)
8. Power Substation (Argyle Street)
9. Pressure Reducing Valve Station (Bayview Ave)
10. Pressure Reducing Valve Station (Revere St)
11. Pressure Reducing Valve Station (Underhill St)
12. Public Landing
13. Revere St. Sewer Pump Station
14. Shirley Street (evacuation route)
15. Washington Street (evacuation route)
16. Winthrop High School

Figure 46 Priority Sites Assessed

Source : *Resilient Winthrop*, Stantec & Woods Hole Group

The *Resilient Winthrop* assessment identifies eight likely flood areas in Winthrop. The report notes that, "Although Winthrop's entire 8.3 mile coastline is vulnerable to coastal flooding, evaluating the results of the BH-FRM brings to attention eight larger, regional flood areas. These locations are already known to flood during coastal storms.

The eight BHFRM Flood Areas in Winthrop include the following:

1. Belle Isle Marsh
2. Nahant Avenue
3. Winthrop Beach
4. Lewis Lake
5. Point Shirley
6. Fishermen's Bend Marsh
7. Ingleside Park
8. Girdlestone Road

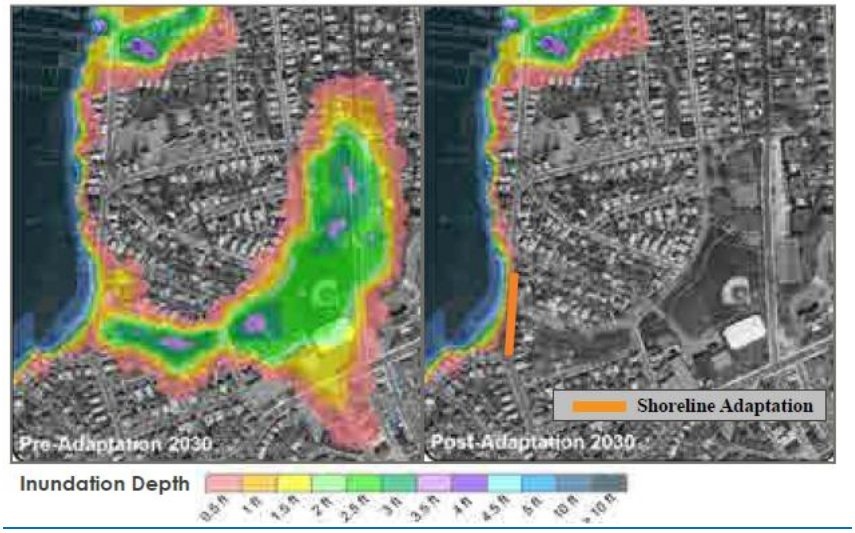
For these areas, the assessment notes the size of the flood area, land uses, Town-identified issues, current construction projects, probable future flood areas, critical public infrastructure in the 2030 and 2070 projected areas to be flooded.

Resilient Winthrop presents a set of recommended adaptation strategies for the Town to consider increasing the resilience of the areas and facilities at risk of present day and future flooding. The adaptation measures are presented in several categories:

- Relocating
- Elevating
- Wet floodproofing
- Dry floodproofing
- Perimeter Barriers
- Supervisory Contral and Data Acquisition (SCADA)

The assessment applies recommended adaptation measures to site-specific critical facilities such as sewer pumping and pressure reducing valve stations (Pleasant Court, Pico Avenue, and Revere Street), as well as area wide recommendations for the eight highest flood risk areas. An example of shoreline adaptation for Ingleside Park is shown in Figure 47 showing greatly reduce flooding in 2030 with adaptation in place.

Figure 47: Morton and Banks Streets Flood Projections



Source : *Resilient Winthrop*, Stantec & Woods Hole Group

COMMUNITY RESILIENCE BUILDING WORKSHOP (MVP)

In 2018 Winthrop participated in the state's Municipal Vulnerability Preparedness program, which featured a multi-stakeholder facilitated workshop focusing on Community Resilience Building. The workshop allowed the Town to take stock of its key assets, its climate-related vulnerabilities, and actions that can be taken to advance the community's resilience. A high level summary of the project findings follows.

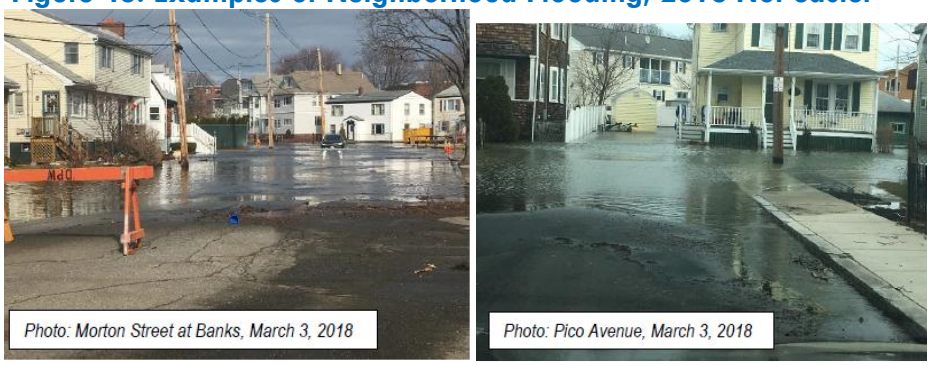
Identified Vulnerable Areas

According to the MVP report, the entire Town was highlighted as being vulnerable to natural hazard events due to its location and the fact that it is surrounded by the ocean – not just a specific neighborhood. There were specific areas mentioned by attendees at the workshop as being vulnerable and those include:

Neighborhoods

- Morton Street/Belle Isle Marsh – Low lying area, coastal surge and flooding.
- Pico Avenue/Fisherman's Bend – Experiences flooding during storm events.
- Ingleside Park – Backup and flooding due to lack of stormwater storage capacity and undersized drains. Floods during coastal storm/precipitation events.
- Point Shirley/Shirley Street – Low-lying street and adjacent seawall experience wave overtopping and flooding during storm events.
- Lewis Lake – Serves as a drainage area for part of the downtown area – lake overflows during storm events and causes localized flooding in adjacent areas.
- Yirrell Beach – Coastal surge and flooding
- Lower Nahant Avenue – Coastal surge, high tide and high precipitation events all cause backup in undersized drain lines and flooding within adjacent neighborhood.
- Coughlin Park – Coastal erosion and flooding during coastal storms.
- Bayou Street Neighborhood – Flooding due to undersized drainage line that backs up during high precipitation events.

Figure 48: Examples of Neighborhood Flooding, 2018 Nor'easter



Source, Winthrop Community Resilience Building Summary of Findings, Woodard & Curran

Ecosystems

Belle Isle Marsh, Coughlin Park, Yirrell Beach, Ingleside Park, Lewis Lake, Beaches

Transportation

Route 145 and Winthrop Parkway (also evacuation routes), Shore Drive, Morton Street, bridges, all roads in Town

Infrastructure

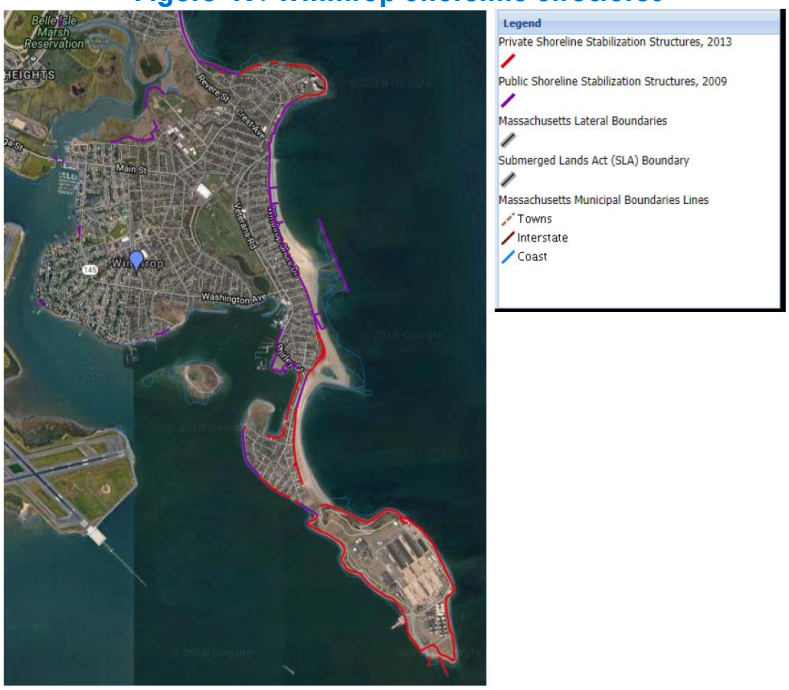
Drainage system, Water/Sewer Infrastructure, Pump Stations, Sea Walls, Utility Power, Public Safety Building, Culverts, MWRA Deer Island Treatment Plant, Municipal Services (police, fire, emergency, shelters) proximity to Logan International Airport.

Shoreline Structures

The Town of Winthrop has a variety of shoreline structures in place that offer a barrier between the built environment and the ocean. Some of the infrastructure includes stone revetments, concrete seawalls, bulkheads and breakwaters. According to data managed by the Massachusetts Office of Coastal Zone Management (CZM) regarding coastal

infrastructure, Winthrop has six structures owned by DCR and 27 town owned structures in varying condition. Half of the public shoreline structures need moderate to significant levels of repair (see Figure 50). At the CRB workshop, participants expressed the need to preserve and maintain existing and exposed seawalls so they continue to function and provide protection for the built environment.

Figure 49: Winthrop Shoreline Structures



Source, Winthrop Community Resilience Building Summary of Findings, Woodard & Curran

Road Network Vulnerability & Isolation

Access to the Town of Winthrop is primarily along Route 145, Winthrop Parkway or across the Belle Isle Bridge (Main Street). Winthrop Parkway connects the town to Revere along a narrow strip of land and this connection has been closed by the Town of Revere in the past due to storm conditions resulting in unsafe passage. With only two main roadways to access Winthrop, managing this infrastructure is critical for emergency evacuation and response. Or, if evacuation and response is not possible, managing isolation and sheltering in place becomes critical. Discussion included the town's preparedness to remain isolated for a period of time and successfully shelter in place. CRB attendees expressed their concern over the need to be better prepared for this type of situation.

MWRA Deer Island Treatment Plant & MassPort's Logan International Airport

The enormity of the road network vulnerability issue is raised even further since the primary travel route to MWRA's Deer Island Sewage Treatment Plant (which treats wastewater from 2.5 million people in Greater Boston) is located in Winthrop and can be compromised. In addition, concern was raised over the potential for a major incident to

occur at the treatment plant or nearby Logan International Airport which could impact Winthrop and/or require the evacuation of the community.

Recommendations to Improve Winthrop's Resiliency

Improving Winthrop's resiliency was discussed at the CRB workshop based on the natural hazards, strengths, vulnerabilities and actions that they defined. At the end of the CRB workshop, each group presented their findings on key actions the community should focus on to improve overall resiliency, and they were asked to identify their top three. Figure 50 summarizes the highest ranked resilience actions identified by workshop participants.

Figure 50: Winthrop CRB Top Recommendations

Rank	Action	Notes
1	Sewer & Drainage Infrastructure	Clean, maintain and upgrade (particularly in the Town Center and low-lying areas) sewer and drainage infrastructure. Seek funding for repair and replacement, design additional storage capacity and modify bylaws and incentives that would support improved conditions for projects. Work would also include flood control projects.
2	Maintain, Replace, Upgrade Seawalls	Various existing infrastructure is in place throughout Winthrop and is in need of repair and upgrade.
3	Natural and Green Infrastructure Solutions, Low Impact Development	To support or enhance the functioning of seawalls and the shoreline as a barrier and for improved stormwater management. Work would also include flood control projects.
4	Develop or redevelop a new public safety building (police, fire, ambulance)	This includes finding a site, designing the building, securing funding and completing construction of a new facility.
5	Maintain and protect Belle Isle Marsh, Coughlin Park and beaches as assets to the community for both recreation and resiliency support.	Work for areas of the community that act as natural barriers includes dune enhancement, plantings, berms, etc.
6	Identify funding for projects to increase resilience	This includes further developing the tax base to increase revenue in the community and securing the money along with leveraging local resources and representatives to seek out and secure funding for Winthrop.

Source, Winthrop Community Resilience Building Summary of Findings, Woodard & Curran

Resiliency actions that were in the top three for the groups when they reported out but did not receive the most votes include:

- **Development of an Evacuation and/or Shelter In Place Plan** to be better prepared for storm events. This would include consideration of food, a formal evacuation plan, multi-phase shelter strategy, emergency response and emergency communication.

- **Development of a culvert ID owner and repair program** where someone would be assigned to monitoring the functioning of culverts and informing the Town of any potential needed repairs.

SUMMARY OF EXISTING HAZARD MITIGATION MEAURES

Winthrop's existing hazard mitigation measures are summarized in Table 47, listed by their related categories of natural hazards. Any changes to these mitigation measures since the 2015 plan are also noted.

Table 47: Existing Essex Mitigation Measures

Existing Mitigation Measures in 2015 Plan	Effectiveness	Comments	2025 Update: Changes since 2015 Plan?
FLOODING AND COASTAL HAZARDS			
1. Participation in the National Flood Insurance Program (NFIP)/ There are 756 policies in force. Enforced by the Commissioner of Inspectional Services	Effective	Encourage all eligible homeowners to obtain insurance; add more public outreach about NFIP program availability and new FIRM maps to Town website page; consider adding info about Community Rating System if applied for.	New FEMA Flood maps were issued in 2024. The Town prepared a *Flood Resilience Checklist for Residential Properties* in 2021. The Town is considering participation in the Community Rating System
2. Conservation Commission website page	Effective.	Provide FEMA flood preparedness and building info, link to possible CRS program and potential flood-proofing incentive programs.	Has been updated
3. Public Services Operations/Maintenance	Effective.	Explore ways to increase infrastructure preventive maintenance and updating program. Create digital drainage infrastructure database.	Digital drainage database has been created. Funding needed to upgrade 8 – 10 inch outfalls and provide backflow prevention
4. 2010 Open Space Plan	Effective.	Target acquisition of open space parcels with flood storage capacity, habitat and recreational value near existing waterways.	None
5. Conservation District and Environmental Design Review	Effective.	None.	Up to date

Existing Mitigation Measures in 2015 Plan	Effectiveness	Comments	2025 Update: Changes since 2015 Plan?
6. Flood Hazard Control Regulations	Effective..	None.	The Town updated its local floodplain bylaw and map to reflect the new FIRM maps.
7. Special Development Overlay District	Effective.	None.	The Town adopted a Center Business District overlay zone.
8. Stormwater Management Bylaw	Effective.	Update to add construction and runoff controls.	The Stormwater Bylaw was updated to meet requirements of the EPA MS4 Stormwater Permit.
9. Subdivision Rules and Regulations	Somewhat Effective.	Consider referencing Stormwater Management Ordinance as standard	Currently under review.
WIND HAZARDS			
10. CEMP	Effective.	Plan is up to date	None
11. The Massachusetts State Building Code	Effective for most situations except severe storms.	None.	The Tenth Edition of the MA State Building Code to be issued in 2025
12. Tree trimming program and power line corridor maintenance.	Satisfactory	More staff funding needed.	The Town is contracting out more tree work. A new Tree Bylaw was adopted.
WINTER HAZARDS			
13. Snow Removal	Somewhat Effective.	Plans to shift to liquid calcium chloride only.	The town continues to use sodium chloride, not liquid calcium chloride, for de-icing
14. Winter Hazards webpage	Effective	None.	None
WILDFIRE HAZARDS			
15. Outdoor burning is allowed by permit only.	Effective.	Brush fire truck, pump and hose needed.	The Town has guidelines for outdoor burning, not permits.

Existing Mitigation Measures in 2015 Plan	Effectiveness	Comments	2025 Update: Changes since 2015 Plan?
			Information via town website and flyers . Burning of leaves and yard waste Is not allowed
16. Water availability: 100 % of Town is served by hydrants; tanker truck agreements with District 13; authority to take water from surface supplies.	Effective.	None.	The Town is part of Metro Fire District 13, which has two Strike Teams for response.
17. Development Review	Effective.	None.	None.
GEOLOGIC HAZARDS			
18. The Massachusetts State Building Code	Effective.	None.	The Tenth Edition of the MA State Building Code to be issued in 2025
19. Mobile generators and light pole for power/light backup	Effective.	Light tower and 2 5 kW mobile generators	The Town has a 50K watt generator for Town Hall and pumping station
DROUGHT HAZARDS			
20. MWRA Drought Management	Effective.	None	Adopt guideline for drought tolerant landscaping
EXTREME TEMPERATURE HAZARDS			
21. Town shelters	Effective.	Green Buildings, Education and Awareness.	None.

Existing Mitigation Measures in 2015 Plan	Effectiveness	Comments	2025 Update: Changes since 2015 Plan?
MULTI-HAZARDS MITIGATION			
22. Comprehensive Emergency Management Plan (CEMP)	Emphasis is on emergency response.	None.	None.
23. Communications: • Reverse 911-Code Red • Member of NERAC • MBTA Mobile Command Unit	Effective	None.	Mobile light tower needed
24. Emergency Management Website page	Effective.	Consider adding more information about NFIP availability and flooding preparedness.	Website has been updated
25. Emergency Power Generators	Effective.	Install back feed from Emergency Operations Center generator to Town Hall.	None
26. Massachusetts State Building Code	Effective for new construction..	Consider adding property owner incentives to exceed Building Code base flood elevation requirements.	The Tenth Edition of the MA State Building Code to be issued in 2025
27. Hazardous Facilities Emergency Response Plans	Effective.	None.	None.
28. Mystic Region Emergency Management Planning Committee (REPC) and Winthrop Local Emergency Planning Committee	Regional cooperation on natural and manmade disasters.	None.	None.

NEW MITIGTION SINCE THE 2015 PLAN

HAZARD TYPE	NEW MITITATION MEASURE
Climate Resilience	Winthrop Climate Action Plan - Winthrop Climate Commission
Climate Resilience	North Suffolk Office of Resilience and Sustainability
Climate Resilience	Community Resilience Building (MVP Program) 2018
Coastal Hazards	Yirrell Beach Management Plan
Multi-Hazards	High Water Rescue Vehicle
Multi-Hazards	Dispatch Center

Local Capacity for Implementation

Under the Massachusetts system of "Home Rule," the Town of Winthrop is authorized to adopt and from time to time amend a number of 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 Bylaws, Health Regulations, Public Works regulations, and local enforcement of the State Building Code. Local Bylaws may be amended each year at the annual 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, such as the Planning Board or Conservation Commission.

The Town of Winthrop has recognized several existing mitigation measures that require implementation or improvements, and the Town has the capacity within its local boards and departments to address these. The Winthrop Department of Public Works and will address the needs for stormwater management, including repairs and upgrades to drainage infrastructure, as well as management of coastal protection facilities not operated by the Commonwealth of Massachusetts. The Planning Board will address implementation of the Zoning Ordinance, Floodplain District, and Subdivision Rules and Regulations. The Building Commissioner will enforce the provisions of the Floodplain District Zoning Bylaw. The Conservation Commission will oversee implementation of the Wetlands Protection Act and the Open Space Plan. The Department of Public Works will oversee implementation of the Stormwater Management Plan.

Opportunities to Expand and Improve the Capacity to Reduce Risk

The Town of Winthrop can build on its existing planning tools by more fully integrating hazard mitigation and climate resilience into future updates of key plans, including the Winthrop 2030 plan The Town has taken steps to increase its local capacity including:

- Establishment of the Winthrop Climate Commission
- Regional coordination with the North Suffolk Office of Resilience and Sustainability
- Participation in the state's Municipal Vulnerability Preparedness program

A comprehensive review of local land use codes (zoning, subdivision, and stormwater regulations) could introduce stronger climate-adaptive measures such as Low Impact Development (LID), green infrastructure, and nature-based solutions. Incorporating hazard data from this plan into the next Comprehensive Emergency Management Plan (CEMP) would also improve coordination and preparedness.

To strengthen administrative capacity, Winthrop could expand training opportunities for municipal staff and create protocols to retain institutional knowledge during staff transitions to support long-term continuity. Enhanced GIS capabilities and a system for tracking local hazard losses would further improve planning and risk analysis.

Financially, the Town can embed resilience priorities into its annual budget and capital planning process to support infrastructure upgrades, including as local matches for state and federal grants.

SECTION 7: MITIGATION MEASURES FROM THE 2015 PLAN

Implementation Progress on the Previous Plan

At a meeting of the Winthrop Hazard Mitigation Team, Town staff reviewed the mitigation measures identified in the 2015 Winthrop Hazard Mitigation Plan and determined by 2025 which measures had been implemented, partially implemented, or deferred. Of those measures that had been deferred, the local team evaluated whether the measure should be deleted or carried forward into this Hazard Mitigation Plan 2024 Update. The team also considered the option of retaining but modifying an existing mitigation measure to reflect changing circumstances or a better understanding of the kind of mitigation needed to address a vulnerability. The decision on whether to delete, retain, or modify each mitigation measure was based on the local team'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, lack of funding or other issue. Table 48 below summarizes the status of mitigation measures.

Winthrop has made considerable progress on implementing mitigation measures since the 2015 Hazard Mitigation Plan. Many of the measures identified in that plan are now on-going aspects of the regular work of Town staff, from the department head level to the Public Works staff. As indicated on Table xx Winthrop has completed many mitigation measures identified in the 2015 Hazard Mitigation Plan. Recommended mitigation measures that have been completed include the following:

Completed Mitigation Projects

- Winthrop Shore Drive seawall
- Floodplain District Management
- Floodplain mapping updates
- Plan for storm surge events.
- Limit development in V-Zones.
- Adopt coastal A-Zones.
- Update building permit to add incentives for additional height above BFE
- Climate change master plan update or action plan
- Drainage preventive practices: vactor truck
- Stormwater best practices training
- Increase wetlands law enforcement practices
- Digitally map storm drains and outfalls
- Wetlands and Stormwater Outreach program
- Update stormwater ordinance
- Update tree maintenance program
- Regional Sea Level Rise Action Work Group participation

- Partner with utility to document hazard areas
- Retrofit at-risk critical, public building roofs to withstand snow loads
- Construct snow fences
- ID populations vulnerable to long term power outage
- Include wildfire risk and mitigation in comprehensive planning
- Inspect fire hydrants on a routine basis
- Require Green Building and parking best practices
- Purchase new trailer-mounted light tower
- Purchase two, 5kW trailer-mounted mobile generators
- Upgrade radio repeater units
- Assess and map community risk
- Winthrop obtained high water rescue vehicles
- Winthrop obtained an inflatable rescue raft

Partially Completed Mitigation Projects

All partially completed mitigation projects will be carried over to the 2025 updated plan:

- Lewis Lake drainage upgrade
- Boston Harbor Drainage Outfall Headwalls / Seawalls
- Consider Community Rating System application
- Acquire/pre-serve vacant flood prone lands as or if they become available.
- Work to ensure electrical utilities are properly maintained
- Upgrade emergency generators: Town Hall/EOC
- Integrate mitigation into local planning
- Increase hazard education and risk awareness

Mitigation Not Completed;-to be Retained in the 2025 Plan Update

Of the mitigation measures that were not completed, the Team decided to retain most in the 2025 plan update:

- Yirrell Beach project
- Complete utility elevation project in flood hazard area
- Ingleside Park drainage upgrade
- Lower Nahant Avenue drainage upgrade
- Upgrade Bayou Street drain line
- Assess vulnerability to severe winds
- Implement a structural retrofit program for town's priority at risk buildings
- Develop and maintain a wildfire database
- Incorporate drought tolerant species into regulations

- Require permeable driveways to promote infiltration and reduce runoff
- Incentivize hazard mitigation (Stormwater fee with incentives)

Mitigation to be Deleted for the 2025 Plan Update

Based on current conditions and town priorities, several mitigation recommendations from the 2015 plan will not be carried over to the 2025 updated plan, including:

- Finish Pico Beach pump station project (wet well & I/I)
- Tornado Safe Room Promotion and construction
- Develop an inventory and assess the earthquake vulnerability of all public and commercial buildings.
- Implement a structural retrofit program for town's priority at risk buildings
- Conduct an inventory of steep slope areas where landslides may be higher risk.
- Develop and maintain a database to track community vulnerability to landslides
- Perform arson prevention activities
- Develop plan to transport water treatment chemicals to Deer Island Wastewater Treatment Plant by barge

Mitigation Priority Changes

The Hazard Mitigation Team considered the priority rankings of mitigation measures to be carried over to the 2025 updated plan and whether any of these should be revised. All mitigation measures will retain the same priority level in the updated plan.

Implementation Next Steps

Moving forward into the next five-year plan implementation period the Town will seek opportunities to incorporate hazard mitigation into its decision-making processes. The challenges the Town faces in implementing many of 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.

Winthrop will be increasing its integration of natural hazard mitigation into its community planning processes by building on priority mitigation actions included in this update of its Hazard Mitigation Plan. The Town will seek opportunities to incorporate hazard mitigation actions into its land use, environmental, capital, and transportation planning efforts.

Table 48: Status of Mitigation Measures from the 2015 Plan

	RECOMMENTED MITIGATON FROM THE 2015 HAZARD MITIGATION PLAN	TYPE OF MITIGATION	PRIORITY	CURRENT STATUS 1. Completed 2. Partially Completed 3. Not Completed	2025 PLAN UPDATE 1. KEEP in the 2025 Plan 2. REVISE for the 2025 Plan 3. DELETE from the 2025 Plan
FLOODING					
A	Yirrell Beach project	Structural Projects	H	**Not Completed**	**Keep in 2025 plan** and Coordinate with Boston
B	Complete utility elevation project in flood hazard area	Structural Projects	H	**Not Completed**	**Keep in 2025 plan**
C	Winthrop Shore Drive seawall	Structural Projects	H	**Completed - DCR**	Delete from 2025 plan
D	Lewis Lake drainage	Structural Projects	H	**Partially Completed** Town did $4million project, regrading and closed pipe; and $2million fully-automated tide gate; Mosquito Control Commission dredged ditches for and removed phragmites for drainage improvements	**Keep in 2025 plan**
E	Ingleside Park	Structural Projects	H	**Not Completed**	**Keep in 2025 plan**
F	Lower Nahant Avenue	Structural Project	H	**Not Completed**	**Keep in 2025 plan**
G	Boston Harbor Drainage Outfall Headwalls / Seawalls	Structural Project	H	**Partially completed**, backflow preventers for 73 outfalls; Point Shirley increased drainage capacity.	**Keep for 2025 plan**
H	**Consider Community Rating System application**	Flood Damage Reduction	H	**In Progress** – Town is working to prepare for CRS status	**Keep in 2025 plan**
I	Floodplain District Management	Flood Damage Reduction	H	**Completed** 2024	Delete from 2025 plan

	RECOMMENTED MITIGATON FROM THE 2015 HAZARD MITIGATION PLAN	TYPE OF MITIGATION	PRIORITY	CURRENT STATUS 1. Completed 2. Partially Completed 3. Not Completed	2025 PLAN UPDATE 1. KEEP in the 2025 Plan 2. REVISE for the 2025 Plan 3. DELETE from the 2025 Plan
J	Floodplain mapping updates	Natural Resource Protection	H	**Completed**	Delete from 2025 plan
K	Acquire/pre-serve vacant flood prone lands as or if they become available.	Natural Resource Protection	H	**In Progress** – the Town is reviewing this option	**Keep in 2025 plan**
L	Plan for storm surge events.	Prevention	H	**Completed,** – addressed in the Comprehensive Emergency Management Plan	Delete from 2025 plan
M	Limit development in V-Zones.	Prevention	H	**Completed,** Building code in flood zones	Delete from 2025 plan
N	Adopt coastal A-Zones.	Prevention	H	Completed	Delete from 2025 plan
0	Update building permit to add incentives for additional height above BFE for new homes in V or A flood zones	Prevention	M	**Completed** – Updated online permitting streamlining	Delete from 2025 plan
P	Climate change master plan update or action plan	Prevention	M	**Completed** – Winthrop 2030 Plan and created Climate Commission	Delete from 2025 plan
Q	Drainage preventive practices: vactor truck	Prevention	M	**Completed;** replacement truck is being built	Delete from 2025 plan
R	Stormwater best practices training	Prevention	M	**Completed** – MS4 Stormwater	Delete from 2025 plan
S	Upgrade Bayou Street drain line	Prevention	M	**Not Completed**	**Keep/Revise for 2025 plan** – Modify, consider closed pipe system
T	Increase wetlands law enforcement practices	Natural Resource Protection	M	**Completed**	Delete from 2025 plan

	RECOMMENTED MITIGATON FROM THE 2015 HAZARD MITIGATION PLAN	TYPE OF MITIGATION	PRIORITY	CURRENT STATUS 1. Completed 2. Partially Completed 3. Not Completed	2025 PLAN UPDATE 1. KEEP in the 2025 Plan 2. REVISE for the 2025 Plan 3. DELETE from the 2025 Plan
U	Finish Pico Beach pump station project (wet well & I/I)	Structural Project	M	**Not completed;** no longer a Town priority	Delete from 2025 plan
V	Digitally map storm drains and outfalls	Prevention	L	**Completed**-MS4 Permit	Delete from 2025 plan
W	Wetlands and Stormwater Outreach program	Natural Resource Protection	L	**Completed** – Climate Commission established; and public meetings on stormwater	Delete from 2025 plan
X	Update stormwater ordinance	Prevention	L	**Completed** – Administrative Site Plan Review addresses stormwater	Delete from 2025 plan
WIND HAZARDS					
Y	Update tree maintenance program	Emergency Services	M	**Completed**	Delete from 2025 plan
Z	Assess vulnerability to severe winds	Prevention	M	**Not completed**	**Keep in 2025 plan**
AA	Work to ensure electrical utilities are properly maintained	Emergency Services Protectic	M	**Partially completed;** utility poles inspected	**Keep in 2025 plan**
BB	Tornado Safe Room Promotion and construction	Prevention	M	**Not Completed;** no longer a Town priority	Delete from 2025 plan
WINTER STORM HAZARDS					
CC	**Regional Sea Level Rise Action Work Group participation**	Prevention	M	**Completed** – North Suffolk Office of Resilience includes Winthrop, Revere, and Chelsea	Delete from 2025 plan
DD	**Partner with MEMA and FEMA on Winter Storm Preparedness**	Prevention	M	**Completed** – addressed in the Comprehensive Emergency Management Plan	Delete from 2025 plan

	RECOMMENTED MITIGATON FROM THE 2015 HAZARD MITIGATION PLAN	TYPE OF MITIGATION	PRIORITY	CURRENT STATUS 1. Completed 2. Partially Completed 3. Not Completed	2025 PLAN UPDATE 1. KEEP in the 2025 Plan 2. REVISE for the 2025 Plan 3. DELETE from the 2025 Plan
EE	Partner with utility to document hazard areas	Prevention	M	**Completed** – ongoing coordination with National Grid	Delete from 2025 plan
FF	Retrofit at-risk critical, public building roofs to withstand snow loads	Prevention	M	**Completed**-addressed by Building Code	Delete from 2025 plan
GG	Construct snow fences	Structural Project	M	**Not completed** – No longer a Town priority	Delete from 2025 plan
HH	ID populations vulnerable to long term power outage	Prevention	M	**Completed** – Senior Facilities in town	Delete from 2025 plan
GEOLOGIC HAZARDS					
II	Develop an inventory and assess the earthquake vulnerability of all public and commercial buildings.	Prevention	L	**Not completed,** most town buildings are newer, built under recent Building Code with seismic standards	Delete from 2025 plan
JJ	Implement a structural retrofit program for town's priority at risk buildings	Structural	L	**Not completed,** most town buildings are newer, built under recent Building Code with seismic standards	Delete from 2025 plan
KK	Conduct an inventory of steep slope areas where landslides may be higher risk.	Prevention	L	**Not completed,** no landslide risk areas in Winthrop	Delete from 2025 plan
LL	Develop and maintain a database to track community vulnerability to landslides	Prevention	L	**Not completed,** no landslide risk areas in Winthrop	Delete from 2025 plan
WILDFIRE HAZARDS					
MM	Develop and maintain a wildfire database	Prevention	L	**Not Completed**	**Keep in 2025 plan**
NN	Include wildfire risk and mitigation in comprehensive planning	Prevention	L	**Completed** – addressed in the Comprehensive Emergency Management Plan	Delete from 2025 plan

	RECOMMENTED MITIGATON FROM THE 2015 HAZARD MITIGATION PLAN	TYPE OF MITIGATION	PRIORITY	CURRENT STATUS 1. Completed 2. Partially Completed 3. Not Completed	2025 PLAN UPDATE 1. KEEP in the 2025 Plan 2. REVISE for the 2025 Plan 3. DELETE from the 2025 Plan
OO	Perform arson prevention activities	Natural Resource Manageme	L	**Not completed;** not a natural hazard, no longer town priority	Delete from 2025 plan
PP	Inspect fire hydrants on a routine basis	Emergency Services Protectic	L	**Completed**	Delete from 2025 plan
EXTREME TEMPERATURES					
QQ	Require Green Building and parking best practices	Prevention	L	**Completed:** Winthrop is a designated Green Community; adopted the Stretch Building Code and a Tree Bylaw	Delete from 2025 plan
RR	Create and maintain a data base to track those vulnerable to extreme temperatures	Prevention	L	**Completed** Board of Health tracks locations at risk	Delete from 2025 plan
DROUGHT					
SS	Incorporate drought tolerant species into regulations	Prevention	L	**Not completed**	**Keep in 2025 plan**
TT	Require permeable driveways and surfaces to promote infiltration and reduce runoff	Prevention	L	**Not completed**	**Keep in 2025 plan**
MULTIPLE HAZARD					
UU	Upgrade emergency generators: Town Hall/EOC	Emergency Services Protectic	H	**Partially complete;** town has generators at Police station, Schools, Dept. of Public Works, water tower, portable trailer; new Fire Station will have generator	**Keep in 2025 plan**
VV	Purchase new trailer-mounted light tower	Emergency Services Protectic	H	**Completed**	Delete from 2025 plan

	RECOMMENTED MITIGATON FROM THE 2015 HAZARD MITIGATION PLAN	TYPE OF MITIGATION	PRIORITY	CURRENT STATUS 1. Completed 2. Partially Completed 3. Not Completed	2025 PLAN UPDATE 1. KEEP in the 2025 Plan 2. REVISE for the 2025 Plan 3. DELETE from the 2025 Plan
WW	Purchase two, 5kW trailer-mounted mobile generators	Emergency Services Protectic	H	**Completed**	Delete from 2025 plan
XX	Develop plan to transport water treatment chemicals to Deer Island Wastewater Treatment Plant by barge	Emergency Services Protectic	H	**Not completed –** water transportation not a viable option	Delete from 2025 plan
YY	Upgrade radio repeater units	Emergency Services Protectic	H	**Completed**	Delete from 2025 plan
ZZ	Assess and map community risk	Prevention	H	**Completed**	Delete from 2025 plan
AAA	Integrate mitigation into local planning	Prevention	H	**Partially completed** – Winthrop 2030 Plan	**Keep in 2025 Plan** – continue and expand local mitigation planning
BBB	Incentivize hazard mitigation	Prevention	H	**Not completed**	**Keep in 2025 Plan;** consider Stormwater Fee with incentives for MS4 compliance; consider CRS
CCC	Increase hazard education and risk awareness	Public Education & Awarenes	H	**Partially completed** – Town maintains Emergency Management web page	**Keep in 2025 plan** and expand the public education effort
NEW	Winthrop obtained high water rescue vehicles	Emergency Services Protectic		**Completed**	Delete from 2025 plan
NEW	Winthrop obtained an inflatable rescue raft	Emergency Services Protectic		**Completed**	Delete from 2025 plan

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 two mitigation grant programs, the Hazard Mitigation Grant Program (HGMP), and the Flood Mitigation Assistance (FMA) program. The links below provide additional information on these programs.

https://www.fema.gov/hazard-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 numerous municipalities across a wide area of the region.

Regional Partners

In the densely developed communities of the study area, mitigating natural hazards, particularly flooding, is more than a local issue. The drainage systems that serve these communities are a complex system of storm drains, roadway drainage structures, pump stations and other facilities owned and operated by a wide array of agencies including but not limited to the Town of Winthrop, the Department of Conservation and Recreation (DCR), and Massachusetts Department of Transportation (MassDOT). The planning, construction, operations, and maintenance of these structures are integral to the flood hazard mitigation efforts of communities. These agencies should be considered the community's regional partners in hazard mitigation. These agencies also operate under the same constraints as communities do, including budgetary and staffing constraints and numerous competing priorities. In the sections that follow, the plan includes recommendations for activities where cooperation with these other agencies may be necessary. Implementation of these recommendations will require that all parties work together to develop solutions.

Inter-Community Considerations

The flooding situation at Point Shirley has regional impacts because it is the key access point for Winthrop emergency equipment to reach the Deer Island Sewage Treatment Plant. Because Deer Island is a regional facility, Winthrop public safety personnel must be able to get to the facility quickly. The extension of the seawall from Wyman Street to Deer Island would alleviate flooding that impacts residences and help to alleviate the roadway flooding that can impede access to Deer Island.

Sea Level Rise and Shoreline Environment – The coastal shoreline of the North Shore area is a dynamic environment where forces of sea-level rise, erosion and deposition of are constantly at work changing the shoreline profile. This process disregards municipal boundaries as sand and other materials are moved along the coast. Shoreline protection measures such as seawalls, jetties, and others have an impact on this process with the potential of building up materials in some areas while stripping it away from others. Municipalities along the North Shore should work to understand how these processes and others associated with sea level rise and storm surge are at work locally and consider mutually beneficial means of protecting their shore side communities from the impacts of storm damage and sea-level rise. Since the previous plan, Winthrop joined with Revere and Chelsea to establish the North Suffolk Office of Resilience and Sustainability (NSORS). This regional collaboration provides an opportunity for the participating municipalities to coordinate their efforts to plan for and address sea level rise, storm surge and related climate adaptation issues on a regional basis.

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 Zoning and By-laws adopted by the Town, the Wetlands Act enforced by the Conservation Commission, the Stormwater Management bylaw enforced for new development, the Subdivision Rules and Regulations enforced for new development, and the Open Space and Recreation Plan, 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 implementing Town's Climate Action Plan, the Resilient Winthrop project, and the Winthrop 2030 Plan; updating the Open Space and Recreation Plan, updating the Floodplain regulations to be consistent with any future changes to the Flood Insurance Rate Maps, and participating in the Resilient Coasts plan released by MA Coastal Zone Management and the Municipal Vulnerability Preparedness 2.0 program.

Overview of the Updated 2025 Mitigation Strategy

The Winthrop Hazard Mitigation Team identified a number of mitigation measures that would serve to reduce the Town's vulnerability to natural hazard events, with a focus on flooding and coastal flooding.

COASTAL FLOODING

A. **Yirrell Beach**- Complete the Yirrell Beach project by extending the seawall to Deer Island approximately 1,000 feet. coordinate with the City of Boston. There is a seawall at Yirrell Beach that stops about 1,000 feet short of Deer Island. This seawall is occasionally breached which results in sand coming up over the wall. This sand has been removed by the MWRA. Because the seawall ends at Wyman Street, this street floods, which can affect up to 40 homes. In March of 2003, the Town had to remove four feet of gravel that had washed up on Wyman Street. The Town has trenched the street so that water flows away from the street but the longer term solution would be to extend the seawall 1,000 feet to Deer Island. The Town did apply for a FEMA hazard mitigation grant to extend the seawall but received funding for storm drain improvements associated with the current seawall only.

B. **Lewis Lake-** The town has partially completed mitigation work since the previous Hazard Mitigation Plan, and will complete the project during the 2025 plan cycle. The previous plans for closed piping was not cost effective, so the Town proceeded with other mitigation actions, including the installation of a $2 million fully automated tide gate and regrading of drainage. The Mosquito Control Commission dredged ditches to improve drainage and control Phragmites. With increasingly intense precipitation events, Lewis Lake has taken on a new importance as a critical stormwater storage area for Winthrop.

C. **Boston Harbor Drainage Outfalls, Headwalls, and Seawalls:** The south and west facing shores of Winthrop on Boston Harbor area are impacted during storm events by what local residents call the "Boston Harbor bathroom effect." Tidal storm surge combines

with inland flooding, in which freshwater precipitation is unable to drain into the ocean due to wind, tide and storm surge driving seawater up into storm drain lines, trapping runoff and causing localized flooding in these neighborhoods.

The Town has partially completed mitigation actions since the previous Hazard Mitigation Plan. Backflow preventers have been installed on 7 of the 63 stormwater outfalls in this area. The Town will work to complete the installation of backflow preventers on the rest of the 63 outfalls during the 2025 Hazard Mitigation planning cycle, and upgrade seawalls and headwalls at Woodside Street, Somerset Street, Sargent Street, and Cottage Park.

D. **Community Rating System:** The Town should consider participating in the FEMA Community Rating System (CRS) program to lower flood hazard risk, raise community awareness and quality for lower flood hazard insurance premiums. See information at: http://ma.stormsmart.org/home/community-rating-system-crs-primer/ Completing this 2025 updated Hazard Mitigation Plan with data on Repetitive Loss properties, will help fulfill FEMA's eligibility requirements for CRS.

E. **Acquisition of Vacant Flood Prone Lands**: Acquire priority open space parcels, such as the Corinth Beach property acquired by the Town in the late 1980s, in floodplain and coastal surge areas in order to maintain flood storage and water infiltration capacity.

FLOODING FROM PRCIPITATION

F. **Ingleside Park:** complete drainage assessment of the park and upgrade undersized drainage infrastructure. The park is at sea level with a pipe that drains to the bay. There is a valve that shuts during heavy tides but the area may need a pump station as well. To help with flooding in this area, the Town has constructed dikes around two homes as a temporary solution.

G. **Lower Nahant Avenue**: replace undersized drainage line, upgrade existing Nahant Avenue drainage outfall headwall and install flapper valve.

H. **Bayou Street:** replace undersized drainage line.

I. **Morton Street:** Implement drainage improvements, including 13 outfalls, backflow preventors, and outfall chambers. A feasibility study has been completed by Woods Hole Group, estimated cost $13 million.

J. **Girdlestone Road/Tileston Road:** Implement drainage improvements, including work on two outfalls and seawall upgrades.

K. **Pico Avenue :** Implement drainage improvements.

L. **Complete project to elevate utility lines** for homes in flood hazard areas. This is listed as a High Priority action as the project has received funding, and Town considers it very important to complete the project.

EXTREME WEATHER (WIND) AND WINTER STORM HAZARDS

M. **Utility Resilience**: Work with the local electrical utility and Department of Public Works to take actions to increase resilience. Since the previous Hazard Mitigation Plan utility poles have been inspected to ensure that they meet specifications. Other related mitigation measures include the following:

- Informing the utility of the Town's updated tree maintenance program and establish standards for all tree pruning around utility lines;
- Incorporating the inspection and management of hazardous trees into the drainage system maintenance process.
- Upgrading overhead utility lines- e.g. adjust utility pole size, utility pole span widths, and/or line strength.
- Using designed-failure mode for power line design to allow lines to fall or fail in small sections rather than as a complete system to enable faster restoration.
- Installing redundancies and loop feeds.

WILDFIRE HAZARDS

N. **Develop and maintain a database** to track the location of any wildfire hazards.

DROUGHT HAZARDS

O **Incorporate drought tolerant native species** into development landscape regulations.

P. **Using permeable driveways and surfaces** to promote groundwater infiltration and reduce stormwater runoff.

MULTI HAZARDS

Q **Emergency Power Generators:** Generators have been installed at the Police Station, Dept. of Public Works, schools, water tower, and the town has a portable trailer generator. Continue to install emergency power generator at the new Fire Station and at Town Hall. The Town is looking to install Storm Switch.

R. **Micro Grid:** Investigate the benefits and feasibility of establishing a micro grid to ensure resilient energy supply to critical facilities when the regional grid is down during hazard events. Identify facilities to be served, types of interconnections, and alternative offline energy sources such as generators, solar, and battery storage.

S. **Coordinated Access and Evacuation:** Collaborate with the Cit of Boston, DCR, and MassDOT to ensure coordinated and effective access connecting Winthrop to the mainland for emergency access and evacuation if needed during an extreme event.

T. **Integrate Hazard Mitigation** into local plans and land use review processes:

- Incorporate risk assessment and hazard mitigation principles into local capital improvement, master, and open space planning efforts.

- Incorporate an element for hazard mitigation into the local development and subdivision review process.

- Determining and enforcing acceptable land uses to alleviate the risk of damage by limiting exposure in such hazard areas.

- Involve citizens in all comprehensive planning activities that identify and mitigate hazards.

U. **Incentivize Hazard Mitigation** by adopting a local Stormwater Fee that includes incentives for improving stormwater management on properties.

V. **Increase Hazard Education and Risk Awareness**: the Town included hazard information on the Emergency Management web page. The Town should enhance public outreach by holding an annual public hazard mitigation workshop with participants for Town officials as well as MEMA, FEMA and private industry (such as insurance) on natural hazards and mitigation

Overall, the Town' hazard mitigation strategy recognizes that mitigating hazards for Winthrop 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 regional and local factors impact the Town's vulnerability, and local officials will need to work together across municipal lines and with state and federal agencies to address these changes.

This Hazard Mitigation Strategy is intended to provide the Town with a "roadmap" to key actions that will improve its resilience to natural hazards. Relevant findings of the plan will be incorporated into other related municipal plans and policies, such as the Capital Investment Plan, the Municipal Vulnerability Preparedness 2.0, and the next update of the Open Space and Recreation Plam and Master Plan.

Process for Setting Priorities for Mitigation Measures

The last step in developing Winthrop'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. The prioritization criteria are summarized below:

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 $200,000
Medium	Estimated costs between $50,000 to $200,000
Low	Estimated costs less than $50,000 and/or staff time
Overall 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. . Medium priority measures would address a hazard of concern to the town, but costs may not be in proportion to the benefits achieved.
Low	Not clear if action has political and public support and not certain that necessary maintenance can occur following the project. . Low priority measures would not address significant or high priority hazards and/or the cost would not be in proportion to the benefits.

Table 49 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 an estimate of the overall benefit and cost of the measures. The benefits, costs, and overall priority were evaluated in terms of:

Table 49: Mitigation Measure Prioritization

Mitigation Action	Geographic Coverage	Estimated Benefit	Estimated Cost	Overall Priority
Coastal Flood Hazards				
A. **Yirrell Beach** project	Yirrell Beach	High	High	High
B. **Lewis Lake** drainage improvements	Lewis Lake	High	Medium	High
C. **Boston Harbor Drainage Outfall** upgrade headwalls and seawalls	Point Shirley	High	Medium	High
D. **Community Rating System:** Consider submitting a CRS application	Townwide	Medium	Low	High
E. **Land acquisition:** Acquire/pre-serve vacant flood prone lands as or if they become available.	Townwide	Medium	High	Medium
Flooding From Precipitation				
F. **Ingleside Park** drainage assessment and improvements	Ingleside Park area	High	High	High
G. **Lower Nahant Ave** drainage improvements	Nahant Avenue	High	Low	High
H. **Upgrade Bayou Street** drain line; consider closed pipe system	Bayou Stret	High	Low	Medium
I. **Morton Street:** Implement drainage improvements, including 13 outfalls, backflow preventors, and outfall chambers.	Morton Street	High	High	High
J. **Girdlestone Road/ Tileston Road:** Implement drainage improvements, including work on two outfalls and seawall upgrades	Girdlestone Road/Tileston Road	High	High	High
K. **Pico Ave:** Implement drainage improvements	Pico Avenue	High	Medium	High

Table 49: Mitigation Measure Prioritization

Mitigation Action	Geographic Coverage	Estimated Benefit	Estimated Cost	Overall Priority
L. **Elevations:** Complete utility elevation project in flood hazard areas		Medium	Medium	Medium
Extreme Weather/Winter Hazards				
M. **Utilities:** Work to ensure resilience of electrical utilities	Townwide	Medium	Low	Medium
Brushfire Hazards				
N. Develop and maintain a **wildfire database**	Townwide	Low	Low	L:ow
Drought Hazards				
O. Incorporate **drought tolerant species** into land use regulations	Townwide	Low	Low	Low
P. **Require permeable driveways** and surfaces to promote infiltration and reduce runoff	Townwide	Medium	Low	Medium
Extreme Temperature Hazards				
Q. **Public education** on cooling centers and warming centers.	Townwide	Medium	Low	Medium
Geologic-Hazards				
R. **Seismic Building Code:** Local enforcement of the seismic requirements of the MA Building Code	Townwide	Low	Low	Low
Muli-Hazards				
S. **Upgrade emergency generators:** Town Hall/EOC	Town Hall / EOC	High	Medium	High
T. **Micro Grid:** Investigate the benefits and feasibility of establishing a micro grid to ensure resilient energy supply to critical facilities	Town center area	Medium	High	Medium

Table 49: Mitigation Measure Prioritization

Mitigation Action	Geographic Coverage	Estimated Benefit	Estimated Cost	Overall Priority
U. **Coordinated Access and Evacuation:** Collaborate with DCR, MassDOT and Boston to ensure coordinated access connecting Winthrop to the mainland for emergency access and evacuation.	Townwide	High	Medium	High
V. **Integrate Hazard Mitigation** into local plans and land use review processes:	Townwide	Medium	Low	Medium
W. **Incentivize Hazard Mitigation** by adopting a local Stormwater Fee	Townwide	Medium	Medium	Medium
X. **Increase Hazard Education** and Risk Awareness:	Townwide	Medium	Low	Medium

Introduction to Potential Mitigation Measures Table (Table 50 below)

Description of the Mitigation Measure – The description of each mitigation measure and cost information is given if cost data were already available from the community. The cost data represents 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 29, 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 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 have 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.

Abbreviations Used in Table 50

FEMA Mitigation Grants includes:
- FMA = Flood Mitigation Assistance Program.
- HMGP = Hazard Mitigation Grant Program.
- ACOE = Army Corps of Engineers.

DHS/EOPS = Department of Homeland Security/Emergency Operations
DEP (SRF) = Department of Environmental Protection (State Revolving Fund)
USDA = United States Department of Agriculture
MA DOT = Massachusetts Department of Transportation
DCR = MA Department of Conservation and Recreation
CIP= Capital Improvement Plan
MVP= MA Municipal Vulnerability Preparedness Program
NCRF= National Coastal Resilience Fund
MA CRG= MA Coastal Resilience Grants
CRMAG= MA Dept. of Environmental Restoration Culvert Replacement Municipal Assistance Grant

Table xx: Recommended Mitigation Measures

Recommended Mitigation Measures	Priority	Mitigation Type	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
COASTAL FLOODING						
A. **Yirrell Beach** project	High	Structural Projects	Winthrop DPW	2026-2030	High $600,000	Winthrop Capital Investment
B. **Lewis Lake** drainage improvements	High	Structural Projects	Winthrop DPW	2026-2030	Medium $200,000	Winthrop Capital Investment (High School & Lewis Lake drainage)
C. **Boston Harbor Drainage Outfall** upgrade headwalls and seawalls	High	Structural Project	Winthrop DPW	2027-2029	Medium $40,000 each: $200,000 total	Winthrop General fund/Public Works
D. **Community Rating System:** Consider submitting a CRS application	High	Structural Project	Winthrop DPW	2026-2027	Low Saff Costs, not to exceed $20,000 per year to implement;	Winthrop General fund/Public Works
E. **Land acquisition:** Acquire/pre-serve vacant flood prone lands as or if they become available.	High	Natural Resource Protection	Planning / Conservation Commission	2028-2030	Medium-High Cost of land ranges from $100,000 to $5 million. No specific parcel at this time to assign a cost to.	Winthrop General fund/Planning and Conservation Depts.

Recommended Mitigation Measures	Priority	Mitigation Type	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
FLOODING FROM PRECIPITATION						
F. **Ingleside Park** drainage assessment and improvements	High	Structural Projects	Winthrop DPW	2026-2029	High $250,000	Winthrop General Fund-Public Works/Winthrop Capital Investment
G. **Lower Nahant Avenue** drainage improvements	High	Structural Project	Winthrop DPW	2026-2029	Low $25,000	Winthrop General Fund-Public Works/Winthrop Capital Investment
H. **Upgrade Bayou Street** drain line; consider closed pipe system	Medium	Prevention	Winthrop DPW	2027-2030	Low $20,000	Winthrop General Fund-Public Works/Winthrop Capital Investment
I. **Morton Street:** Implement drainage improvements, including 13 outfalls, backflow preventors, and outfall chambers.	High	Structural Project	Winthrop DPW	2027-2028	High $13 Million	Winthrop General Fund-Public Works/Winthrop Capital Investment
J. **Girdlestone Road/ Tileston Road:** Implement drainage improvements, including work on two outfalls and seawall upgrades	High	Structural Project	Winthrop DPW	2026-2027	High	Winthrop General Fund-Public Works/Winthrop Capital Investment

Recommended Mitigation Measures	Priority	Mitigation Type	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
K. **Pico Ave:** Implement drainage improvements	High	Structural Project	Winthrop DPW	2026-2028	Medium	Winthrop General Fund-Public Works/Winthrop Capital Investment
L. **Utility Elevations:** Complete utility elevation project in flood hazard areas	High	Structural Projects	Winthrop DPW	2026-2030	Medium $200,000	Winthrop General Fund/Public Works
EXTREME WEATHER/WINTER HAZARDS						
M. **Utilities:** Work to ensure resilience of electrical utilities	Medium	Prevention	Winthrop DPW, coordinated with Utility	2026 - 2030	Low 5,000 staff time per year	Winthrop General Fund/Public Works
WILDFIRE HAZARDS						
N. Develop and maintain a **wildfire database**	Low	Prevention	Winthrop Fire/Emergency Management	2026-2030	Low $10,000	Winthrop General Fund/Fire Dept.
DROUGHT HAZARDS						
O. Incorporate **drought tolerant species** into land use regulations	Low	Prevention	Planning / Conservation	2026-2027	Low $5,000	Winthrop General Fund/Planning & Conservation
P. **Require permeable driveways** and surfaces to promote infiltration and reduce runoff	Medium	Prevention	Planning / Conservation Commission	2026-2027	Low $10,000	Winthrop General Fund/Planning & Conservation

Recommended Mitigation Measures	Priority	Mitigation Type	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
EXTREME TEMPERATURE HAZARDS						
Q. **Public education** on cooling centers and warming centers.	Medium	Public Education	Health Dept/ Emergency Management	2026-2030	Low Staff Time	Winthrop General Fund/Health Dept/Emerg. Mgt.
GEOLOGIC HAZARDS						
R. **Seismic Building Code:** Local enforcement of the seismic requirements of the MA Building Code	Low	Prevention	Building Commissioner	2026-2030	Low Staff Time	Winthrop General Fund/Building Commission
MULTI HAZARDS						
S. **Upgrade emergency generators:** Town Hall/EOC	High	Emergency Services Protection	Winthrop Fire/Emergency Management	2026-2029	Medium $75,000	Winthrop General Fund/Fire Dept. - EMD
T. **Micro Grid:** Investigate the benefits and feasibility of establishing a micro grid to ensure resilient energy supply to critical facilities	Medium	Emergency Services Protection	Winthrop DPW	2026-2030	High	Winthrop General Fund/Emergency Management
U. **Coordinated Access and Evacuation:** Collaborate with DCR, MassDOT and Boston	High	Prevention	Town Administrator/ Winthrop DPW / Emergency Management	2026-2030	Medium	Winthrop General Fund/Emergency Management & Town Administrator

Recommended Mitigation Measures	Priority	Mitigation Type	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
to ensure coordinated access connecting Winthrop to the mainland for emergency access and evacuation.						
V. **Integrate Hazard Mitigation** into local plans and land use review processes:	Medium	Prevention	Town Administrator/ Planning/ DPW	2026-2030	Low Staff Time	Winthrop General Fund/Planning & DPW
W. **Incentivize Hazard Mitigation** by adopting a local Stormwater Fee	Medium	Prevention	Winthrop DPW / Town Administrator	2026-2028	Medium	Winthrop General Fund/DPW & Town Administrator
X. **Increase Hazard Education** and Risk Awareness:	Medium	Prevention	Planning/ Conservation/ Emergency Management	2026-2030	Low Staff Time	Winthrop General Fund/

SECTION 9: PLAN ADOPTION AND MAINTENANCE

Plan Adoption

The Winthrop Hazard Mitigation Plan 2025 Update was adopted by the Town Council on [ADD DATE]. See Appendix E for documentation. The plan was approved by FEMA on [ADD DATE] for a five-year period that will expire on [ADD DATE].

Plan Maintenance

MAPC worked with the Winthrop Hazard Mitigation Planning Team to prepare this plan. After approval of the plan by FEMA, this group will meet on a regular basis, at least annually, to function as the Hazard Mitigation Team, with the Town Administrator designated as the coordinator. Additional members could be added to the local implementation 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 Implementation Team, these will be placed on the Town's web site, and any meetings of the Hazard Mitigation Implementation Team will be publicly noticed in accordance with Town and state open meeting laws.

Implementation and Evaluation Schedule

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

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, coordinated by the Director of Public Works, will have primary responsibility for tracking progress and updating the plan.

Begin to prepare for the next Plan Update -- 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. The 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 – 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. Once the resources have been secured to update the plan, the Hazard Mitigation

Implementation Team may decide to undertake the update themselves, contract with the Metropolitan Area Planning Council to update the plan or hire another consultant. However the Hazard Mitigation Implementation Team decides to update the plan, the group will need to review the current FEMA hazard mitigation plan guidelines for any changes. The Winthrop Hazard Mitigation Plan Update will be forwarded to MEMA and DCR for review and to FEMA for approval.

Integration of the Plans with Other Planning Initiatives

This Hazard Mitigation Strategy is intended to provide the Town with a "roadmap" to key actions that will improve its resilience to natural hazards. The previous plan was incorporated into the Town's Strategic Plan and this updated plan will be incorporated into other related plans and policies, such as the Open Space and Recreation Plan, the Capital Investment Plan, and the Municipal Vulnerability Preparedness 2.0.

Upon approval of the Winthrop Hazard Mitigation Plan 2025 Update by FEMA, the Local Hazard Mitigation Team coordinator 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. The plan will be reviewed and discussed with the following departments during the first six (6) months following plan adoption. During updates of any town department's plans or policies, the relevant portions of this mitigation strategy will be incorporated.

- Fire Department
- Emergency Management
- Police Department
- Public Works Department
- Engineering
- Building
- Planning Board/Planning and Community Development
- Conservation Commission
- Parks and Recreation
- Public Health

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

The Hazard Mitigation Plan, which incorporates risk assessment and mitigation actions on climate change from the Winthrop Climate Action Plan, the Resilient Winthrop assessment, and the Town's Community Resilience Building workshop, will be integrated into other Town plans and policies as they are updated and renewed, including the Open Space Plan, Town Zoning and Subdivision Control Regulations, and Capital Investment Program.

SECTION 10: REFERENCES

- Town of Winthrop, General Bylaws
- Town of Winthrop, Zoning Bylaw
- Town of Winthrop, Business District Master Plan, 2017
- Town of Winthrop, Climate Action Plan for Winthrop, 2025
- Town of Winthrop, Community Resilience Building Summary, 2018
- Town of Winthrop, Stormwater Management Program Plan, 2022
- Town of Winthrop, Open Space and Recreation Plan, 2014
- Town of Winthrop, Resilient Winthrop, Designing Coastal Infrastructure for Climate Change
- Town of Winthrop, Winthrop 2030
- Blue Hills Observatory
- Environment America Research and Policy Center, When It Rains It Pours– Global Warming and the Increase in Extreme Precipitation, July 2012
- FEMA, Disaster Declarations for States and Counties, 1978-2025
- FEMA, Flood Insurance Study, Suffolk County, 2024
- FEMA Flood Insurance Rate Maps for Suffolk County, MA, 2016
- FEMA, HAZUS-MH, 2023
- FEMA, Local Mitigation Planning Policy Guide, 2025
- Massachusetts Climate Change Assessment, 2022
- MA Geographic Information System, *McConnell Land Use Statistics*
- Massachusetts Report of the MA Coastal Erosion Commission, 2016
- MA Office of Coastal Zone Management, Sea Level Rise: Understanding and Applying Trends and Future Scenarios for Analysis and Planning, December 2013.
- MA Office of Dam Safety, Inventory of Massachusetts Dams
- Massachusetts State Hazard Mitigation and Climate Adaptation Plan, 2018, 2023
- Massachusetts State Hazard Mitigation Plan, 2013
- Metropolitan Area Planning Council, Winthrop Climate Resilient Land Use Project
- Metropolitan Area Planning Council, GIS Lab, Regional Plans and Data.
- New England Seismic Network, Boston College Weston Observatory
- NOAA Centers for Environmental Information
- Northeast States Emergency Consortium
- Tornado History Project
- US Census, 2020, American Community Survey2017-21
- USDA Forest Service, Wildfire Risk to Communities
- USGS, National Water Information System
- U.S. Global Change Research Program, Fourth National Climate Assessment, 2018

APPENDIX A: HAZARD MAPPING

The MAPC GIS (Geographic Information Systems) Lab produced a series of maps for each community. Some of the data came from the Northeast States Emergency Consortium (NESEC). More information on NESEC can be found at http://www.serve.com/NESEC/. Due to the various sources for the data and varying levels of accuracy, the identification of an area as being in one of the hazard categories must be considered as a general classification that should always be supplemented with more local knowledge.

The map series consists of eight maps as described below. The maps in this appendix are necessarily reduced scale versions for general reference.

Map 1.	Population Density
Map 2.	Potential Development
Map 3.	Flood Zones
Map 4.	Earthquakes and Landslides
Map 5.	Hurricanes and Tornadoes
Map 6.	Average Snowfall
Map 7.	Composite Natural Hazards
Map 8.	Hazard Areas
Map 9	Extreme Heat
Map 10	Sea Level Rise
Map 11	Wildfires

Map 1: Population Density – This map uses the US Census block data for 2020 and shows population density as the number of people per acre in seven categories with 60 or more people per acre representing the highest density areas.

Map 1b: Environmental Justice – This map shows Environmental Justice (EJ) populations using 2020 data. EJ designations from the State include English isolation, income, and minority residents.

Map 2: Land Use – This map shows land cover and land use from MassGIS' 2016 Land Cover/Land Use dataset.

Map 3: Flood Zones – The map of flood zones used the FEMA NFIP Flood Zones for Middlesex County as its source. For more information, refer to the FEMA Map Service Center website http://www.msc.fema.gov. The definitions of the flood zones are described in detail on this site as well. The flood zone map for each community also shows critical infrastructure and municipally owned and protected open space.

Map3b: Flood Claims – This map shows flood insurance and disaster claim records from March 2010. The March 29, 2010 federal disaster declaration associated with severe rainfall and flooding triggered the launch of the Federal Emergency Management Agency's (FEMA's) Individual Assistance Program through which residential property owners, businesses, and institutions without flood insurance were eligible to apply for relief

to pay for storm-related expenditures and repairs. Across the seven counties, over 27,000 individual claims were approved for nearly $59 million in disaster assistance, while reimbursements to state and local governments totaled $25 million. In the MAPC region, 18,400 claims were approved for $30 million dollars in disaster assistance.

Map 4: Earthquakes and Landslides (Regional) – This map depicts landslide risk and recorded earthquake epicenters in the community and surrounding region. This information came from NESEC. For most communities, there was no data for earthquakes because only the epicenters of an earthquake are mapped.

The landslide information shows areas with either a low susceptibility or a moderate susceptibility to landslides based on mapping of geological formations. This mapping is highly general in nature. For more information on how landslide susceptibility was mapped, refer to http://pubs.usgs.gov/pp/p1183/pp1183.html.

Map 5: Hurricanes and Tornadoes (Regional) – This map shows the spatial characteristics of several different meteorological properties and past events in the community and surrounding region. The map includes the storm tracks for both hurricanes and tropical storms. This information must be viewed in context. A storm track only shows where the eye of the storm passed through. In most cases, the effects of the wind and rain from these storms were felt in other communities even if the track was not within that community. This map also shows the location of tornadoes with a classification as to the level of damages. What appears on the map varies by community since not all communities experience the same wind-related events. These maps also show the 100-year wind speed and areas that could be inundated by storm surge during a hurricane, if any.

Map 6: Average Snowfall (Regional) - This map shows the average snowfall in the community and the surrounding region.

Map 7: Composite Natural Hazards (Regional) - This map shows four categories of composite natural hazards for areas of existing development. The hazards included in this map are 100-year wind speeds of 110 mph or higher, low and moderate landslide risk, FEMA Q3 flood zones (100 year and 500 year) and hurricane surge inundation areas. Areas with only one hazard were considered to be low hazard areas. Moderate areas have two hazards present. High hazard areas have three hazards present and severe hazard areas have four hazards present.

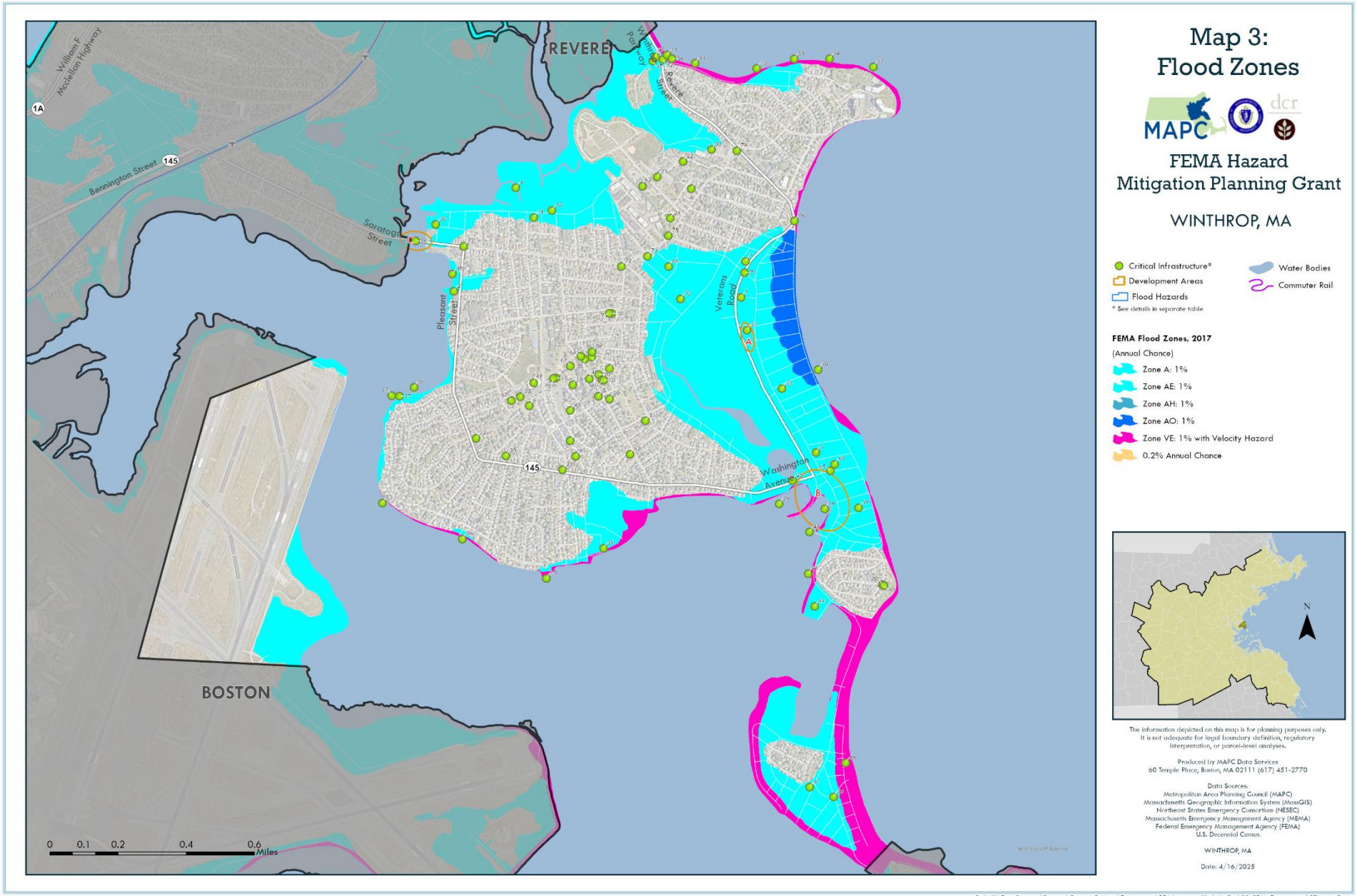
Map 8: Local Hazard Areas – For each community, locally identified hazard areas are overlaid on an aerial photograph/ The critical infrastructure sites and planned development areas are also shown. The source of the aerial photograph is Mass GIS.

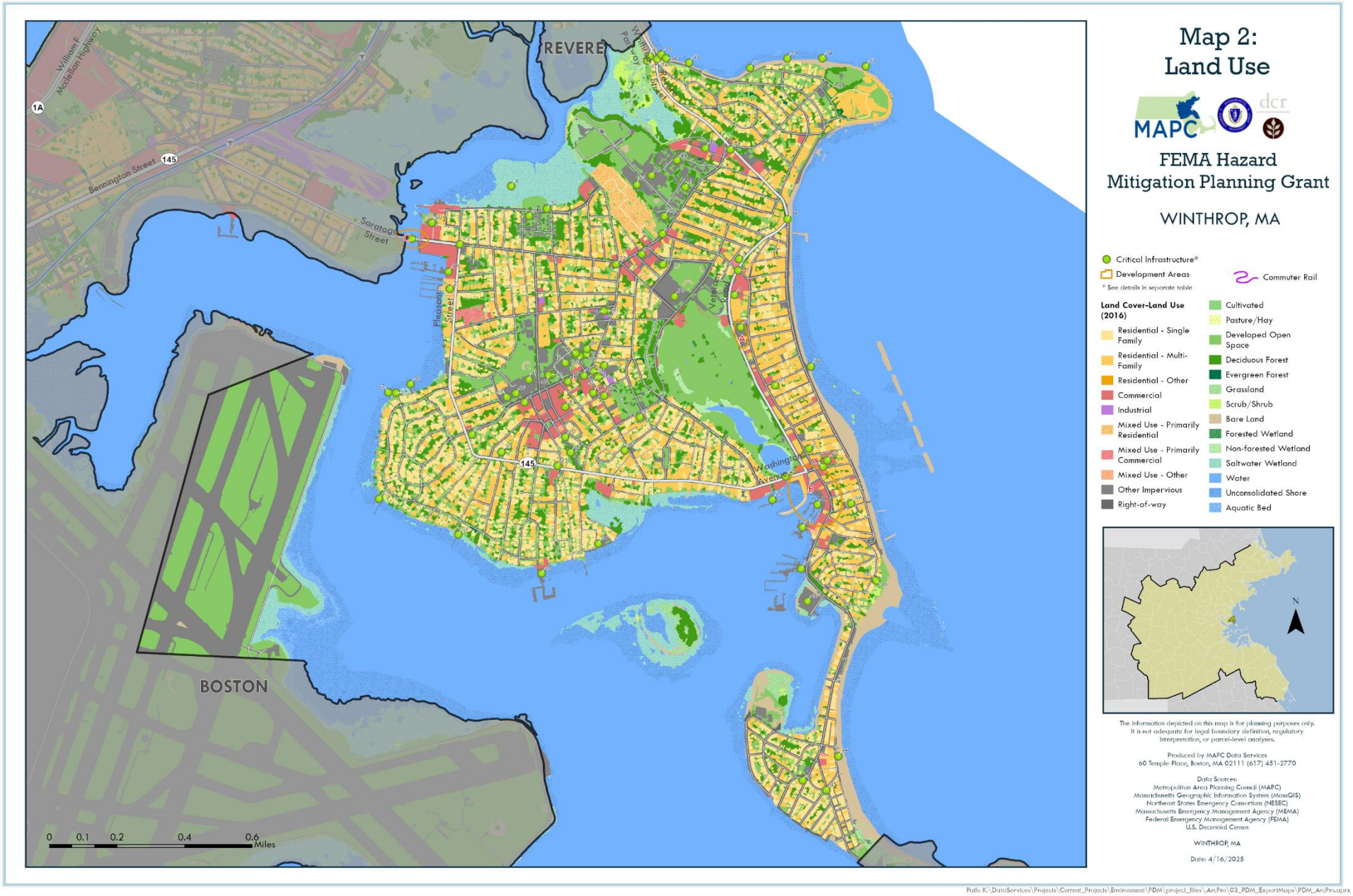
Map 9: Extreme Heat – MAPC's Statewide Land Surface Temperature (LST) Index was created by combining estimates of surface temperature from days in 2018, 2019, and 2020 where the daily air temperature maximum exceeded 70 degrees Fahrenheit. The Statewide LST Index "Hot Spots" data depicts the 5% highest LST index areas in each Regional Planning Agency (RPA) region. The data was generated by identifying pixels whose LST index values are equal to or greater than 95% of LST index values in the region, and then delineating cohesive regions where pixels meet this criterion as polygons.

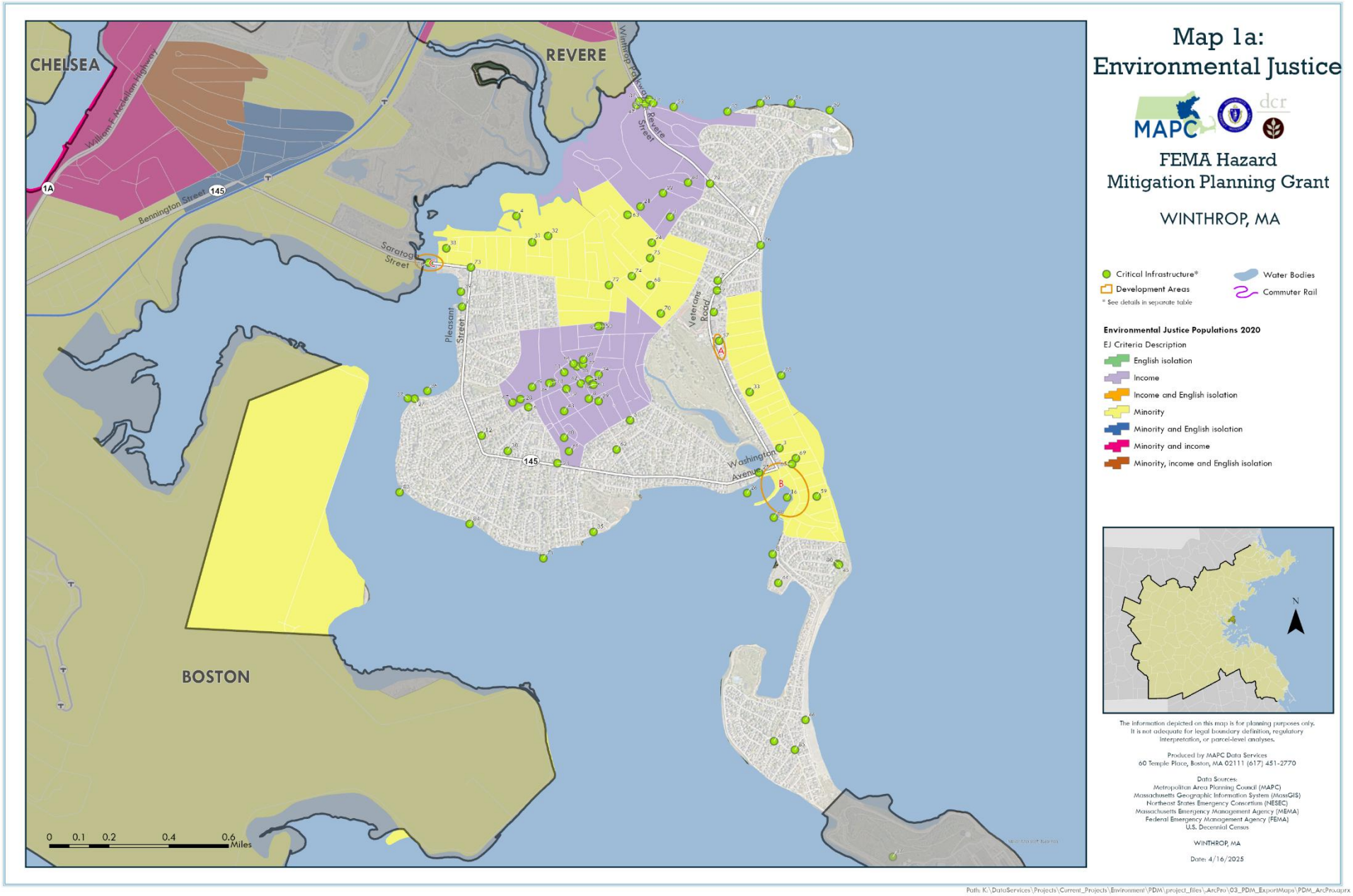
Map 9 represents the "Hot Spots" relative to the MAPC region, mapped on top of the National Land Cover Database's 2016 30-m tree canopy data.

Map 10: Sea Level Rise – This map presents projections for three future sea level rise scenarios developed for the Massachusetts Coastal Flood Risk Model (MC-FRM) by the Wood Hole Group. The map shows the extent of flood inundation for a 1% annual chance storm for projected sea level rise scenarios of 1.2 feet, 2.4 feet, and 4.2 feet. These scenarios are approximately equivalent to the levels of sea level rise projected for the years 2030, 2050, and 2070, respectively.

Map 11: Wildfires – This map shows wildfire risk to the community using USDA data. Wildfire risk is classified as very low, low, moderate, high, and very high.


Map 3:
Flood Zones
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
WINTHROP, MA
Critical Infrastructure*
Development Areas
Flood Hazards
* See details in separate table
Water Bodies
Commuter Rail
FEMA Flood Zones, 2017
(Annual Chance)
Zone A: 1%
Zone AE: 1%
Zone AH: 1%
Zone AO: 1%
Zone VE: 1% with Velocity Hazard
0.2% Annual Chance
REVERE
BOSTON
William F. McClellan Highway
Bennington Street
Saratoga Street
Pleasant Street
Revere Street
Veterans Road
Washington Avenue
145
1A
0 0.1 0.2 0.4 0.6 Miles
N
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 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)
U.S. Decennial Census
WINTHROP, MA
Date: 4/16/2025


Map 2:
Land Use
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
WINTHROP, MA
Critical Infrastructure*
Development Areas
* See details in separate table
Commuter Rail
Land Cover-Land Use (2016)
Residential - Single Family
Residential - Multi-Family
Residential - Other
Commercial
Industrial
Mixed Use - Primarily Residential
Mixed Use - Primarily Commercial
Mixed Use - Other
Other Impervious
Right-of-way
Cultivated
Pasture/Hay
Developed Open Space
Deciduous Forest
Evergreen Forest
Grassland
Scrub/Shrub
Bare Land
Forested Wetland
Non-forested Wetland
Saltwater Wetland
Water
Unconsolidated Shore
Aquatic Bed
N
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 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)
U.S. Decennial Census
WINTHROP, MA
Date: 4/16/2025
REVERE
BOSTON
William F. McClellan Highway
Bennington Street
Saratoga Street
Bleachery Street
Winthrop Parkway
Revere Street
Point Shirley
Washington Avenue
1A
145
0 0.1 0.2 0.4 0.6 Miles
Path: K:\DataServices\Projects\Current_Projects\Environment\PDM\project_files\ArcPro\03_PDM_ExportMaps\PDM_ArcPro.aprx


CHELSEA
REVERE
BOSTON
Bennington Street
Saratoga Street
Pleasant Street
Veterans Road
Washington Avenue
Winthrop Parkway
Revere Street
William F. Middleton Highway
1A
145
A
B
0 0.1 0.2 0.4 0.6 Miles
Map 1a:
Environmental Justice
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
WINTHROP, MA
Critical Infrastructure*
Development Areas
* See details in separate table
Water Bodies
Commuter Rail
Environmental Justice Populations 2020
EJ Criteria Description
English isolation
Income
Income and English isolation
Minority
Minority and English isolation
Minority and income
Minority, income and English isolation
N
The information depicted on this map is for planning purposes only.
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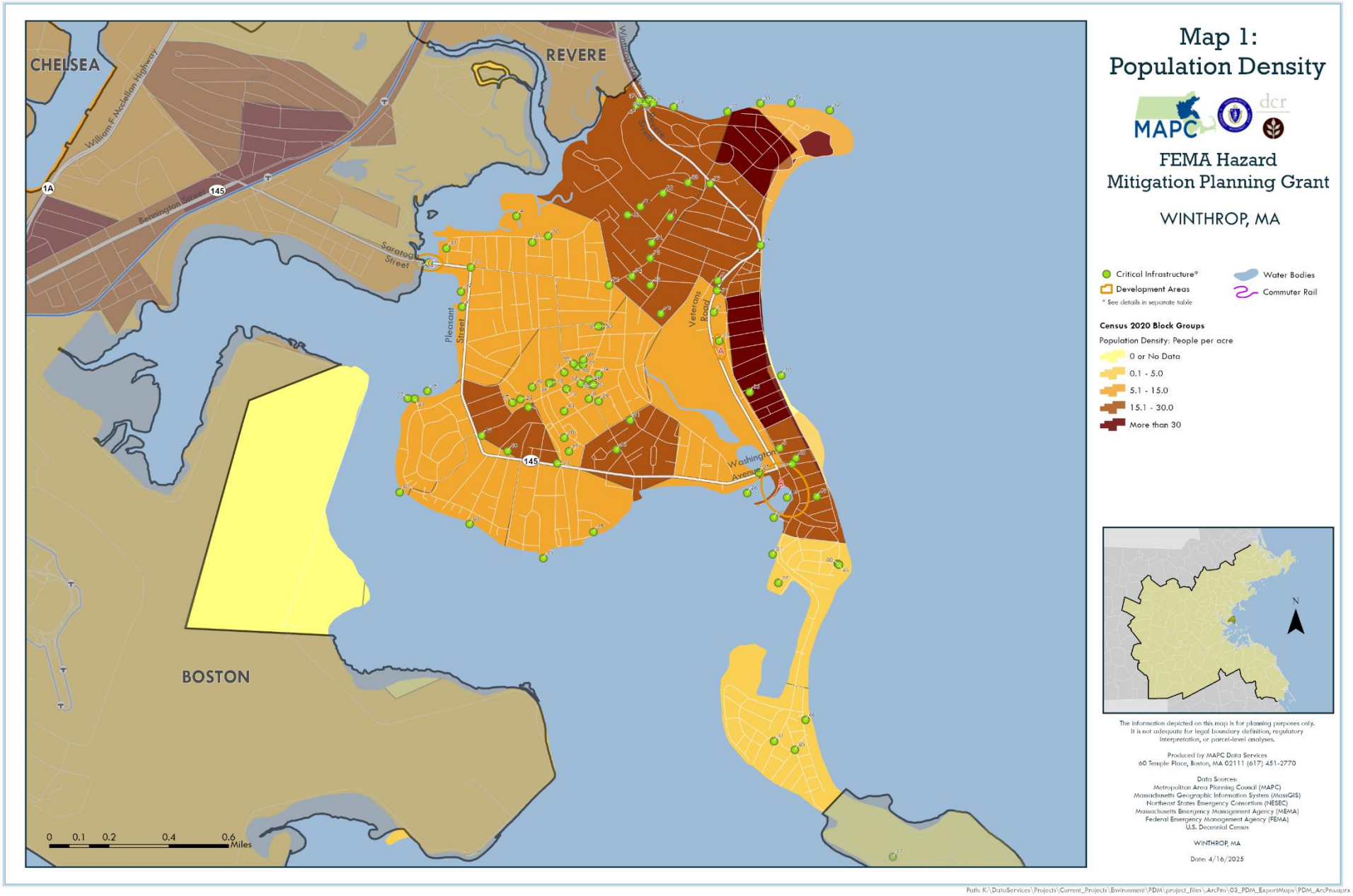
interpretation, or parcel-level analyses.
Produced by MAPC Data Services
60 Temple Place, Boston, MA 02111 (617) 451-2770
Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Northeast States Emergency Consortium (NESEC)
Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)
U.S. Decennial Census
WINTHROP, MA
Date: 4/16/2025
Path: K:\DataServices\Projects\Current_Projects\Environment\PDM\project_files\ArcPro\03_PDM_ExportMaps\PDM_ArcPro.aprx


CHELSEA
REVERE
BOSTON
William F. McClellan Highway
Bennington Street
Saratoga Street
Pleasant Street
Veterans Road
Washington Avenue
145
1A
0 0.1 0.2 0.4 0.6 Miles
Map 1:
Population Density
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
WINTHROP, MA
Critical Infrastructure*
Development Areas
* See details in separate table
Water Bodies
Commuter Rail
Census 2020 Block Groups
Population Density: People per acre
0 or No Data
0.1 - 5.0
5.1 - 15.0
15.1 - 30.0
More than 30
N
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U.S. Decennial Census
WINTHROP, MA
Date: 4/16/2025
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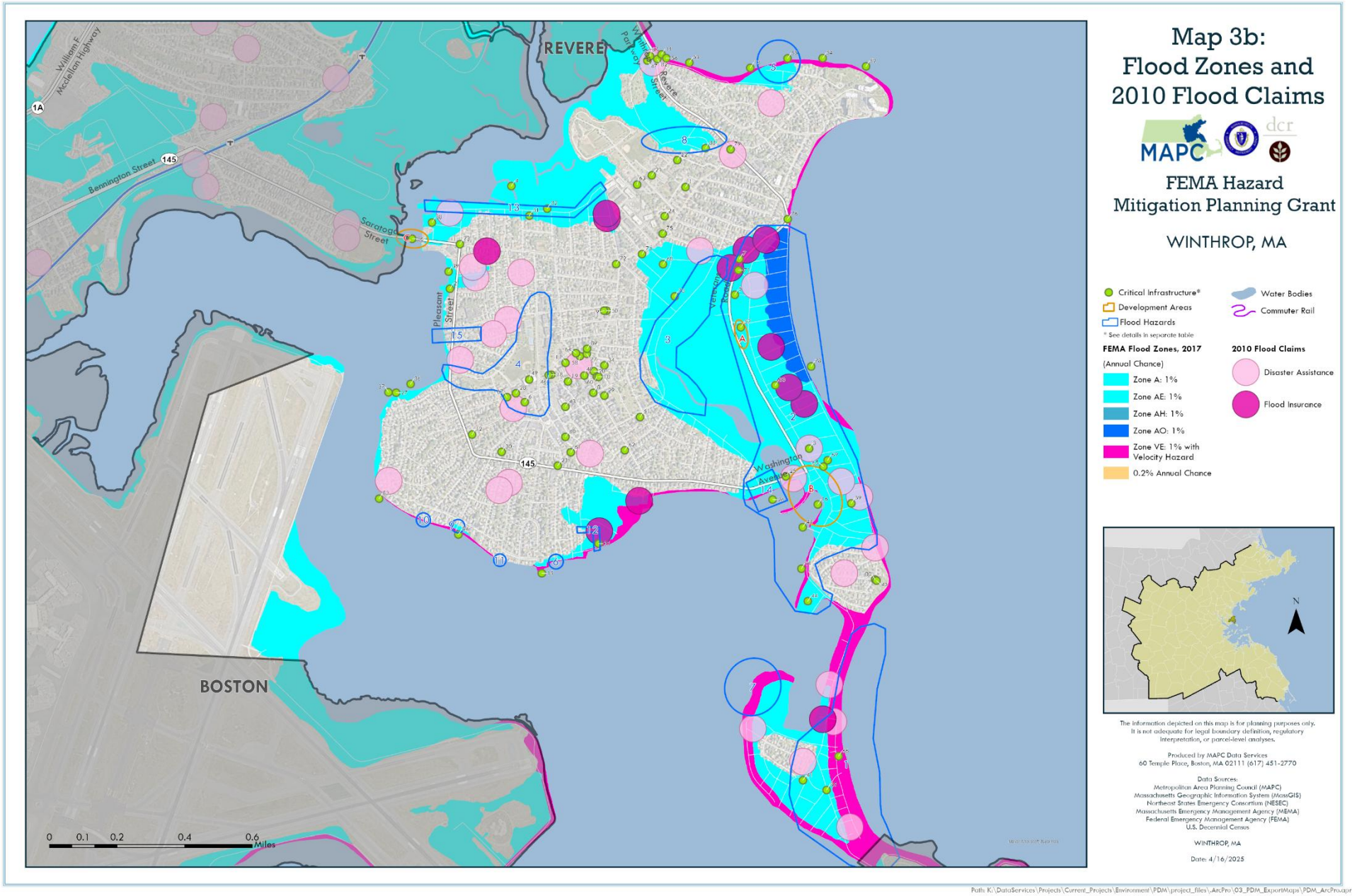
REVERE
BOSTON
William F. McClellan Highway
Bennington Street
Saratoga Street
Pleasant Street
Revere Street
Washington Avenue
Winthrop Parkway
Winthrop Beach
145
1A
0 0.1 0.2 0.4 0.6 Miles
Map 3b:
Flood Zones and
2010 Flood Claims
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
WINTHROP, MA
Critical Infrastructure*
Development Areas
Flood Hazards
* See details in separate table
Water Bodies
Commuter Rail
FEMA Flood Zones, 2017
(Annual Chance)
Zone A: 1%
Zone AE: 1%
Zone AH: 1%
Zone AO: 1%
Zone VE: 1% with Velocity Hazard
0.2% Annual Chance
2010 Flood Claims
Disaster Assistance
Flood Insurance
N
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Federal Emergency Management Agency (FEMA)
U.S. Decennial Census
WINTHROP, MA
Date: 4/16/2025
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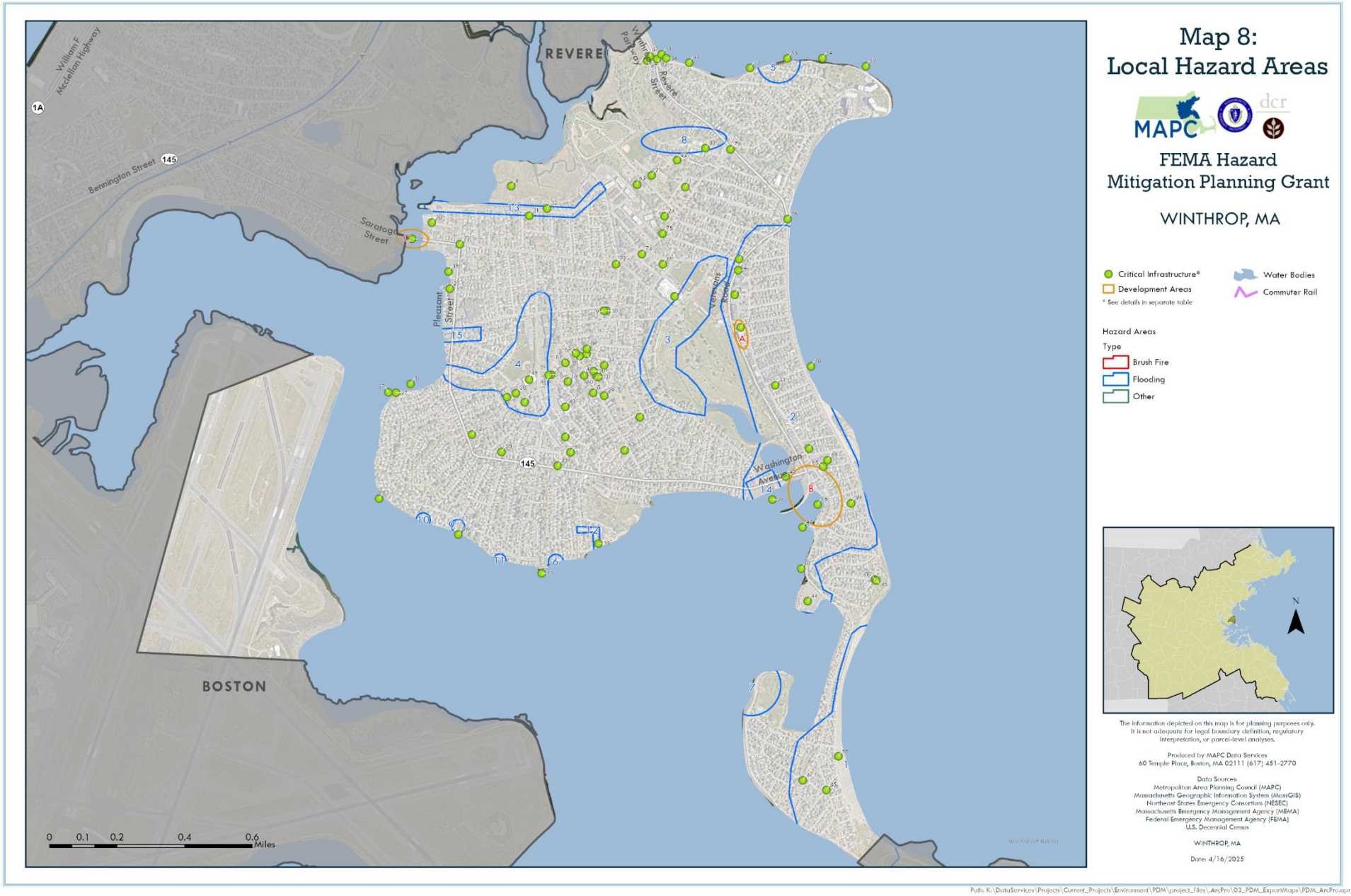
Map 8:
Local Hazard Areas
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
WINTHROP, MA
Critical Infrastructure*
Development Areas
* See details in separate table
Water Bodies
Commuter Rail
Hazard Areas
Type
Brush Fire
Flooding
Other
REVERE
BOSTON
Bennington Street
Saratoga Street
Pleasant Street
Revere Street
Winthrop Parkway
Veterans Road
Washington Avenue
William F. McClellan Highway
1A
145
0 0.1 0.2 0.4 0.6 Miles
N
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Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)
U.S. Decennial Census
WINTHROP, MA
Date: 4/16/2025
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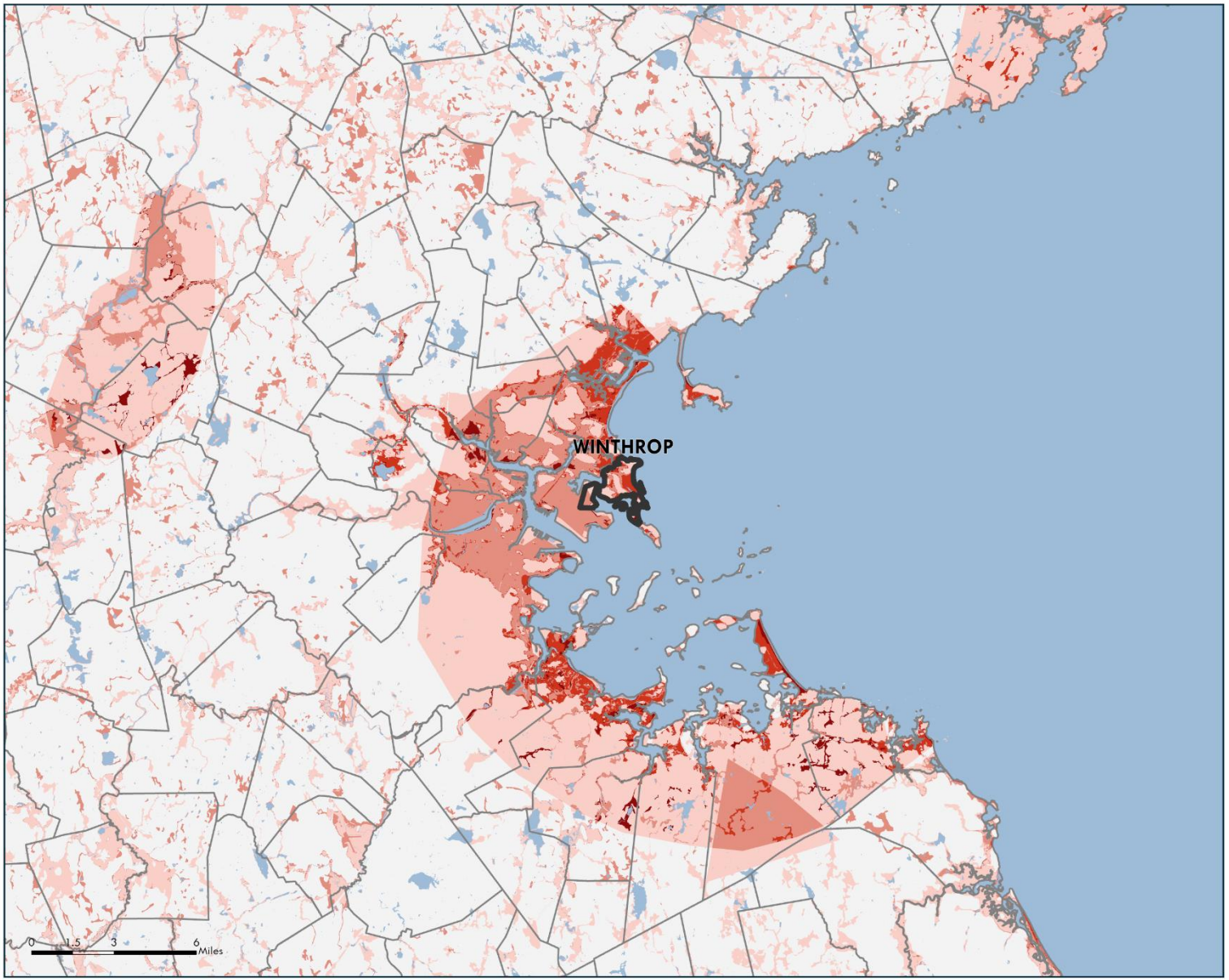


Map 7: Composite Natural Hazards

FEMA Hazard Mitigation Planning Grant

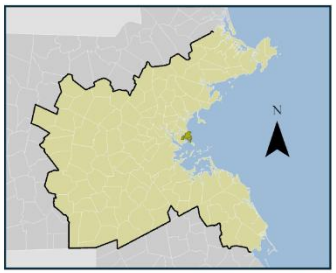
WINTHROP, MA

Composite Natural Hazards

- Low (2 Hazards)
- Moderate (3 Hazards)
- High (4 Hazards)
- Very High (5 Hazards)

Composite natural hazards shown for areas of existing development.
Hazards include:

- 100 year wind speed of 110 MPH or higher
- Moderate landslide risk
- FEMA flood zones (100 year and 500 year)
- Average snowfall of 36.1" or more
- Hurricane surge inundation areas



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Data Sources:
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Federal Emergency Management Agency (FEMA)
U.S. Decennial Census

WINTHROP, MA

Date: 4/16/2025

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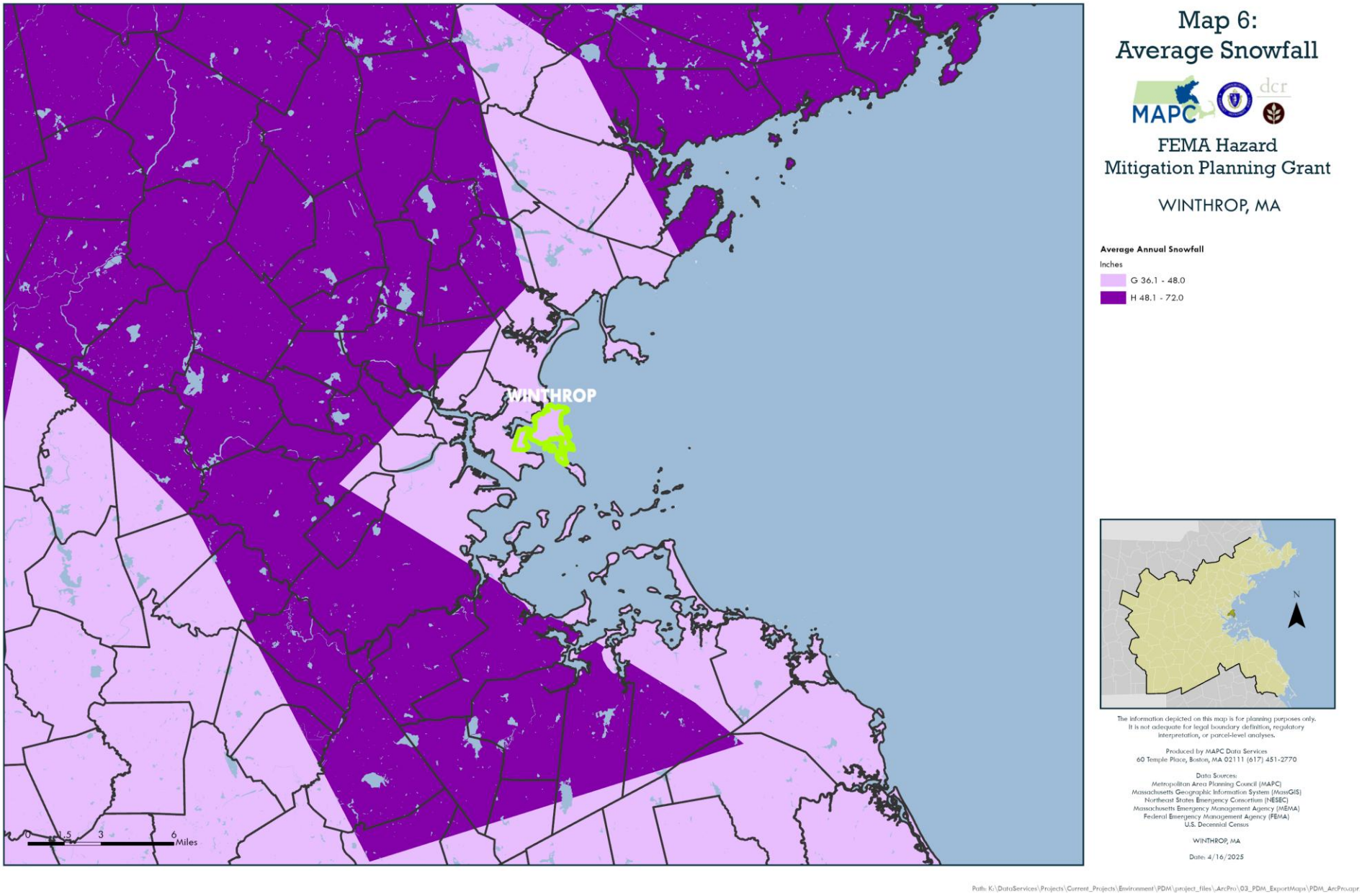
Map 6:
Average Snowfall
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
WINTHROP, MA
Average Annual Snowfall
Inches
G 36.1 - 48.0
H 48.1 - 72.0
WINTHROP
0
1.5
3
6
Miles
N
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Federal Emergency Management Agency (FEMA)
U.S. Decennial Census
WINTHROP, MA
Date: 4/16/2025
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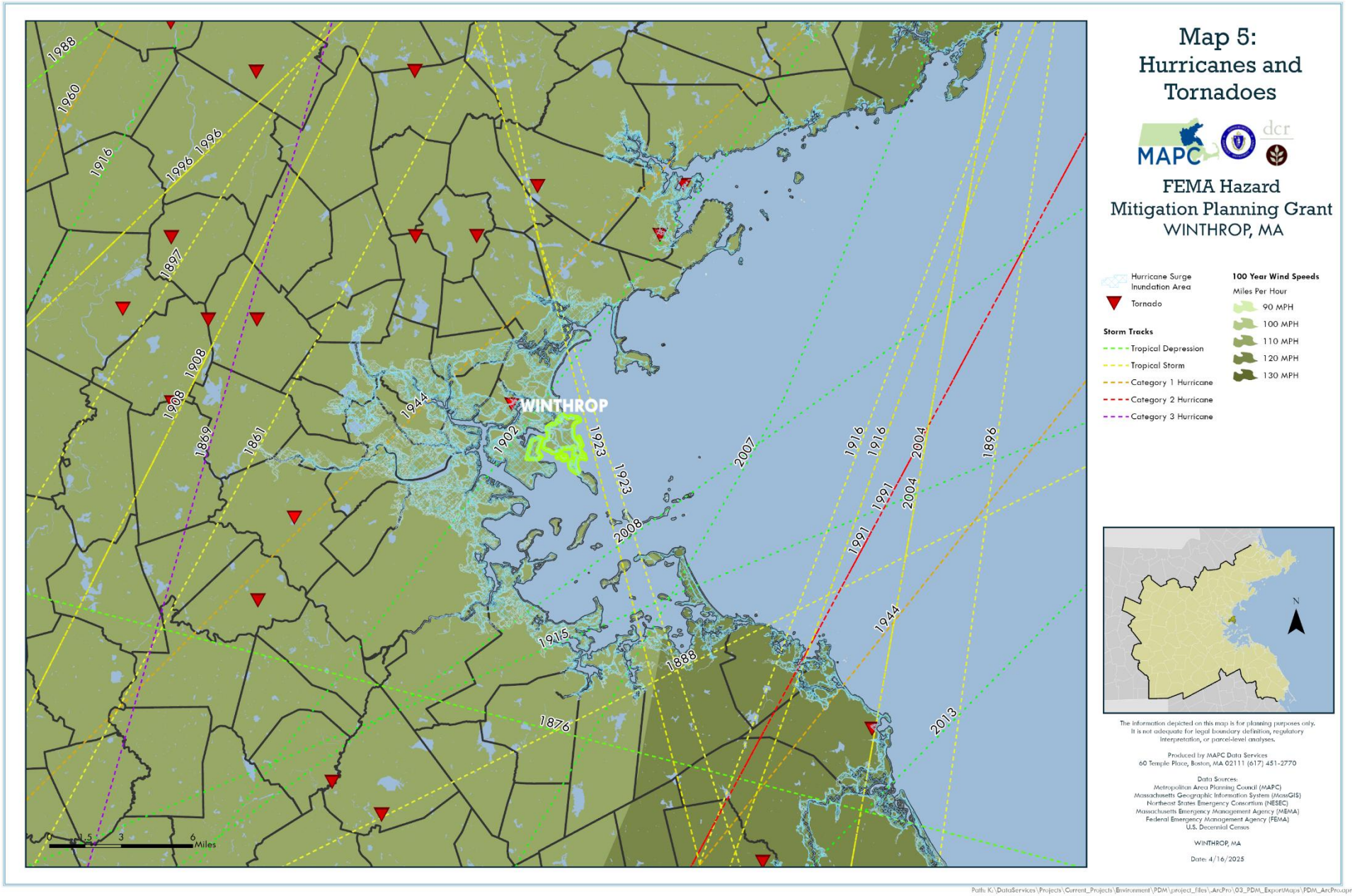
Map 5:
Hurricanes and Tornadoes
MAPC
dcr
FEMA Hazard Mitigation Planning Grant
WINTHROP, MA
Hurricane Surge Inundation Area
Tornado
Storm Tracks
Tropical Depression
Tropical Storm
Category 1 Hurricane
Category 2 Hurricane
Category 3 Hurricane
100 Year Wind Speeds
Miles Per Hour
90 MPH
100 MPH
110 MPH
120 MPH
130 MPH
WINTHROP
1988
1960
1916
1996
1996
1897
1908
1908
1869
1861
1944
1902
1923
1923
2008
2007
1916
1916
2004
1896
1991
1991
2004
1944
1915
1888
1876
2013
0 1.5 3 6 Miles
N
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Data Sources:
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Federal Emergency Management Agency (FEMA)
U.S. Decennial Census
WINTHROP, MA
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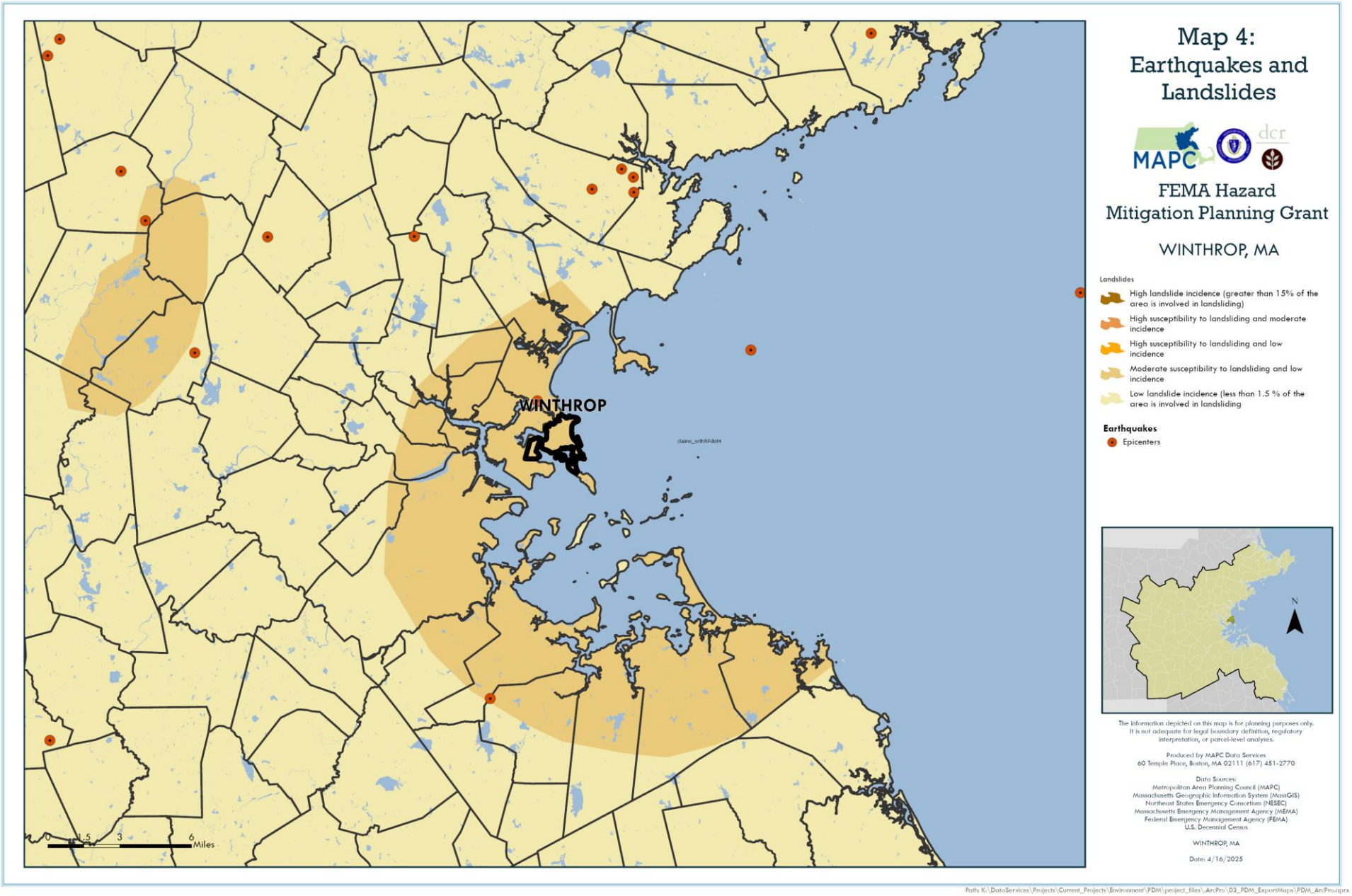
Map 4:
Earthquakes and
Landslides
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
WINTHROP, MA
Landslides
High landslide incidence (greater than 15% of the area is involved in landsliding)
High susceptibility to landsliding and moderate incidence
High susceptibility to landsliding and low incidence
Moderate susceptibility to landsliding and low incidence
Low landslide incidence (less than 1.5 % of the area is involved in landsliding
Earthquakes
Epicenters
WINTHROP
0 1.5 3 6 Miles
N
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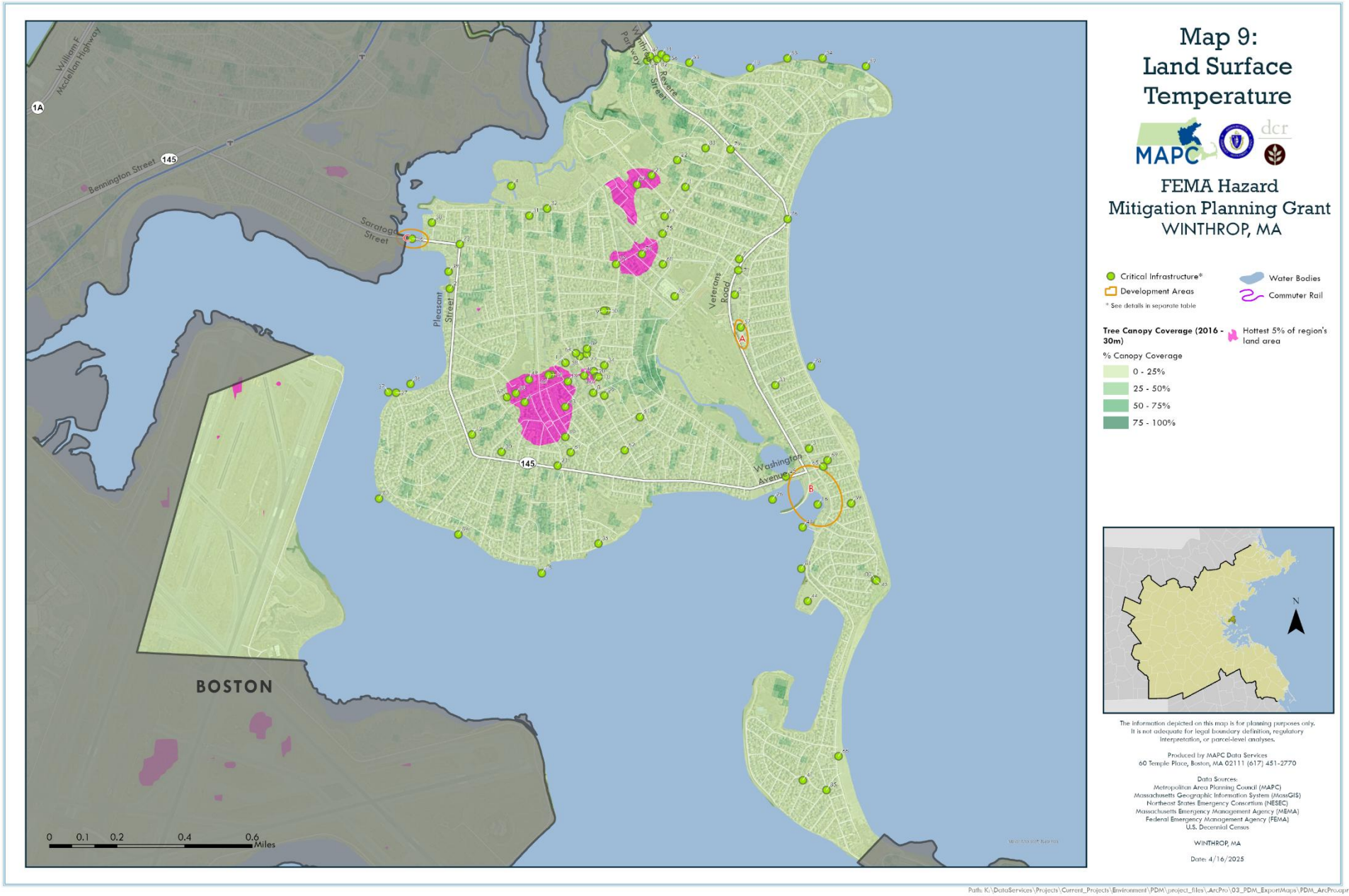
Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)
U.S. Decennial Census
WINTHROP, MA
Date: 4/16/2025


Map 9:
Land Surface Temperature
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
WINTHROP, MA
Critical Infrastructure*
Development Areas
* See details in separate table
Water Bodies
Commuter Rail
Tree Canopy Coverage (2016 - 30m)
Hottest 5% of region's land area
% Canopy Coverage
0 - 25%
25 - 50%
50 - 75%
75 - 100%
BOSTON
Bennington Street
Saratoga Street
Pleasant Street
Revere Street
Veterans Road
Washington Avenue
William F. McClellan Highway
145
1A
0 0.1 0.2 0.4 0.6 Miles
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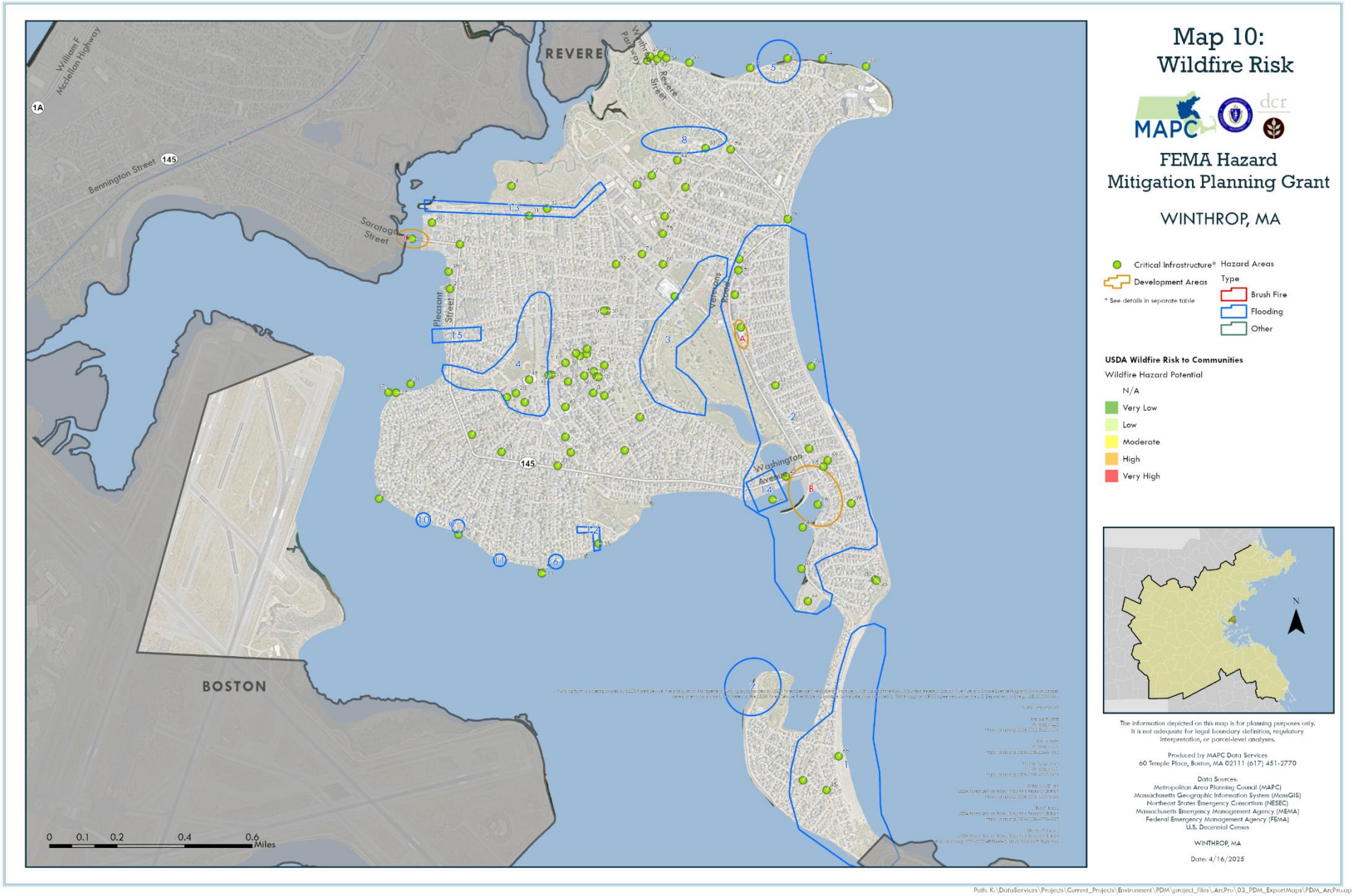
Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)
U.S. Decennial Census
WINTHROP, MA
Date: 4/16/2025


Map 10:
Wildfire Risk
MAPC
dcr
FEMA Hazard
Mitigation Planning Grant
WINTHROP, MA
Critical Infrastructure*
Development Areas
* See details in separate table
Hazard Areas
Type
Brush Fire
Flooding
Other
USDA Wildfire Risk to Communities
Wildfire Hazard Potential
N/A
Very Low
Low
Moderate
High
Very High
REVERE
BOSTON
Bennington Street
Saratoga Street
Pleasant Street
Revere Street
Winthrop Parkway
Veterans Road
Washington Avenue
William F. McClellan Highway
145
1A
0 0.1 0.2 0.4 0.6 Miles
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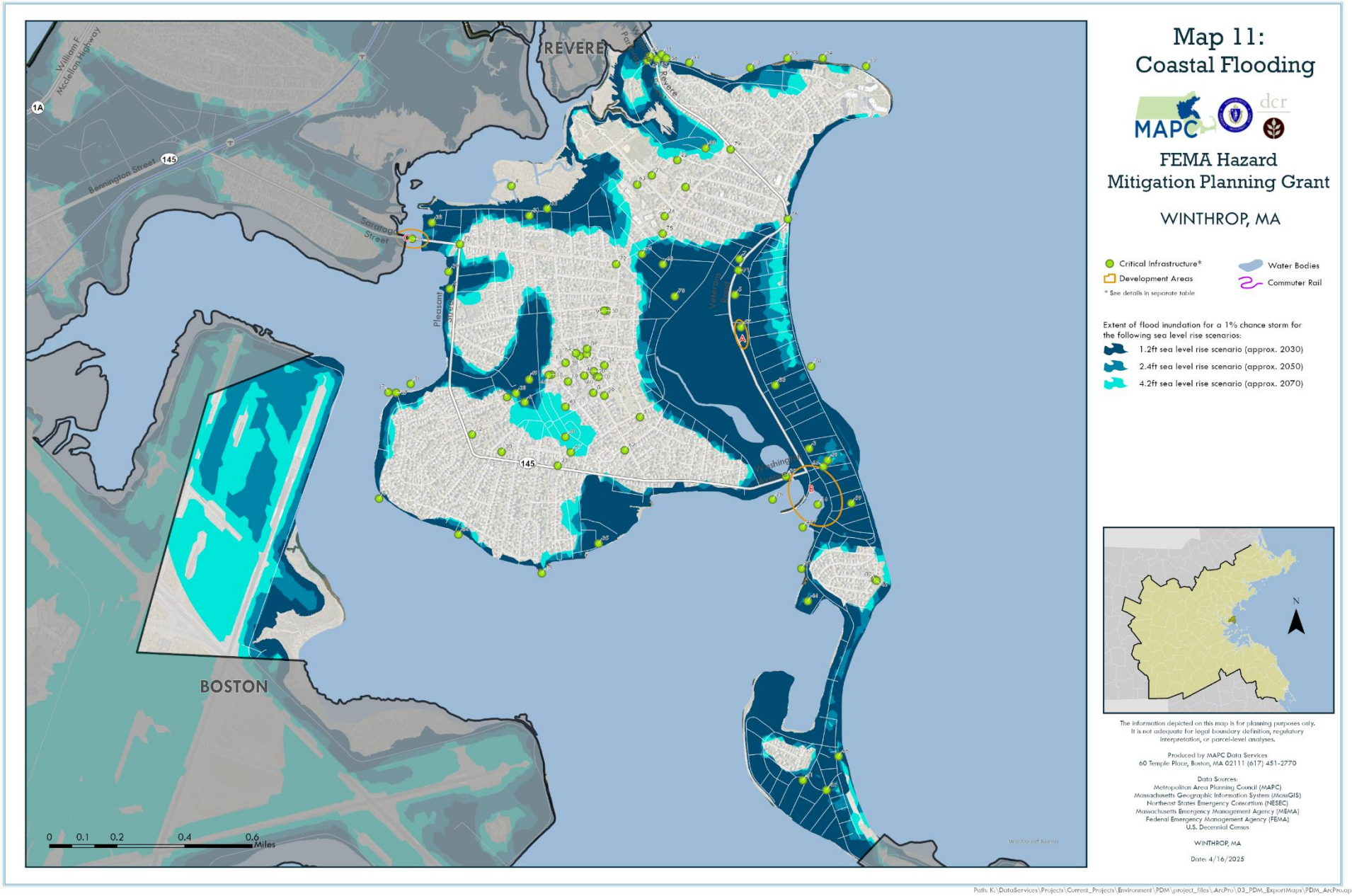
Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)
U.S. Decennial Census
WINTHROP, MA
Date: 4/16/2025



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APPENDIX B: HAZARD MITIGATION TEAM

Winthrop Hazard Mitigation Plan Update
Team Meeting #1

Tuesday, July 16, 2024
2:00 – 3:30 PM

Town Hall
Harvey Room

AGENDA

---

1. **Welcome and Introductions**

2. **Review of HMP Project and Schedule** (see attached timeline)

3. **Getting Started: Local Data Updates from the 2017 Plan**

   - *The Team will update 3 types of local data from the 2017 plan (see attached worksheets):*

     1. **Local Hazard Areas** (Flooding, Wildfire, etc.)
     2. **Critical Facilities**
     3. **New Development sites**

   - *MAPC's GIS Planner Alexa DeRosa will join via Zoom to map new or revised local sites using the online platform Google MyMaps*

4. **Next steps: Preparing for Public Meetings and Outreach**

   - **We will hold 2 Public Meetings during development of the plan:**
     1st public meeting during the planning process (Fall 2024)
     2nd public meeting on the draft plan and seek comments (Spring 2025)
   - The HMP Team to identify local stakeholders to invite
   - Next HMP Team meeting in October

APPENDIX B: HAZARD MITIGATION TEAM

Winthrop Hazard Mitigation Plan Update
Team Meeting #2

Monday, October 28, 2024
2:00 – 3:30 PM

Town Hall
Harvey Room

AGENDA

---

1. **Welcome and Introductions**

2. **Review and Update of Mitigation Goals for the Plan**
   1. *See Worksheet #4 – Goals from the 2017 Plan*
   2. We will review and update the goals and add new goals as appropriate.

3. **Review Status of Existing Mitigation Measures**
   3. *See Worksheet #5 – Existing Mitigation from the 2017 Plan*
   - We will review **changes to mitigation measures**
   - Add any **new mitigation measures** adopted since the 2017 plan
   - Note **Effectiveness** and **Improvements Needed** to mitigation measures

4. **Prepare for First Public Meeting**
   - Set date and host board or commission (target Jan./Feb.)
   - ***HMP Team to identify local stakeholders to invite:***
     - Businesses, Community groups, NGO's, etc.
     - Focus on vulnerable populations
     - Refer to MVP Workshop invitees
     - Public outreach on Town website, social media

5. **Next HMP Team Meeting: January 2025**

APPENDIX B: HAZARD MITIGATION TEAM

Winthrop Hazard Mitigation Plan Update
Team Meeting #3

Wednesday, March 26, 2025
1:30 – 3:00 PM

Town Hall
Harvey Room

AGENDA

---

1. Review Status of Mitigation Strategies from the 2015 Plan

The Team will review the recommended mitigation measures from the 2015 plan.
See the attached worksheet to note the status of mitigation recommendations.

- ***Note current status:*** (1) Completed, (2) In Progress, (3) Not Implemented
- For those not implemented, *please note why and add any updates*
- Note any measures to be *changed or deleted* for the 2025 plan

2. Prepare for First Public Presentation

- Set date in April and host board
- MAPC will prepare meeting notice, social media post, press advisory
- ***HMP Team to identify local stakeholders to invite:***
  - Businesses, Institutions, Community groups, NGO's, etc.
  - Focus on vulnerable populations/EJ communities

3. Review of Next Steps

- Final Team Meeting–May
  - Finalize mitigation recommendations for the 2025 plan
- Final Public Presentation–June
  - MAPC Presentation of the draft plan at a public meeting
  - Draft plan to be posted online for public review
- Submit draft plan to MEMA & FEMA for review–June
  - Respond to MEMA & FEMA comments/revisions if any
  - Final plan to be adopted by the Select Board

APPENDIX B: HAZARD MITIGATION TEAM

Winthrop Hazard Mitigation Plan Update

Team Meeting #4

Tuesday, April 15, 2025
1:30 – 3:00 PM

Town Hall
Harvey Room

AGENDA

---

1. Review and Finalize the Mitigation Strategies for 2025 Plan

- The Team will review the draft recommended mitigation measures for the 2024 plan
- We will confirm the recommendations, lead agencies, timeframes, and costs
- *See the attached Draft Mitigation Strategies.*

2. Prepare for Public Presentation

- Confirm host board and set date in April or early May
- MAPC will prepare meeting notice, social media post, press advisory
- MAPC will prepare PowerPoint and give public presentation

- *HMP Team to identify local stakeholders to invite:*
  - Businesses, Institutions, Community groups, NGO's, etc.
  - Focus on vulnérable populations/EJ communistes

3. Schedule Final Public Meeting

- Confirm host board and set date in early June
- MAPC will prepare meeting notice, social media post, press advisory
- MAPC will prepare PowerPoint and give public presentation

APPENDIX C: DOCUMENTAION OF PUBLIC MEETINGS

When: **Tuesday, May 20th, 2025**
6:30 PM

Where: **Winthrop Town Council**
Town Hall, 1 Metcalf Square, Harvey Hearing Room

Zoom: https://us02web.zoom.us/j/86402877371?pwd=aEGFoS8tYq9iAM2eiqQSiPSXzHPM27.1
Meeting ID 86402877371# / Passcode 549371 / Phone 1-305-224-1968

Winthrop experiences natural hazards that can affect residents and businesses, including **flooding, coastal storms, and hurricanes.**

The Town is updating its *FEMA Hazard Mitigation Plan* to assess its vulnerability to natural hazards and strategies to increase resilience.

Join us on May 20 at the Town Council for a presentation about Town's Hazard Mitigation Plan

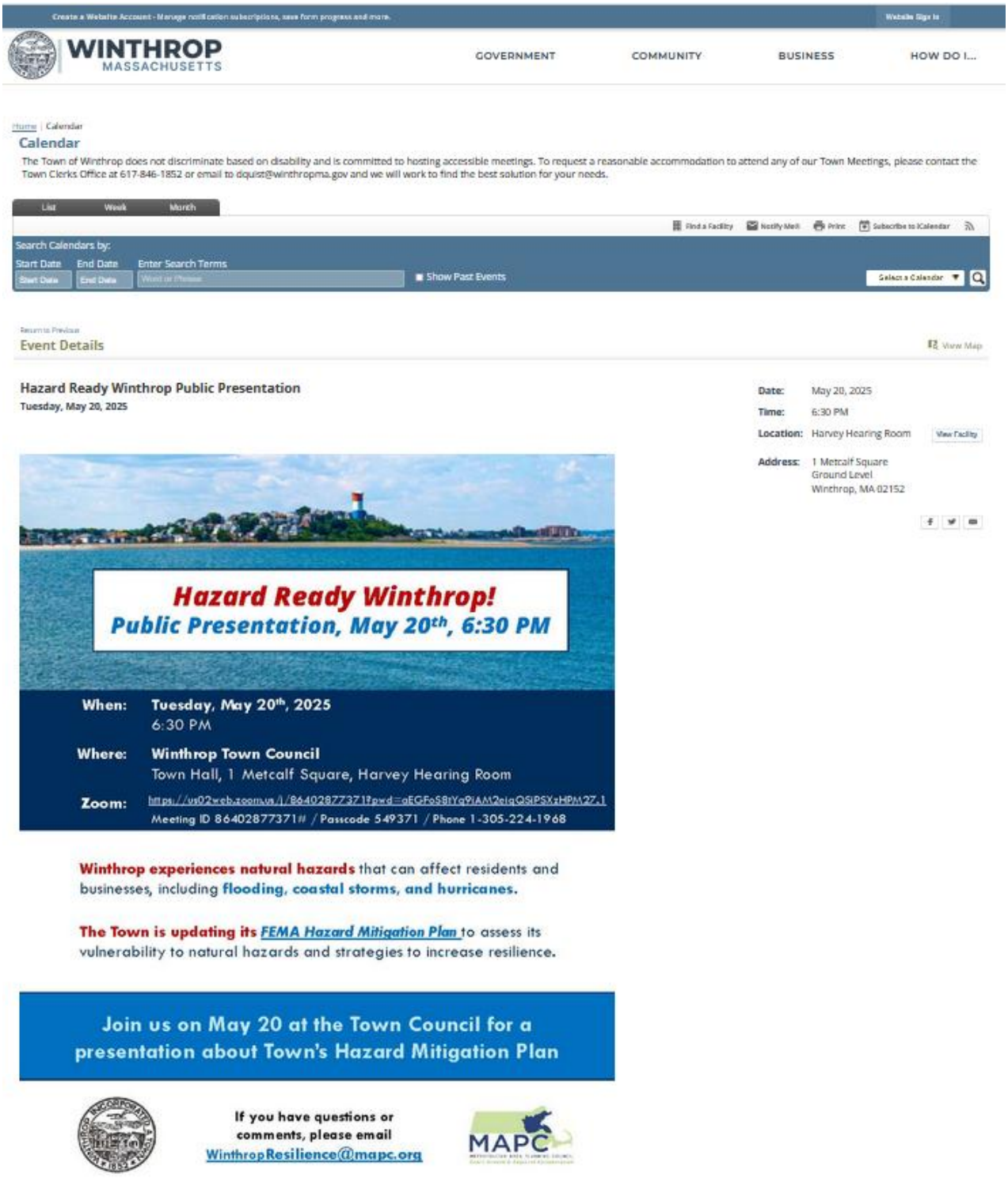
If you have questions or comments, please email
WinthropResilience@mapc.org

APPENDIX C: DOCUMENTAION OF PUBLIC MEETINGS

SOCIAL MEDIA CARD

APPENDIX C: DOCUMENTAION OF PUBLIC MEETINGS

TOWN WEBSITE POST



APPENDIX C: DOCUMENTAION OF PUBLIC MEETINGS

ZOOM INFORMATION

WINTHROP TOWN COUNCIL

Town Council Members
Town Council President James Letterie
Precinct 1 Councilor Costigan
Precinct 3 VP- Councilor Belcher
Precinct 4 Councilor Swope
Precinct 5 Councilor Aiello
Precinct 6 Councilor DaRos
Councilor at Large DeMarco
Councilor at Large Tassinari

MEETING AGENDA
MAY 20, 2025
TOWN COUNCIL
6:30 PM
HARVEY HEARING ROOM

CALL TO ORDER
ROLL CALL
PLEDGE OF ALLEGIANCE

1. **MINUTES**
   Approval of Minutes May 6, 2025 as circulated
2. **GENERAL INFORMATION AND RECOMMENDATIONS**
   CITATIONS- Learn to Skate 40Yr. Anniversary
   Sean Donahue
   George Barker
   CITATION-Retirement
   Marylou Osborne
   PRESENTATION:
   MAPC-Hazard Mitigation Presentation
3. **PUBLIC HEARING**
4. **PUBLIC COMMENT**
5. **CORRESPONDENCE**
6. **COMMITTEE REPORTS**
7. **SCHOOL DEPARTMENT REPORT**
8. **UPDATE POLICY MAKING COMMITTEES**
9. **TOWN MANAGER REPORT**
10. **OLD BUSINESS**
    MBTA 3A – Discussion and Procedure
    Discussion:
    ADU's and Short Term Rental's
11. **NEW BUSINESS**
    Proclamation Recognizing Pride Month
    Proclamation Town Council Approve to Recognize June 19, 2025 as Juneteenth National Independence Day in Winthrop
    Town Council appropriate $1,465,356 Free Cash / Stabilization Funds
    Town Council appropriate $200,000 from Retained Earnings/Wate Sewer Capital Stabilization Fund
    Town Council appropriate $130,000 Free Cash / Compensated Absences and OPEB Trust
    Town Council appropriate $20,000 Retained Earnings / Ferry Enterprise Fund Costs
    Town Council appropriate the sum of $38,500,000 for the demolition of the Old Middle School & Auditorium and Design of New Fire House
    Discuss next procedure on appointing councilor for P2
12. **PUBLIC COMMENT**
13. **PUBLIC RELATIONS / UPCOMING EVENTS**
    - Nomination Papers for the Local Election 11-4-25 Available Clerks Office
    - Please participate on the 2025 Community Health Needs Assessment-Town Website
    - Winthrop Ferry Up & Running: Schedule on Winthrop Website / Weekends begin May 24, 2025
    - June 7, 2025 Pride Pot Luck -Ingleside Park 2-6 PM
    - June 14, 2025 Pride Pub Crawl-Drop Zone Brewery 4PM
    - June 21, 2025 – Strawberry Festival-Winthrop Deane House

APPENDIX D: FLOOD RESILIENCE CHECKLIST

TOWN OF WINTHROP

Town Hall – 1 Metcalf Square
Winthrop, Massachusetts 02152

Winthrop Flood Resilience Checklist for Residential Properties

Last Updated: April 1st, 2021

The following checklist should be submitted with permit applications to the Building Commissioner for residential new construction, substantial improvements of existing buildings or utilities upgrade. This checklist is meant to serve as a guide for property owners and developers to help prepare for increased flood risks due to climate change.

Please refer to the Flood Resilience Checklist Addendum for additional information and definitions.

PROJECT INFORMATION

Applicant Name: _____

Owner: _____

Property Address: _____

Map # _____ **Lot #** _____

Is this project: ☐ New Construction ☐ Substantial Improvement of Existing Building

☐ Other Retrofit ☐ Equipment/Utilities Upgrade

Note: Construction of new structures and substantial improvements to existing structures in a flood zone must comply with all National Flood Insurance Program (NFIP) and Massachusetts State Building Code regulations.

Please provide a brief description of the proposed work:

_____

_____

_____

1. FEMA Special Flood Hazard Area	
Is any portion of your property in a 1% flood zone (FEMA Special Flood Hazard Area)?	
☐ Yes, What Zone: _____ What is the Base Flood Elevation? _____	☐ No

1

TOWN OF WINTHROP

Town Hall – 1 Metcalf Square
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FEMA defines the Base Flood Elevation (BFE) as the computed elevation to which the flood is anticipated to rise during the base flood. BFE's listed on FEMA Flood Insurance Rate Maps (FIRMs)are also referred to as the 1-percent annual chance flood or 100-year flood.

2. COASTAL FLOODING	
Is your property in a location expected to be impacted by future Sea Level Rise (SLR)? See Map X.	
☐ Yes, What Scenario: _____ What flood depth is expected at the property? _____ft.	☐ No
Has your property flooded in the past?	
☐ Yes ☐ No ☐ Don't know	
If your answered "YES" to the previous question, please answer the following questions to the best of your knowledge.	
What were the dates of the flooding?	
Flood Event #1 _____ Flood Event #2 _____	Flood Event #3 _____ Flood Event #4 _____
What was the depth of the flooding to your property? (If you can, state the height of the water above the lowest floor, including the basement floor.)	
Flood Event #1 _____ Flood Event #2 _____	Flood Event #3 _____ Flood Event #4 _____

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Additional Comments:_____

_____

_____

3. RAINSTORMS AND PRECIPITATION	
Has your property flooded in the past due to precipitation?	
☐ Yes ☐ No ☐ Don't know	
If your answered "YES" to the previous question, please answer the following questions as best you can.	
What were the dates of the flooding?	
Flood Event #1 _____	Flood Event #3 _____
Flood Event #2 _____	Flood Event #4 _____
What was the depth of the flooding to your property? (If you can, state the height of the water above the lowest floor, including the basement floor.)	
Flood Event #1 _____	Flood Event #3 _____
Flood Event #2 _____	Flood Event #4 _____
Additional Comments:_____	
_____	
_____	

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4. FLOODING SITE INTERVENTIONS

Are you providing extra freeboard as a protection measure from flood damage?

*Freeboard is the elevation a building's lowest floor above the base flood elevation. The MA Building Code- Residential Code requires 2 feet of freeboard in V zones and 1 foot of freeboard in A zones. Additional freeboard provides increased protection from flooding and greatly reduced flood insurance premiums. Please review the Massachusetts Office of Coastal Zone Management **Freeboard Fact Sheet** or visit the CZM freeboard **webpage** for more information.*

☐ Yes Base Flood Elevation: _____ Proposed Freeboard: _____	☐ No Check all that apply: ☐ Too expensive ☐ Existing zoning/height restrictions won't allow Please describe any additional reasons _____ _____

Was future Sea Level Rise considered when determining the freeboard? ☐ Yes ☐ No

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Please provide annual flood insurance quotes/estimates for the following:	
1ft. of freeboard: $_____ (for A zones only) 2ft. of freeboard: $_____ 3ft. of freeboard: $_____ 4ft. of freeboard: $_____	
What building or site measures are you implementing to protect against flooding and reduce flood damage?	
☐ Elevate Building	☐ Eliminate basement use
☐ Elevate mechanical and electrical equipment (flood-proof equipment that cannot be elevated)	☐ Sump Pump/Internal Drainage System
☐ Install Backflow Valves	☐ Installing flood openings
Other (please describe): _____	

5. STORMWATER RETENTION AND REUSE SITE INTERVENTIONS	
Please provide the percentage of existing impervious cover*: _____ %	
List the percentage of proposed impervious cover*: _____ %	
**Impervious cover includes any structure, surface or improvement that reduces and/or prevents absorption of stormwater into land (buildings, paved driveways, parking areas, and pathways)*	
What building or site measures are you implementing for reducing stormwater run-off and protecting against flooding from rainfall?	
☐ Increase Green Spaces and Planted Areas	☐ Rain Garden, Bioswales, or other Green Infrastructure
☐ Permeable Pavement or Permeable Pavers	☐ Green Roofs
☐ Rainwater Harvesting/Cistern	

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APPENDIX E: DOCUMENTATION OF PLAN ADOPTION

<PRINT ON TOWN LETTERHEAD>

CERTIFICATE OF ADOPTION
TOWN COUNCIL

TOWN OF WINTHROP, MASSACHUSETTS

A RESOLUTION ADOPTING THE
TOWN OF WINTHROP HAZARD MITIGATION PLAN 2025 UPDATE

WHEREAS, the Town of Winthrop established a Local Hazard Mitigation Planning Team to prepare the *Town of Winthrop Hazard Mitigation Plan 2025 Update*; and

WHEREAS, the *Town of Winthrop Hazard Mitigation Plan 2025 Update* contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Winthrop, and

WHEREAS, duly-noticed public meetings were held by the Winthrop Town Council on May 20, 2025, and October xx, 2025 and

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

NOW, THEREFORE BE IT RESOLVED that the Town of Winthrop Town Council adopts the *Town of Winthrop Hazard Mitigation Plan 2025 Update*, in accordance with M.G.L. 40 §4 or the charter and bylaws of the Town of Winthrop.

ADOPTED AND SIGNED this Date. _____

Name(s)

Title(s)

Signature(s)

ATTEST