TOWN OF ASHLAND
HAZARD MITIGATION PLAN
2025 UPDATE

Welcome To ASHLAND Inc. 1846

MAPC
METROPOLITAN AREA PLANNING COUNCIL

SECTION 1 ACKNOWLEDGMENT AND CREDITS

This plan was prepared for the Town of Ashland by the Metropolitan Area Planning Council (MAPC) under the direction of the Massachusetts Emergency Management Agency (MEMA) and the Massachusetts Department of Conservation and Recreation (DCR). The plan was funded by the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP).

MAPC Officers

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Ashland Local Hazard Mitigation Planning Team

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Lyn Moraghan	Deputy Fire Chief/Assistant EMD

Doug Small	Director of Public Works
Evan White	Senior Engineer
Michael Herbert	Town Manager
Cara Rossi	Police Chief
Doug Scott	Building Commissioner
Samantha Riley	Sustainability Coordinator
Becca Solomon	Conservation Agent
Sofia Chrisafideis	Conservation Assistant
Matt Boland	Fire Captain
Kevin Piers	Police Sergeant
Jordan Linden	Community Outreach and Events Coordinator
Richard Briggs	Operation Lieutenant
Peter Matchak	Director of Planning/Town Planner
Alvaro Esparza	Assistant Town Planner

Public Meeting Participants and Community Stakeholders

Special thanks to the public meeting participants, residents, and community stakeholders who provided feedback.

SECTION 2 TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

SECTION 3 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

This is an update to the most recent Ashland Hazard Mitigation Plan, which was approved by the Town on October 16, 2017. The original plan was approved by FEMA in 2008. The Hazard Mitigation Plan update was led by the Ashland Local Hazard Mitigation Planning Team (or "Local Team"), composed of staff from Town Departments including Fire, Economic Development, DPW, Health, Engineering, Conservation, Police, and Planning. The Local Team met on the following dates:

- July 11, 2024
- October 22, 2023
- January 22, 2025
- May 22, 2025

The Local Team discussed updates to local hazard areas, critical facilities, hazard mitigation goals, the Town's existing mitigation measures, and new or revised hazard mitigation measures that would benefit the Town.

Public participation in the planning process is important for improving awareness of the impacts of natural hazards and to build support for the actions the Town takes to mitigate them. The Local Team hosted two public meetings hosted by the Select Board. Town staff, residents, the Town Manager, and all Select Board members were present. The public meetings were held on:

- February 5, 2025
- August 6, 2025

Key stakeholders and neighboring communities were notified and invited to participate. The first public meeting was also used to launch a public survey that helped gather additional information related to hazard mitigation concerns, impacts, and preferred strategies. The second public meeting was used to launch a public comment period for the draft plan update. Please refer to the appendices for more information about the public comments received, and the Planning Process & Public Participation for more information about the outreach and engagement efforts that informed this plan update.

RISK ASSESSMENT

The Ashland Hazard Mitigation Plan assesses the potential impacts to the Town from flooding, high winds, winter storms, brush fire, geologic hazards, extreme temperatures, and drought. Flooding, driven by hurricanes, northeasters and other storms, clearly presents the greatest hazard to the Town. These are shown on the map series (Appendix A).

The Ashland Local Hazard Mitigation Planning Team identified 62 Critical Facilities. These are also shown on the map series and listed in Table 46, identifying which facilities are located within the mapped hazard zones.

A HAZUS analysis, which can be found in full in the 'Vulnerability Assessment' Section.

HAZARD MITIGATION GOALS

The Ashland Local Hazard Mitigation Planning Team reviewed and discussed the goals from the 2017 Hazard Mitigation Plan for the Town of Ashland. ***All the goals are considered critical for the Town and are not listed in order of importance.***

Goal 1: Prevent and reduce the loss of life, injury, public health impacts and property damage resulting from all major natural hazards.

Goal 2: Identify and seek funding for measures to mitigate or eliminate each known significant flood hazard area.

Goal 3: Integrate hazard mitigation planning as an integral factor in all relevant municipal departments, committees and boards.

Goal 4: Prevent and reduce the damage to public infrastructure resulting from all hazards.

Goal 5: Encourage the business community, major institutions and non-profits to work with the Town to develop, review and implement the hazard mitigation plan.

Goal 6: Work with surrounding communities, state, regional and federal agencies to ensure regional cooperation and solutions for hazards affecting multiple communities.

Goal 7: Ensure that future development meets federal, state and local standards for preventing and reducing the impacts of natural hazards.

Goal 8: Take maximum advantage of resources from FEMA and MEMA to educate Town staff and the public about hazard mitigation.

***Goal 9:** Consider the potential impacts of climate change and incorporate climate sustainability and resiliency into hazard mitigation planning.

***Goal 10:** Integrate environmental justice considerations into natural hazard mitigation efforts by identifying hazard impacts, tailoring mitigation measures, and engaging climate-vulnerable populations. This is particularly critical in Ashland, given its designation as a 'double-EJ' community, home to both minority and low-income populations residing in flood-prone areas.

***Goal 11**: Partner with public utilities and communications such as Eversource, Verizon, Comcast, MWRA for better outreach during natural hazards.

* Indicates new goals.

HAZARD MITIGATION STRATEGY

The Ashland Local Hazard Mitigation Planning Team identified a number of mitigation measures that would serve to reduce the Town's vulnerability to natural hazard events. Overall, the hazard mitigation strategy recognizes that these measures will be an ongoing process as our understanding of natural hazards and the steps that can be taken to mitigate their damages changes over time. Global climate change and a variety of other factors impact the Town's vulnerability and in the future, and local officials will

need to work together across municipal lines and with state and federal agencies in order to understand and address these changes. The Hazard Mitigation Strategy will be incorporated into the Town's other related plans and policies.

PLAN REVIEW AND UPDATE PROCESS

The process for developing Ashland's Hazard Mitigation Plan 2025 Update is summarized in Table 1 below.

Table 1. Plan Review and Update Process

Section	*Reviews and Updates*
3: Public Participation	The Local Team placed an emphasis on public participation for the Hazard Mitigation Plan update, and discussed strategies to enhance outreach and engagement efforts during Local Team meetings. During the project process, the plan was discussed at two public meetings, a public survey was shared, and the plan was made available on the Town's website for public comment. Outreach efforts to publicize these engagement opportunities included webpage content, social media posts, e-blasts, and flyers.
4: Risk Assessment	MAPC gathered the most recently available hazard, climate, and land use data and met with Town staff to identify changes in local hazard areas and development trends. Town staff reviewed critical infrastructure with MAPC staff in order to create an up-to-date list. This information was incorporated into an updated hazard map set, available in Appendix A. MAPC also used the most recently available version of HAZUS to assess the impacts of flooding, hurricanes, and earthquakes.
5: Goals	The Hazard Mitigation Goals were reviewed, updated, and endorsed by the Local Team.
6: Existing Mitigation Measures	The list of existing mitigation measures was updated to reflect current mitigation activities in the Town.
7 & 8: Hazard Mitigation Strategy	Mitigation measures from the 2018 plan were reviewed and assessed as to whether they were completed, partially completed, or deferred. The Local Hazard Mitigation Planning Team determined whether to carry forward measures into the 2024 Plan Update, revise them, or delete them. The Plan Update's hazard mitigation strategy reflects both new measures and measures carried forward from the 2018 plan. The Local Hazard Mitigation Team prioritized all of these 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 measures into other Town planning and regulatory review processes and better prepare the Town for the next comprehensive HMP update.

As indicated Section 7: Mitigation Measures from the 2017 Plan, the Town has made progress implementing mitigation measures identified in the 2017 HMP. Below is a summary of the progress:

15 of the mitigation measures from the 2017 plan were carried over to this 2025 plan update, most of which are partially complete. These partially completed measures are being improved or progressed by the town.

1 mitigation measures from the 2017 plan were not completed and not carried over to the current plan as they are no longer relevant to the town.

As indicated in Section 8: Hazard Mitigation Strategy, the town has identified new mitigation measures to pursue.

15 new mitigation measures that were not in the previous plan were identified and added to this plan update.

Moving forward into the next five-year plan implementation period there will be many more opportunities to incorporate hazard mitigation into the Town's decision-making processes. The challenges the Town faces in implementing these measures are primarily due to limited funding and available staff time. This plan should help the Town prioritize the best use of its limited resources for enhanced mitigation of natural hazards.

SECTION 4 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 Ashland contracted with the Metropolitan Area Planning Council (MAPC), to assist the Town in updating its local Hazard Mitigation Plan, which was adopted in 2017. MAPC is the Regional Planning Agency (RPA) serving the 101 communities in the greater Boston area and provided facilitation and technical support for this project.

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. FEMA's 2022 Local Mitigation Planning Policy Guide recognized that adapting to the expected impacts of climate change is a form of hazard mitigation. Therefore, this plan incorporates consideration of future risks due to projections for the increased frequency and severity of extreme weather fueled by global climate change effects.

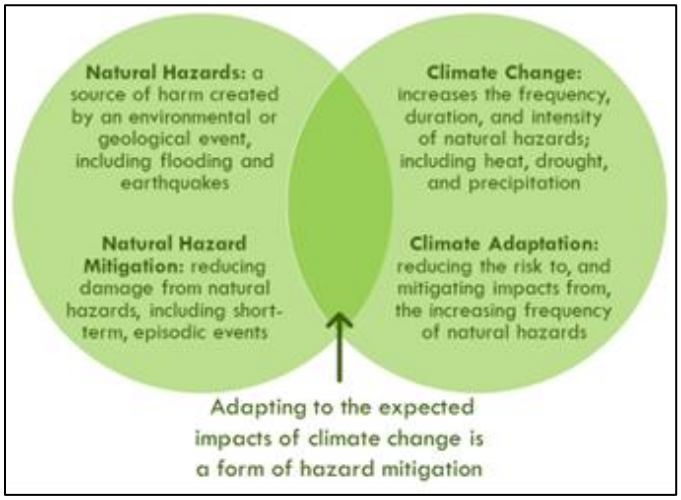

Figure 1. Natural Hazards and Climate Change

PREVIOUS FEDERAL/STATE DISASTERS

The Town of Ashland has experienced 20 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 five were due to hurricanes or nor'easters, and four were due to severe winter weather.

Table 2. Federal/State Declared Disasters 1991-2023

Disaster Name	*Date of Event*	*Declared Areas*
Hurricane Bob	August 1991	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
Severe Coastal Storm No Name Storm	October 1991	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
Blizzard	March 1993	Statewide
Blizzard	January 1996	Statewide
Windstorm	May 1996	Counties of Plymouth, Norfolk, Bristol
Severe Storms, Flood	October 1996	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
Heavy Rain, Flood	June 1998	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
Severe Storms, Flood	March 2001	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
Snowstorm	March 2001	Berkshire, Essex, Franklin, Hampshire, Middlesex, Norfolk, Worcester
Snowstorm	February 2003	Statewide
Snowstorm	December 2003	Barnstable, Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, Worcester
Flooding	April 2004	Essex, Middlesex, Norfolk, Suffolk, Worcester
Snowstorm	January 2005	Statewide
Hurricane Katrina	August 2005	Statewide
Severe Storms, Flooding	October 2005	Statewide
Severe Storms, Flooding	May 2006	Statewide
Severe Storm, Inland, Coastal Flooding	April 2007	Statewide
Severe Winter Storm	December 2008	Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Suffolk, Worcester
Severe Storms, Flooding	December 2008	Statewide
Severe Storms, Flooding	March/April 2010	Bristol, Essex, Middlesex, Suffolk, Norfolk, Plymouth, Worcester

Hurricane (Hurricane Earl)	September 2010	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester
Severe Winter Storm, Snowstorm	January 2011	Berkshire, Essex, Hampden, Hampshire, Middlesex, Norfolk, Suffolk
Hurricane (Hurricane/Tropical Storm Irene)	August 2011	Barnstable, Berkshire, Bristol, Dukes, Franklin, Hampden, Hampshire, Norfolk, Plymouth
Severe Storm, Snowstorm	October 2011	Berkshire, Franklin, Hampden, Hampshire, Middlesex, Worcester
Severe Winter Storm, Snowstorm, Flooding	February 2013	Statewide
Severe winter storm, snowstorm, flooding	January 2015	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester
Severe winter storm and Snowstorm	March 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
COVID-19	January 2020	Statewide
Severe winter storm and snowstorm	January 2022	Bristol, Norfolk, Plymouth, Suffolk

Sources: Massachusetts State Hazard Mitigation and Climate Adaptation Plan, Appendix B, 2018; OpenFEMA. Dataset: Disaster Declarations; and FEMA Declared Disasters. See "Section 10: Reference List" for more information.

Since 2018, there have been 6 Massachusetts State Declared Disasters that affected Ashland. Below is a list of them, mostly containing winter storms and pandemics.

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	January 20, 2020 – May 11, 2023	Statewide
Massachusetts Covid-19 Pandemic	January 20, 2020 – May 11, 2023	Statewide

Massachusetts Sever Winter Storm and Snowstorm	January 28-29, 2022	Statewide
Massachusetts Hurricane Lee	September 15-17, 2023	Statewide

Source: FEMA Declared Disasters

FEMA FUNDED MITIGATION PROJECTS

Over the last 20 years the Town of Ashland has not received funding from FEMA for any mitigation projects under the Pre-Disaster Mitigation or Hazard Mitigation Grant Program.

Table 4. FEMA-Funded Mitigation Projects

Grant	Project Title	Scope of Work	Total Cost
HMGP 1813-21	Brentwood Drainage Project	Drainage Improvements	$680,719

COMMUNITY PROFILE

The Town of Ashland's ideal location midway between Boston and Worcester provides easy access to the interstate highway system and the Massachusetts Turnpike. Ashland was, in earlier times, a stopping point on a major Indian trail which later became known as the Bay Path, connecting Cambridge and Connecticut. It was here that a community of Natick Indians was established as the Village of Magunkaquog in about 1659. Once the original starting point of the world famous Boston Marathon, which still runs through Ashland, the town is also known as the site of Henry Warren's invention of the electric clock, later manufactured here under the Telechron name.

Ashland, although predominantly residential, is committed to a close working relationship with its business community. Businesses, residents and visitors look forward to "Ashland Day", a not-to-be-missed annual celebration of traditional New England spirit. [1]

The Town is governed by a Select Board with a Town Manager. The town operates under the Open Town Meeting format. The 2020 population was 18,832 people and there were 7,495 housing units.

The town maintains a website at http://www.ashlandmass.com.

Challenges facing Ashland when planning for natural disasters include tackling old housing units, renter-occupied units, households who do not have a car (challenges for evacuation) and communicating with residents who have limited English skills.

Table 5. Ashland Characteristics

Population = 18,832
• **5% are under age 5** • **18.6 % are under age 18**

• **17.3% are age 65 or over**
• **2.8% speak English less than "very well" (over age 5)**
• **2.3% of households have no vehicle**
• **9.5% have a disability**
• **0.3% live in group quarters**
Number of Housing Units = 7,495
• **15.3% are renter-occupied housing units**
• **8.9% of housing units were built before 1940**

Source: U.S. Census, 2020 Decennial Census and American Community Survey 2023

Ashland town, Middlesex County, Massachusetts - Census Bureau Profile

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

- Another defining characteristic of the town are the tree-lined streets. Although these trees are vulnerable to high winds and ice storms, they are a tradeoff the town is willing to have.
- The town has proactive municipal officials that frequently share information and coordinate on a regular basis. An example of this was the first data collection session for the PDM plan, at which representatives of several different departments were present.
- Ashland is home to historic structures and sites that are irreplaceable and bring economic value to the town.
- Ashland contains several major roadways that provide emergency routes for evacuation and for routes to medical facilities.
- Ashland has some bridge crossings and dams that could be at risk in the event of flooding.
- Ashland would be a good candidate for flood-related grants due to the potential impact to property, transportation emergency routes, economic/historic resources, and the ability to solve the flooding problems through structural measures such as culvert upgrades, dam and bridge upgrades or flood proofing. The cost-benefit analysis would likely be in the town's favor.
- Much of the critical infrastructure in the town is located in clusters, often near areas of floodplain. These facilities are therefore at higher risk during natural hazards.

Ashland is 12.9 square miles and located within MAPC's MetroWest Regional Collaborative (MWRC) subregion along with Framingham, Holliston, Marlborough, Natick, Southborough, Wayland, Wellesley, and Weston. Ashland is near several major Massachusetts highways (I-495, I-90, and I-95) and Massachusetts State Routes 9 and 85. Route 135 runs through Ashland. The town has a MBTA Commuter Rail stop, Ashland Station, on the Framingham/ Worcester Line, and numerous bus routes connect Ashland to destinations in the region. Once a manufacturing town, Ashland has since become a popular suburb of Boston with wonderful

schools and green spaces. Ashland offers many amenities that make it a desired destination: the Town's school system (recently ranked 33rd best in the state) attracts families, its location near Interstate 90 and the Commuter Rail provides access to regional employment centers and transportation into Boston and Worcester, and its spacious parks and historical/cultural assets provide for enriching recreational activities. But the high cost of housing and a limited variety of available housing types makes it difficult for many to settle and stay in town. The majority of Ashland's housing stock is single-family (79%). Although many Ashland households have higher incomes (57% earn more than $100,000 a year), the remaining population has a variety of housing needs. Renters, seniors, singleperson households, and lower-income households struggle to afford housing in Ashland that meets their needs. More than a quarter of Ashland households are also low-income, earning less than 80% of the area median income (AMI) of $119,000 (HUD, 2020).

SECTION 5 PLANNING PROCESS AND PUBLIC PARTICIPATION

MAPC employs a six-step planning process based on FEMA's hazard mitigation planning guidance focusing on local needs and priorities but maintaining a regional perspective matched to the scale and nature of natural hazard events. 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:

- Meetings and work with the Local Teams.
- Two public meetings, shared on Local Access TV and advertised through e-blasts, webpage content, a flyer, and social media posts.
- A public survey and advertising the survey through e-blasts, webpage content, a flyer, social media posts, and invitations sent to community stakeholders, Town boards and commissions, and other local or regional entities.
- A project website, available at https://www.mapc.org/resource-library/ashland-hmp/
- Launching a public comment period at the second public meeting and posting the draft plan to the project website to facilitate public comment.

PLANNING PROCESS SUMMARY

The six-step planning process outlined below is based on the guidance provided by FEMA in the Local Multi-Hazard Mitigation Planning Guidance. Public participation is a central element of this process, which attempts to focus on local problem areas and identify needed mitigation measures based on where gaps occur in the existing mitigation efforts of the municipality. By working on municipal hazard mitigation plans in groups of neighboring cities and towns, MAPC is able to identify regional opportunities for collaboration and facilitate communication between communities. In plan updates, the process described below allows staff to bring the most recent hazard information into the plan, including new hazard occurrence data, changes to a municipality's existing mitigation measures, and progress made on actions identified in previous plans.

Figure 2. Six-Step Planning Process

1. **Map the Hazards** – MAPC relies on data from a number of different federal, state, and local sources in order to map the areas with the potential to experience natural hazards. This mapping represents a multi-hazard assessment of the municipality and is used as a set of base maps for the remainder of the planning process. A particularly important source of information is the knowledge drawn from local municipal staff on where natural hazard impacts have occurred. These maps can be found in Appendix B.

2. **Assess the Risks & Potential Damages** – Working with the Local Team, 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 many resources to complete this plan update, including the sample of key documents listed below. Refer to Section XIII. Reference List for a full list of sources and more detailed information.

- Town of Ashland, General Bylaws
- Town of Ashland, Zoning Bylaw
- Town of Ashland Comprehensive Plan 2016 Draft
- Town of Ashland Open Space Plan
- Town of Ashland Capital Improvement Program
- Massachusetts State Hazard Mitigation Plan 2013
- FEMA, Local Mitigation Plan Review Guide; October 1, 2011
- FEMA, Flood Insurance Rate Maps for Middlesex County, MA, 2012
- Metropolitan Area Planning Council, GIS Lab, Regional Plans and Data.
- New England Seismic Network, Boston College Weston Observatory, http://aki.bc.edu/index.htm
- NOAA National Climatic Data Center, http://www.ncdc.noaa.gov/
- Northeast States Emergency Consortium, http://www.nesec.org/
- USGS, National Water Information System, http://nwis.waterdata.usgs.gov/usa/nwis
- US Census, 2010

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 must be documented.

4. **Develop Mitigation Strategies** – MAPC works with the local municipal staff to identify new mitigation measures, utilizing information gathered from the hazard identification, vulnerability assessments, and the community's existing mitigation efforts to determine where additional work is necessary to reduce the potential damages from hazard events. Additional information on the development of hazard mitigation strategies can be found in Chapter 8.

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 D.

6. **Implement & Update the Plan** – Implementation is the final and most important part of any planning process. Hazard Mitigation Plans must also be updated on a five-year basis making preparation for the next plan update an important on-going activity. Chapter IX includes more detailed information on plan implementation.

2017 PLAN IMPLEMENTATION AND MAINTENANCE

The 2017 Town of Ashland Hazard Mitigation Plan contained a risk assessment of identified hazards for the Town and mitigation measures to address the risk and vulnerability from these hazards. Since approval of the plan by FEMA and local adoption, progress has been made on implementation of the measures. The Town has advanced a number of projects for implementation, including providing rain barrels to community stakeholders, auditing water use, comprehensive drainage improvements, dam restoration and repairs, participation in nationwide communication systems for first responders, and collaborated with neighboring communities as part of the Charles River Climate Compact.

THE LOCAL HAZARD MITIGATION PLANNING TEAM

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

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

Table 6. Membership of the Ashland Hazard Mitigation Planning Team

Name	Role	Department
Keith Robie	Fire Chief/EMD	Fire
Lyn Moraghan	Deputy Fire Chief/Assistant EMD	Fire
Doug Small	Director of Public Works	Public Works
Evan White	Senior Engineer	Engineer
Michael Herbert	Town Manager	Town
Cara Rossi	Police Chief	Police
Doug Scott	Building Commissioner	Inspection Services
Samantha Riley	Sustainability Coordinator	Sustainability

Becca Solomon	Conservation Agent	Conservation
Sofia Chrisafideis	Conservation Assistant	Conservation
Matt Boland	Fire Captain	Fire
Kevin Piers	Police Sergeant	Police
Jordan Linden	Community Outreach and Events Coordinator	Economic Development
Richard Briggs	Operation Lieutenant	Police
Peter Matchak	Director of Planning/Town Planner	Planning
Alvaro Esparza	Assistant Town Planner	Planning

The Local Hazard Mitigation Planning Team met four times on the dates listed below. The agendas for these meetings are included in Appendix B.

- **July 11, 2024**: to discuss the project overview and update local hazard areas and critical facilities inventory
- **October 22, 2024**: to update hazard mitigation goals and existing mitigation measures
- **January 22, 2025**: to update the recommended mitigation strategies from the 2018 HMP and prepare for Public Meeting #1
- **May 22, 2025**: to develop new recommended mitigation measures and prepare for Public Meeting #2

PUBLIC MEETINGS, SURVEYS, AND PUBLIC COMMENT

Public participation in the hazard mitigation planning process is important, both for plan development and for later implementation of the plan. Residents, business owners, and other community members are an excellent source for information on the historic and potential impacts of natural hazard events and particular vulnerabilities the community may face from these hazards. Their participation in this planning process also builds understanding of the concept of hazard mitigation, potentially creating support for mitigation actions taken in the future to implement the plan. To gather this information and educate residents on hazard mitigation, the Town hosted two public meetings, one during the planning process on February 6, 2025 and one once the draft plan was complete and ready for review on August 6, 2025.

Natural hazard mitigation plans typically do not attract much public involvement in the Boston region, unless there has been a recent hazard event. One of the best strategies for overcoming this challenge is to include discussion of the hazard mitigation plan on the agenda of an existing board or commission. With this strategy, the meeting receives widespread advertising and a guaranteed audience of the board or commission members plus those members of the public who attend the meeting.

Another strategy for inclusive and accessible engagement is to develop a low-barrier way for residents to add their voice to the planning process. With the launch of an online survey, seen in Figure 6, residents are able to engage in their own homes and on their own time. The project team launched a survey on Feb 5, 2025 and advertised it at the first public meeting, on the Town website, on the Town social media, and through email blasts. Screenshots are seen below.

Figure 3. Screenshot of Survey

LOCAL STAKEHOLDER INVOLVEMENT

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

Town of Holliston
Town of Sherborn
Town of Hopkinton
Town of Southborough
Town of Framingham
Select Board
Planning Board
Conservation Commission
Sustainability Committee
Board of Health
Economic Development
School Committee
Assesors
Health
Conservation
Economic Development
Planning Department
Sustainability

Town Manager
Animal Control
DPW
Water and Sewer
IT
Recreation
Human Services
Elderly Services
Fire Department
Police Department
Schools
Ashland Library
Ashland Farmers Market
Businesses Association
Energize Ashland

See Appendix D for public meeting notices and press advisories. The draft Ashland Hazard Mitigation Plan 2017 Update was posted the following URL for the second public meeting: http://mapc.ma/hmp-ashland. Members of the public could access the draft document and submit comments or questions to the Town and MAPC. No public comments were received by the Town.

CONTINUING PUBLIC PARTICIPATION

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

PLANNING TIMELINE

Table 7. Planning Timeline for the 2024 HMP Update, Post-Plan Implementation & Plan Update Timeline

July 11, 2024	First Meeting of the Ashland Local Hazard Mitigation Planning Team
October 22, 2024	Second Meeting of the Ashland Local Hazard Mitigation Planning Team
January 22, 2025	Third Meeting of the Ashland Local Hazard Mitigation Planning Team
May 22, 2025	Fourth Meeting of the Ashland Local Hazard Mitigation Planning Team
February 6, 2025	First Public Meeting with Ashland Select Board
August 6, 2025	Second Public Meeting with Ashland Select Board
TBD	Draft Plan Update submitted to MEMA
TBD	Draft Plan Update submitted to FEMA
TBD	Notice of Approvable Pending Adoption sent by FEMA
TBD	Plan Adopted by the Town of Ashland
TBD	FEMA Formal Approval of the plan for 5 years
2026	Conduct Mid-Term Plan Survey on Progress
2027	Seek FEMA grant to prepare next plan update

2028	Begin process to update the plan
2029	Submit Draft 2030 Plan Update to MEMA and FEMA
2029	FEMA approval of 2030 Plan Update

SECTION 6 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. To update Ashland'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, HAZUS.

> *"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)

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' 2023 State Hazard Mitigation and Climate Adaptation Plan (2023 SHMCAP) and Massachusetts' 2022 Climate Change Assessment.

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 almost 200 years since record keeping began in 1831. See Figure 9 below for more information.

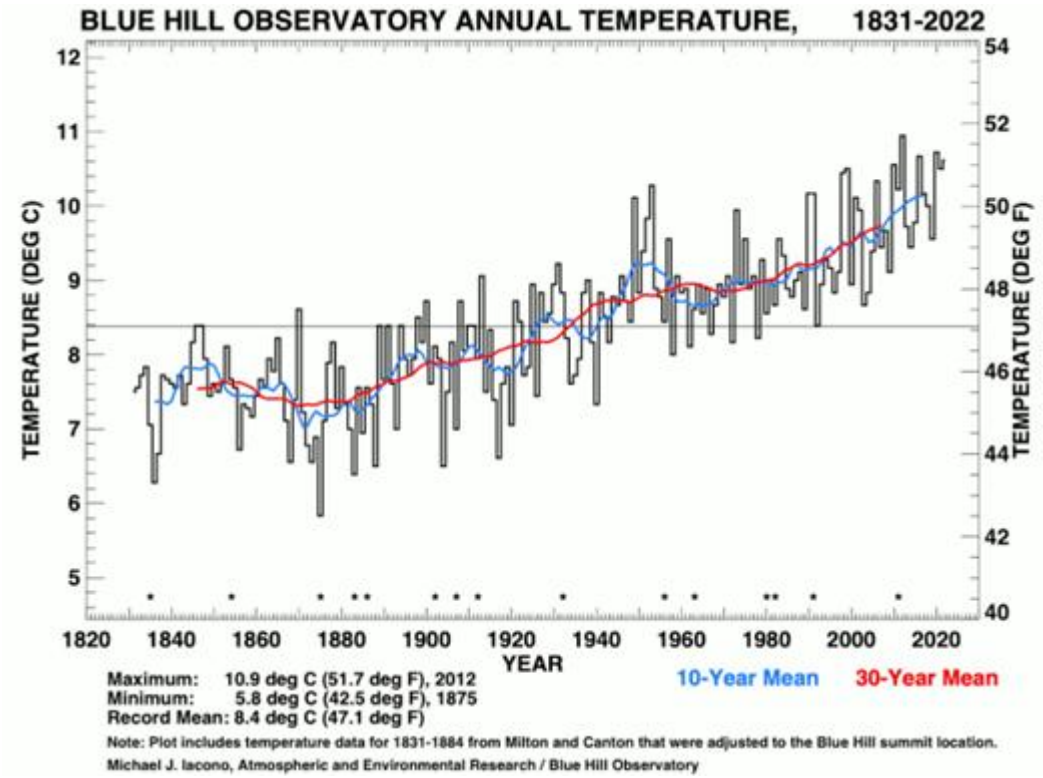

Figure 4. Observed Increase in Temperature

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).

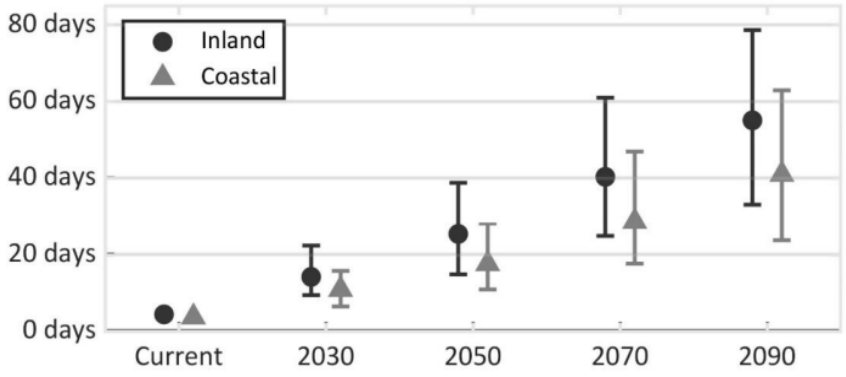

Figure 5. Change in the Annual Number of Days Over 90°F Compared to Today

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 11 from the State's 2022 Climate Change Assessment.

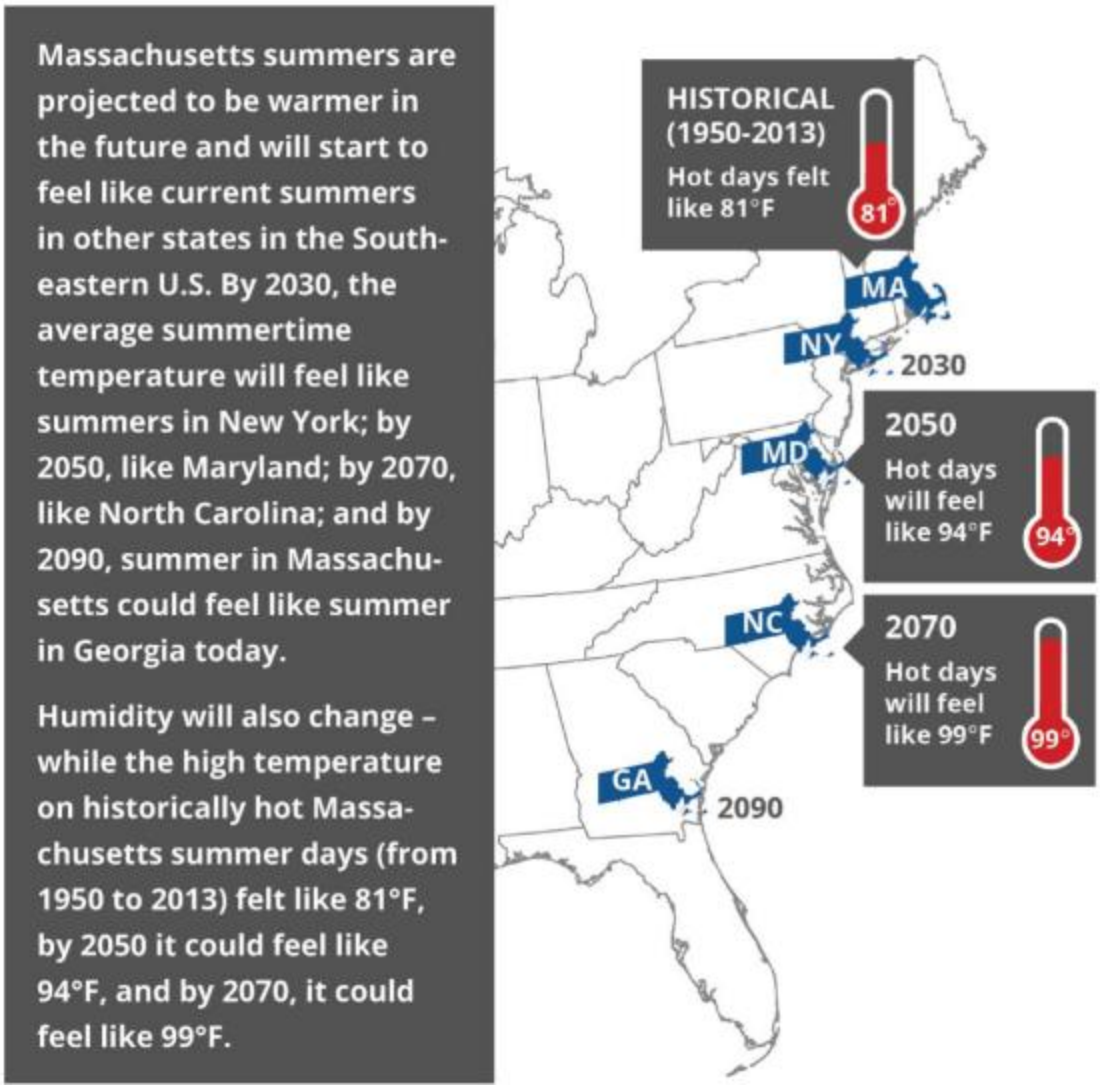

Figure 6. Change in Average Summertime Temperatures for Massachusetts

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 12 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.

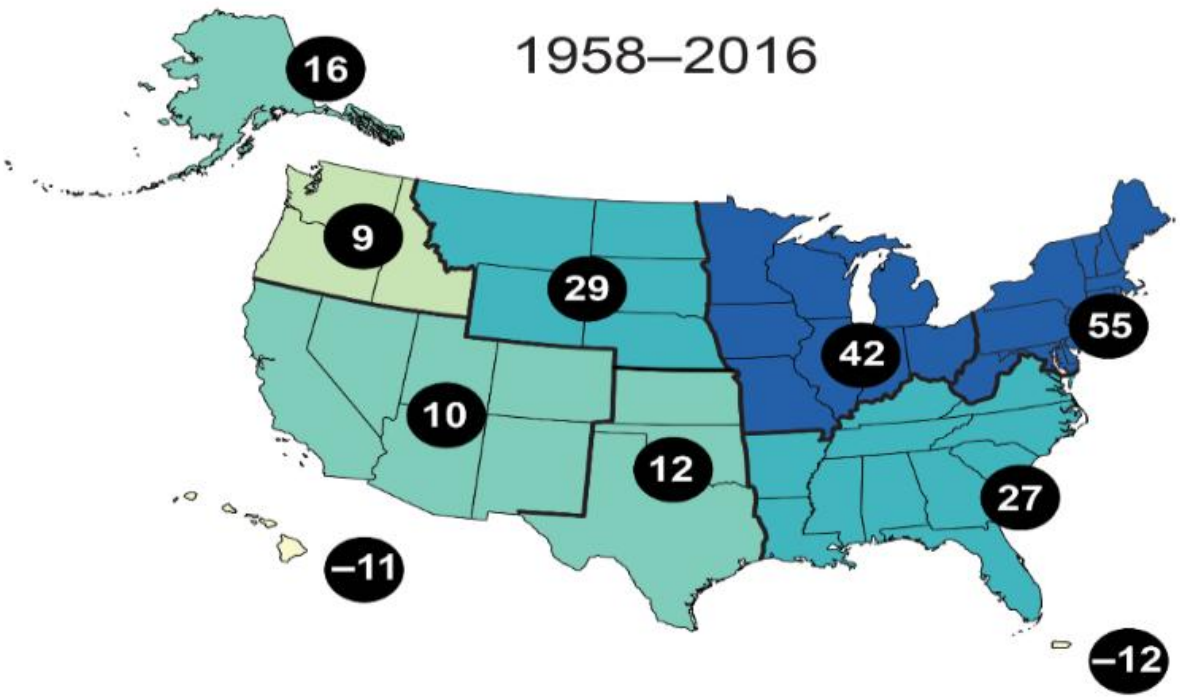

Figure 7. Observed Change in Total Annual Precipitation in the Heaviest 1% Events

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 13 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).

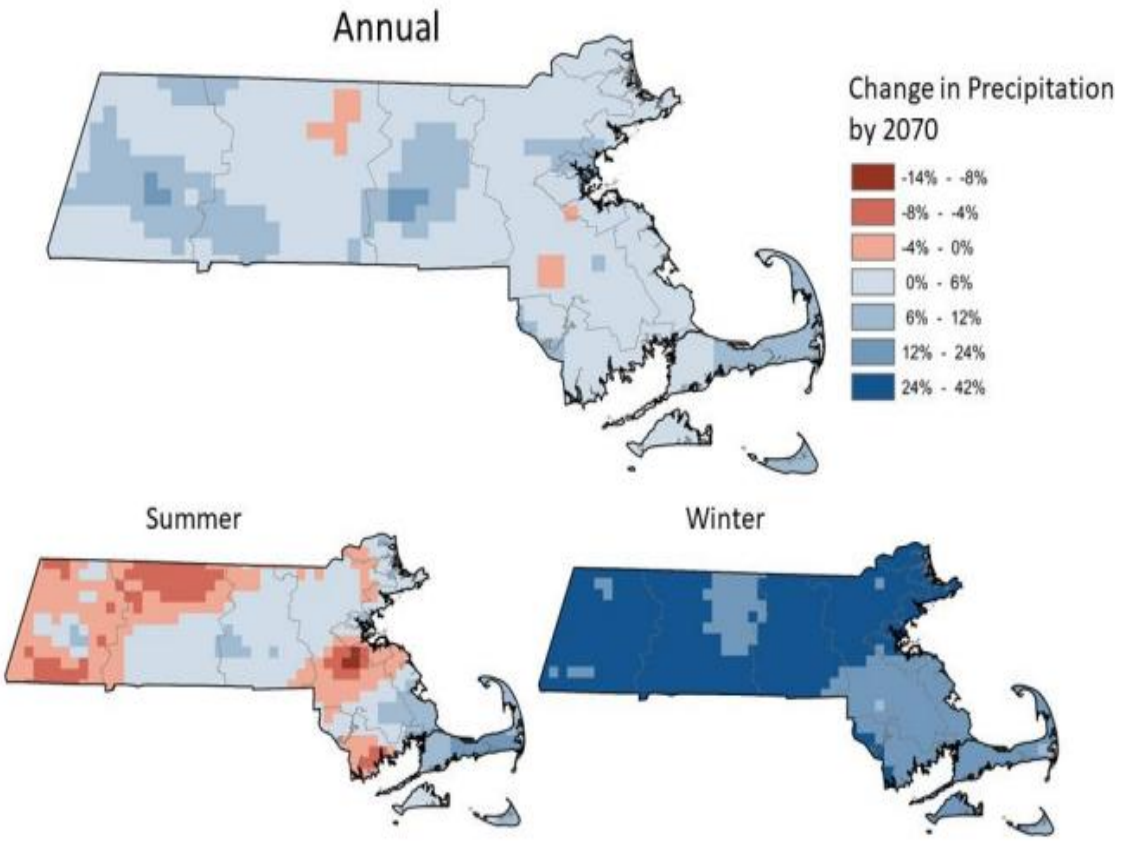

Figure 8. Change in Annual and Seasonal Precipitation in 2070 Compared to Today

Source: 2022 MA Climate Change Assessment. 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, 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 Central region where Ashland 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 below for more information.

Future results presented for four time periods identified in the table by their central year: 2030 (near-term, 2020-2039); 2050 (mid-century, 2040-2059); 2070 (mid-late century, 2060-2079); and 2090 (end of century, 2080-2099). Values may not sum due to rounding.

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, & S. 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, & S. Coast	186	182	187	191	194
Statewide	**176**	**175**	**179**	**182**	**187**
Statewide Percent Change	***0%***	***-1%***	***2%***	***3%***	***6%***

Source: Analysis of LOCA downscaled GCM data

Figure 9. Indicators of Drought- Consecutive Dry Day Events (number of multiple-dry-day events per year) and Total Annual Days without Rain in MA

Source: 2022 MA Climate Change Assessment. The Town of Ashland is located in the Central Region, outlined by the red ovals above.

SEA LEVEL RISE

While Ashland is not a coastal community, high-level information on sea level rise is discussed here 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 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 15 below for more information.

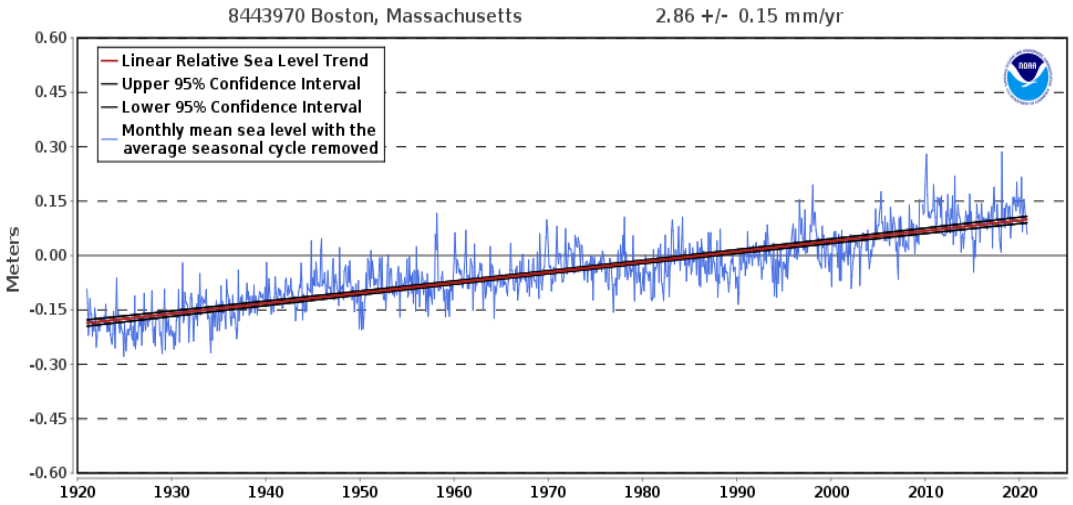

Figure 10. Observed Increase in Sea Level Rise

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

OVERVIEW OF HAZARDS AND IMPACTS

Following the outline of the 2018 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 9 below, which is originally from the 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
	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
	Drought	Rising Temperatures, Extreme Weather	

 **Changes in Precipitation**	Landslide	Rising Temperatures, Extreme Weather	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
 **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 (Extreme Cold and Extreme Heat)	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'easters, Blizzards, Snow, Ice Storms and Ice Jams)		
	Tornadoes		
	Other Severe Weather (Thunderstorms and Hail)		

In order to update Ashland risk assessment, MAPC gathered the most recently available hazard and land use data and met with Town staff to identify changes in local hazard areas and development trends. MAPC also used FEMA's damage estimation software, HAZUS (described in the Vulnerability Assessment).

Additionally, the ResilientMass Plan and the 2018 SHMCAP are two key planning documents that examine natural hazards that have the potential to impact the Commonwealth. The 2018 SHMCAP uses definitions for hazard considerations that expanded on previous research in the 2013 Massachusetts State Hazard Mitigation Plan by including additional climate projections. The ResilientMass Plan (also known as the 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan) calls for a comprehensive, integrated, and collaborative approach to climate change planning.

Definitions used in the Commonwealth of Massachusetts State Hazard Mitigation Plan

Frequency - *The frequency designations used for Ashland were based on the 2018 State Hazard Mitigation and Climate Action plan supplemented with NOAA's county-level storm event data, local information from the Hazard Mitigation Team, and HAZUS results, as well as the 2013 State HMP definitions, which define frequency categories as:*

- **Very low frequency:** events that occur less frequently than once in 100 years (less than 1% per year)
- **Low frequency:** events that occur from once in 50 years to once in 100 years (1% to 2% per year);
- **Medium frequency:** events that occur from once in 5 years to once in 50 years (2% to 20% per year);
- **High frequency**: events that occur more frequently than once in 5 years (Greater than 20% per year).

Severity - *The 2018 SHMCAP defines severity as, "the extent or magnitude of a hazard, as measured against an established indicator (e.g., Richter Scale, Saffir-Simpson Hurricane Scale, or Regional Snowfall Index)." The severity designations used for Ashland were based on NOAA's county-level storm event data, local information from the Hazard Mitigation Team, HAZUS result, and the 2013 State HMP definitions, which define severity categories as:*

- **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 8 below summarizes the frequency and severity of hazard risks for Massachusetts and Ashland, based on available data, including:

- **State-level data** including the 2022 Climate Change Assessment, ResilientMass Plan, and 2018 SHMCAP)
- **County-level data** from NOAA's National Climatic Data Center and Storm Events Database for Middlesex County (where Ashland is located)
- **Local-level information** including input from the Local Team, the hazard mapping included in Appendix A, and the Hazus results included in Appendix A.

Table 9. Hazard Risks Summary

Natural Hazard	Frequency		Severity	
	MA	**Ashland**	**MA**	**Ashland**
Inland Flooding	High	High	Serious to Catastrophic	Serious to catastrophic
Dam Failures	Low	Very Low	Extensive	Extensive
Drought	Medium	Medium	Minor to Serious	Minor
Coastal Flooding	High	N/A	Serious to Extensive	N/A
Coastal Erosion	Variable	N/A	Serious to Extensive	N/A
Tsunami	Very Low	N/A	Extensive to Catastrophic	N/A
Extreme Temperatures (Extreme Cold and Extreme Heat)	High	Medium	Minor to Serious	Minor
Wildfires	High	Low	Minor to Extensive	Minor
Invasive Species	High	Low	Minor	Minor
Hurricanes/Tropical Cyclones	Medium	Medium	Serious to Catastrophic	Serious
Severe Winter Weather (Nor'easters, Blizzards & Snow, Ice storms and Ice jams)	High	High	Minor to Extensive	Minor
Tornadoes	High	Low	Serious to Extensive	Minor
Other Severe Weather (Thunderstorms & Hail)	High	High	Minor to Extensive	Minor

Earthquakes	Very Low	Very Low	Serious to Catastrophic	Serious
Landslide	High	Low	Minor to Extensive	Minor

Sources: Frequency information for MA comes from the 2018 SHMCAP. Severity information for MA comes from the 2013 State HMP. Frequency and severity information for Ashland come from NOAA's county-level data, local information from the Local Team, hazard mapping and HAZUS results.

Note: Not all hazards included in the 2022 Climate Change Assessment or the 2018 SHMCAP are relevant to the Town. Given Ashland inland location, coastal hazards and tsunamis are unlikely to affect the Town and are therefore listed as Not Applicable ("N/A") in the Table above. Ice jams are also not a hazard in Ashland. The US Army Corps Ice Jam Database shows no record of ice jams in Ashland, and the Town did not identify ice jams as an issue of concern.

Invasive species, although present (spotted lanternfly) were also not identified as a major issue to the Town. Given the Town's location in an area of low landslide incidence (Map 6 in Appendix A), and designated in the table above as the lowest category of frequency (very low) and the lowest category of severity (minor), as well as the lack of previous documented landslide events, the Town did not identify landslides as a hazard of concern that warrants mitigation measures.

CHANGES IN PRECIPITATION

INLAND FLOODING

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

Ashland is located in the SuAsCo (Sudbury-Assabet-Concord) Watershed. Flooding is one of the most prevalent natural hazards in Ashland. Flooding can be associated with overflowing rivers and streams, as well as stormwater associated with impervious surfaces which overwhelm the capacity of natural or structured drainage systems and stormwater infrastructure.

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 (Commonwealth of Massachusetts, 2018) and (NOAA, 2022).

- February 1978
- January 1979
- April 1987
- October 1991
- October 1996
- June 1998
- March 2001
- April 2004
- May 2006
- April 2007
- March 2010

- February 2013
- January 2018
- March 2018
- June 2020

The best available local data is for Middlesex County through the National Centers for Environmental Information (see Table 11). Middlesex County, which includes the Town of Ashland, experienced 54 flood events from March 2010 to December 2022. No deaths or injuries were reported and the total reported property damage in the county was $42.06 million. See the table below for more information.

Table 10. Middlesex County Flood Events, 2010-2023

Date	Deaths	Injuries	Property Damage ($)
3/14/2010	0	0	26,430,000
3/29/2010	0	0	8,810,000
4/1/2010	0	0	0
8/28/2011	0	0	5,000
10/14/2011	0	0	0
6/8/2012	0	0	0
6/23/2012	0	0	15,000
7/18/2012	0	0	5,000
10/29/2012	0	0	0
6/7/2013	0	0	0
7/1/2013	0	0	0
7/23/2013	0	0	0
9/1/2013	0	0	10,000
3/30/2014	0	0	35,000
7/27/2014	0	0	0
8/31/2014	0	0	0
10/22/2014	0	0	20,000
10/23/2014	0	0	0
12/9/2014	0	0	5,000
12/9/2014	0	0	30,000
5/31/2015	0	0	0
8/4/2015	0	0	0
8/15/2015	0	0	125,000
9/30/2015	0	0	0
4/6/2017	0	0	0
6/27/2017	0	0	1,000
7/12/2017	0	0	1,000,000
7/18/17	0	0	0
8/2/2017	0	0	5,000
10/25/17	0	0	0
10/30/2017	0	0	0

1/12/2018	0	0	0
1/13/2018	0	0	0
4/16/2018	0	0	0
6/25/2018	0	0	15,000
8/8/2018	0	0	35,000
8/12/2018	0	0	30,000
8/17/2018	0	0	0
10/29/2018	0	0	0
11/3/2018	0	0	0
11/10/2018	0	0	0
7/6/2019	0	0	0
8/07/19	0	0	0
9/2/2019	0	0	300
6/21/20	0	0	0
6/28/20	0	0	5,000
7/23/20	0	0	0
9/10/20	0	0	3,000
7/9/21	0	0	0
9/2/21	0	0	0
11/12/21	0	0	10,000
8/5/22	0	0	0
8/7/22	0	0	0
9/5/22	0	0	0
Total	**0**	**0**	**$42.06 M**

Source: NOAA, National Centers for Environmental Information, Storm Events Database

Additionally, Middlesex County experienced 3 flash flood events from December 2012 to December 2022. No deaths or injuries were reported and the total reported property damage in the county exceeded $30 million. Most of the reported property damage occurred during the flash flood event on June 28, 2020. See the table below for more information.

Table 11. Middlesex County Flash Flood Events, 2012-2022

Date	Deaths	Injuries	Property Damage ($)
3/14/2010	0	0	26,430,000
3/29/2010	0	0	8,810,000
4/1/2010	0	0	0
8/28/2011	0	0	5,000
10/14/2011	0	0	0

6/8/2012	0	0	0
6/23/2012	0	0	15,000
7/18/2012	0	0	5,000
10/29/2012	0	0	0
6/7/2013	0	0	0
7/1/2013	0	0	0
7/23/2013	0	0	0
9/1/2013	0	0	10,000
3/30/2014	0	0	35,000
7/27/2014	0	0	0
8/31/2014	0	0	0
10/22/2014	0	0	20,000
10/23/2014	0	0	0
12/9/2014	0	0	5,000
12/9/2014	0	0	30,000
5/31/2015	0	0	0
8/4/2015	0	0	0
8/15/2015	0	0	125,000
9/30/2015	0	0	0
4/6/2017	0	0	0
6/27/2017	0	0	1,000
7/12/2017	0	0	1,000,000
7/18/17	0	0	0

8/2/2017	0	0	5,000
10/25/17	0	0	0
10/30/2017	0	0	0
1/12/2018	0	0	0
1/13/2018	0	0	0
4/16/2018	0	0	0
6/25/2018	0	0	15,000
8/8/2018	0	0	35,000
8/12/2018	0	0	30,000
8/17/2018	0	0	0
10/29/2018	0	0	0
11/3/2018	0	0	0
11/10/2018	0	0	0
7/6/2019	0	0	0
8/07/19	0	0	0
9/2/2019	0	0	300
6/21/20	0	0	0
6/28/20	0	0	5,000
7/23/20	0	0	0
9/10/20	0	0	3,000
7/9/21	0	0	0
9/2/21	0	0	0
11/12/21	0	0	10,000

8/5/22	0	0	0
8/7/22	0	0	0
9/5/22	0	0	0
Total	**0**	**0**	**$42.06 M**

Although not included in the tables above showing flood events over the last ten years, the most severe recent flooding occurred during the major storms of 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. accumulation was officially recorded by the National Weather Service (NWS. The weather pattern that caused these floods 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.

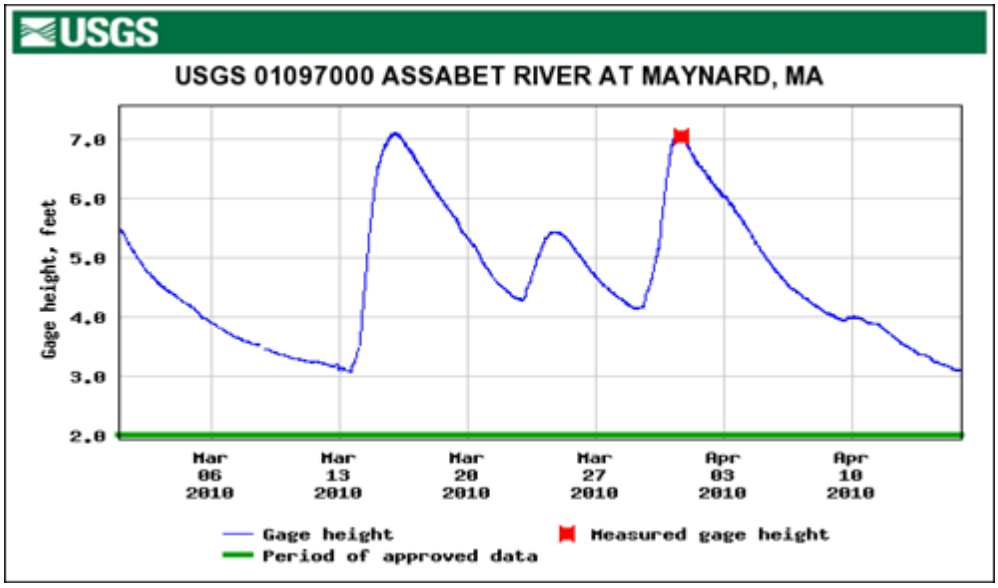

Figure 11. USGS Flood Gage Discharge Data for Assabet River, March 2010 Floods

Source: United States Geological Survey, National Water

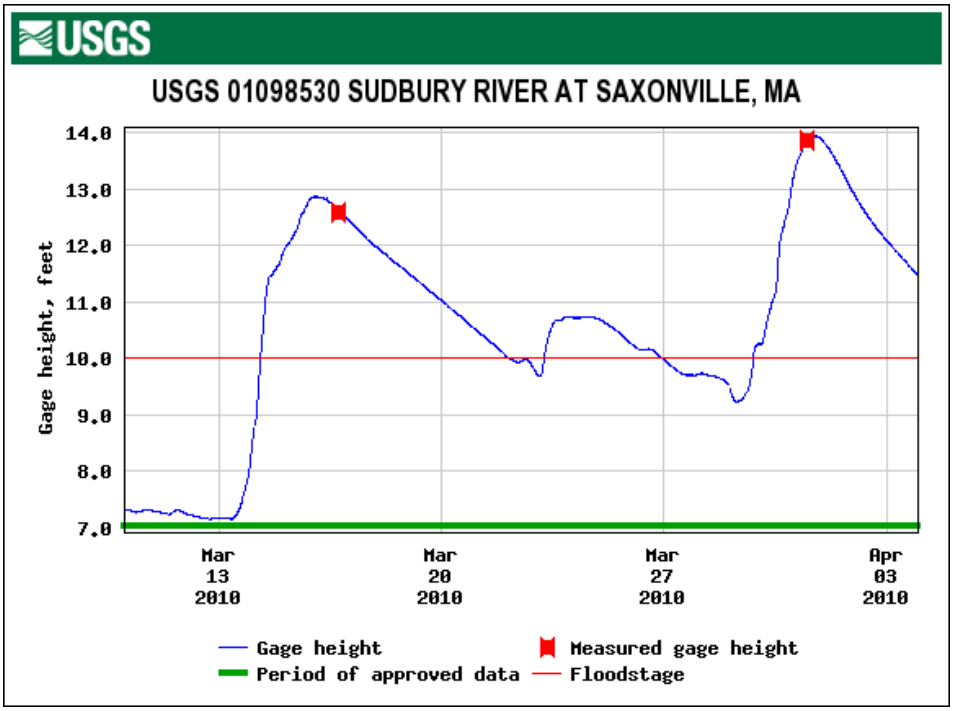

Figure 12. USGS Flood Gage Data for Nearby Sudbury River

Source: United States Geological Survey

Damages from flooding from 20210 to 2022 in Middlesex County totaled $42.5 million. It is notable that $35.2 million of that was due to the March 2010 storms. Those storms were a federally declared disaster, making federal assistance available to residents who did not carry flood insurance.

Overview of Town-Wide Flooding

As with most of eastern Massachusetts the natural hazard threat that is most prevalent in the town of Ashland, and therefore the focus of most of the town's hazard mitigation efforts is flooding. The town of Ashland is bordered by the towns of Framingham and Southborough to the north, Holliston to the south, Hopkinton to the west, and Sherborn to the east.

The town is impacted by several bodies of water, including but not limited to the Hopkinton Reservoir, the Ashland Reservoir, the Sudbury River, the Bracket Reservoir, the Waushakum Pond, and the Indian Brook. Virtually all of the 100-year and 500-year flood zones in town are located near major bodies of water, including those named above. Though the flood zones have not been properly studied as a system, town officials believe that many of the town's more frequent flooding problems are related to insufficient or inoperable flood management structures, such as culverts, dams and drain pipes that are not large enough to quickly transport flood waters away from town streets and neighborhoods and toward the nearby wetlands.

According to Local Hazard Mitigation Team, most of the town's flood-related hazards are related to high rain events, such as heavy rainstorms, tropical storms or winter rain and snow storms. In addition, the spring rainy season is a particularly hazardous time, as runoff from winter snowfalls, saturates much of the town's wetlands and fills the town's streams and brooks. A heavy or severe rain event at this time of year can often overwhelm the natural flood storage areas of the town, as well as the man-made drainage structures and create flood hazards on streets and around residential and business areas in town. Combined with the watershed from its neighboring towns, the Ashland area can accumulate a great deal of water in a short amount of time during heavy rains, severe storms and in the spring season.

Potential flood damages to Ashland have been estimated using HAZUS-MH.

Virtually all of the 100-year and 500-year flood zones in town are located near major bodies of water, including those named above. However, in many of those zones, the flood frequency is greater than the 100-year flood event. Though the flood zones have not been properly studied as a system, town officials believe that many of the town's more frequent flooding problems are related to insufficient or inoperable flood management structures, such as culverts, dams and drain pipes that are not large enough to quickly transport flood waters away from town streets and neighborhoods and toward the nearby wetlands.

With its combined water sources, areas in Ashland can accumulate a great deal of water in a short amount of time during heavy rains, severe storms and in the spring season.

The 2023 Climate Change Assessment quantified the developed land area flooded for events including:

- 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 area could be impacted by the annual probability event by 2070. See Figure below for more information.

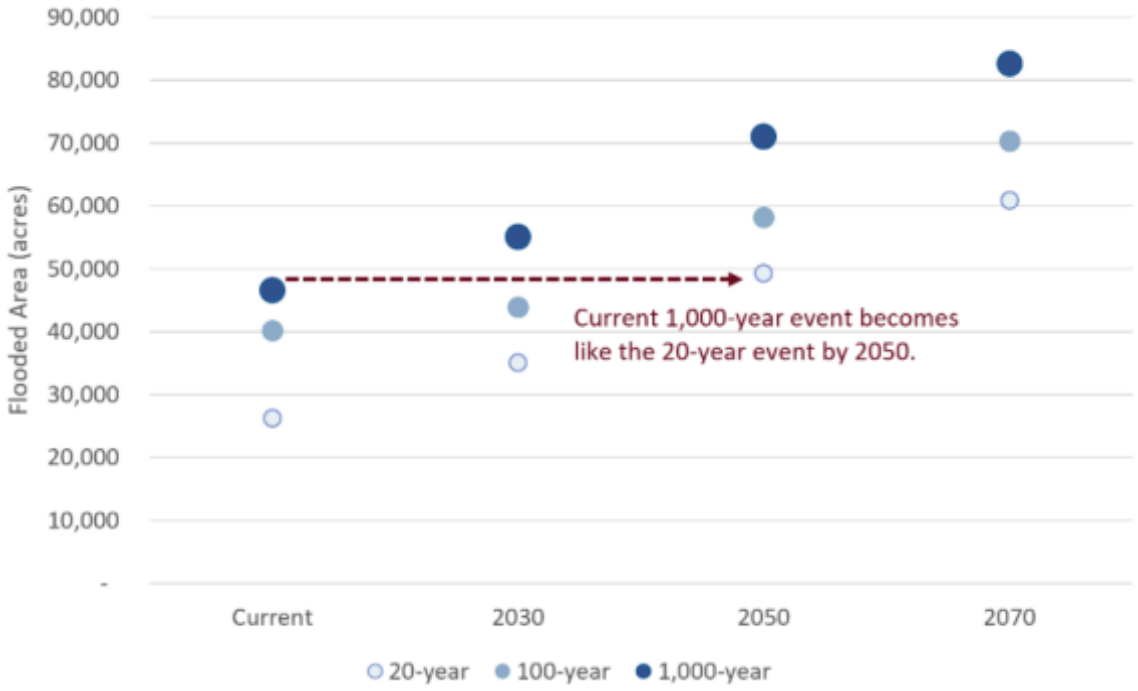

Figure 13. Total Flooded Area of the Commonwealth for Selected Events

Source: 2022 MA Climate Change Assessment

Potential Flood Hazard Areas

Information on potential flood hazard areas was taken from two sources. The first was the current National Flood Insurance Rate Maps, dated July 17, 2012. The FIRM flood zones are shown on Map 3b. in Appendix A and their definitions are listed below.

The current effective Flood Insurance Study (FIS) can be found through FEMA's database.

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.

Zones X500 (.2% annual chance) **-** Zone X500 is the flood insurance rate zone that correspond 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

In addition, information on areas subject to flooding was provided by local officials. The Locally Identified Areas of Flooding described below were identified by Town staff as areas where flooding is known to occur. All of these areas do not necessarily coincide with the flood zones from the FIRM maps. Some may be areas that flood due to inadequate drainage systems or other local conditions rather than location within a flood zone. The numbers correspond to the numbers on Map 8, "Local Hazard Areas."

Locally Identified Areas of Flooding

The town identified the following local areas of potential flooding. These are summarized in Table 13 and displayed on Map 8, with the corresponding map location numbers in the first column of Table 13.

The locally identified areas of flooding described below were identified by the Local Team as areas where flooding occurs. 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. The numbers correspond to the numbers on Map 8, "Local Hazard Areas". The numbers do not reflect priority order.

Table 12. Locally Identified Areas of Flooding

Site ID	Site Name	Description
1	Megunko Hill Stream	This stream originates in the Megunko Hill area, flows along the railroad tracks and then backs up to flood the area around the intersection of Tilton and Cherry Streets, including the fire station there. This area floods routinely on small storm events and is the biggest flooding nuisance in downtown Ashland. Catch basins in this neighborhood are routinely cleaned prior to larger storm

		events to reduce flooding impacts. The drainage from Tilton Avenue to Main Street needs to be improved to mitigate this flooding problem. Current mitigation includes a drainage study being paid for by the town using project mitigation money that will cover the Tilton and Cherry Street drainage area.
2	Central Street/Alden Street Intersection	This is a relatively flat neighborhood which has poor drainage and it floods consistently. There are at least two catch basins that need to be replaced and the drain pipes for this area need to be re-routed to into either the Main Street, Hanover Street or Route 135 drainage systems.
3	Metcalf Avenue @ railroad tracks	This site consists of a dysfunctional catch basin where Metcalf Trail intersects the railroad tracks. The catch basin and storm drain line need to be cleaned out.
7	Oak Street/Oregon Street Intersection	This area features a clogged catch basin that floods during all storm events. Though the catch basin has been cleaned consistently by the town, the catch basin itself needs replacing and new, upgraded drain lines need to be installed from the intersection all the way along Oregon Road.
10	Edgewood Drive (end)	Located in a floodplain area, localized flooding occurs at the end of Edgewood Drive when the undersized drainage system backs up and floods houses nearby. This results in water running off from the end of Edgewood Drive and impacting the surrounding neighborhood as well. The town would like to commission a drainage study for this area as a first step towards mitigating flooding problems here.
11	Concord Street Bridge	During larger storm events, water levels rise in the Sudbury River, backup against the low arched dam and then flood the surrounding neighborhood. The town's current mitigation strategy is to release water from the Mill Pond upstream of the bridge prior to storm events to create additional storage capacity and keep river levels lower during storm. Long term mitigation would include be to create further flood water storage by enlarging the existing culverts along Concord Street.
13	Mulhall Road/Wesson Road	Flooding in this area does not impact any homes at this time but does create localized flooding near the intersection of these two roads. A new drainage line has been recently installed along Mulhull Road and future mitigation would include replacing all catch basins on both roads.
14	Beaver dam at end of Mulhall Road	Causes flooding
15	Beaver dam off Greenwood Road	Causes flooding
16	Beaver dam at Coldstream Brook off Main Street	Causes flooding
17	South Street Boat Landing at Ashland Reservoir	Causes flooding
27	Olive Street near Esther Lane	There are three undersized pipes and need to upgrade to a open bottom culvert box since area is prone to flooding.

How participants implement the substantial improvement/substantial damage provisions of their floodplain management regulations after an event:

The Town implements the SI/SD provisions of its floodplain management regulations as required per the NFIP (CFR Title 44, Parts 59 through 65) and Massachusetts State Building Code (780 CMR). The Town provides a "Substantial Improvement or Substantial Damage Application Packet Checklist" to the checklist for applicants that must submitted as part of the community permit

application process for substantial improvement or substantial damage of a structure located in a special flood hazard area. Applicants are responsible for submitting a Floodplain Management Permit Application which includes itemized SI/SD claims, and

Ultimately the Building Commissioner provides determinations on the permit. 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 SI/SD provisions.

Based on the record of previous occurrences, flooding events in Ashland are a high frequency event as defined by the Massachusetts State Hazard Mitigation Plan. This hazard may occur more frequently than once in five years, or a greater than 20% chance per year.

Flooding and Climate Change

Data from the 2022 MA Climate Change Assessment related to changes in precipitation patterns is included in an earlier part of this Section. 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, Ashland 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 in its proposed regulations 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 for the Town of Middlesex is summarized in the table below (NOAA, 2023) .

Table 13. Rainfall rates for the 10-year 24-hour storm

NOAA 14	NOAA 14+	NOAA 14++
5.25 inches	5.90 inches	6.56 inches

The 2022 MA Climate Change Assessment also highlights the following climate impacts for the Central Region (where Ashland is located), related to flooding:

- 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 inland 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).

DAM FAILURE

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. According to the Office of Dam Safety, three dams have failed in Massachusetts since 1984, one of which resulted in a death. There have been no recorded dam breaches in Ashland.

The increasing intensity of precipitation is the primary climate concern related to dams, as they were designed based on historic weather patterns. The ResilientMass Plan and the 2018 SHMCAP both indicate that changing precipitation patterns may increase pressure on dams and increase the likelihood of overflow events.

The MA Department of Conservation and Recreation (DCR) defines dam hazard classifications as follows:

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

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

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

According to data provided by the DCR and the town, there are six dams located in Ashland, four of which are owned by the Commonwealth of Massachusetts, Department of Conservation and Recreation, and two of which are owned by the Town of Ashland. They are summarized in the Table below.

Table 14. DCR Inventory of Dams in Ashland

Dam Name	River Impounded	Name Owner	Hazard Potential Classification
Mill Pond Dam	Sudbury River	Town of Ashland	High Hazard
Hopkinton Reservoir Dam	Indian Brook	Mass. DCR	High Hazard
Hopkinton State Park Swimming Pool Dam	Tributary of Indian Brook	Mass. DCR	High Hazard
Ashland Reservoir Dam	Cold Spring Brook	Mass. DCR	High Hazard
Sudbury River Dam	Sudbury River	Mass. DCR	Low Hazard
Cedar St. Dam	Sudbury River	Town of Ashland	Significant Hazard

Source: MA Department of Conservation and Recreation Office of Dam Safety

There have been no dam failures documented for the Town of Ashland. Based on the record of previous occurrences, dam failure in Ashland is a very low frequency event as defined by the ResilientMass Plan. This hazard may occur less frequently than once in 100 years (less than 1% per year). The Town frequently inspects its dams and dikes and submits reports to the DCR Office of Dam Safety as required.

Four of Ashland's dams are considered high hazards and one of significant hazard. Local officials did not indicate any sort of concern.

The team coordinated with the Town of Ashland to obtain and review the EAP for high hazard dams.

DROUGHT

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

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 moisture (U.S. Geological Survey). This is considered the drought of record in Massachusetts.

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. Ashland is located in the Northeast Region, and drought is considered a potential town-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 levels provide a basic framework from which to take actions to assess, communicate, and respond to drought conditions. They begin with a normal situation where data are routinely collected and distributed, move to heightened vigilance with increased data collection during an advisory, to increased assessment and proactive education during a watch. Water restrictions might be appropriate at the watch or warning stage, depending on the capacity of each individual water supply system. A warning 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. Drought levels are used to coordinate both state agency and local response to drought situations.

The Massachusetts drought levels are shown in comparison to the U.S. Drought Monitor levels in Table 20. The two sets of drought indices are similar, but Massachusetts combines the USDM's level D2 and D3 into one category, Critical Droughts.

Table 15. 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 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. 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. 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.

The table below 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 the State data as the best available data for previous drought occurrences.

Table 16. 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.

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.

Previous Occurrences

A summary of Massachusetts long term historic drought events from 1879 to 2019 is shown in Table 22. This table was prepared for the Massachusetts Drought Management Plan in 2019, so it does not include droughts in the last few years.

Table 17. 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

EEA's Drought Management Task Force provides information on historic drought status for the Northeast region in Massachusetts, where Ashland is located. That information is summarized in Table 23 and Figure 22 below.

Table 18. Drought Status History for the Northeast Region, 2001-2023

Mild Drought/Advisory	2001, 2002, 2007, 2010, 2017
Significant Drought/Watch	2002, 2016,
Critical Drought/Warning	2016, 2020, 2022
Emergency Drought/Emergency	None

Source: Drought Management Task Force, 2023

As shown in Figure below, another measure of drought is the U.S. Drought Monitor, which characterizes droughts as abnormally dry, moderate, severe, extreme, and exceptional. Extreme drought is characterized by likely crop and pasture losses, water shortages, and water restrictions[3].

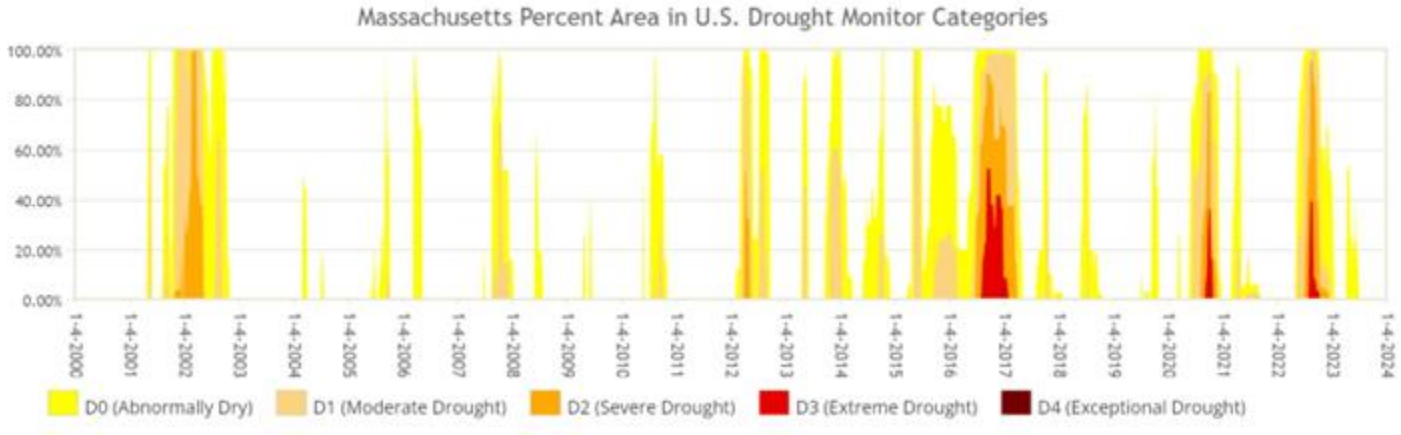

Figure 14. Percent Area in Massachusetts with Drought Conditions 2000-2023

According to the US Drought Monitor, in 2016, nearly half of Massachusetts was in extreme drought conditions with 15 inches of deficit rainfall (Figure 23), the worst drought since 1965. The drought geographically affected 6.5 million people, forced communities to buy drinking water from the Massachusetts Water Resources Authority,[1] and prompting State aid to farmers for crop losses.

In recent past there have been several droughts in Massachusetts. 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 (Figure 23). This was followed by another drought four years later in 2020, which was 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 but the region experienced another drought in the summer of 2022.

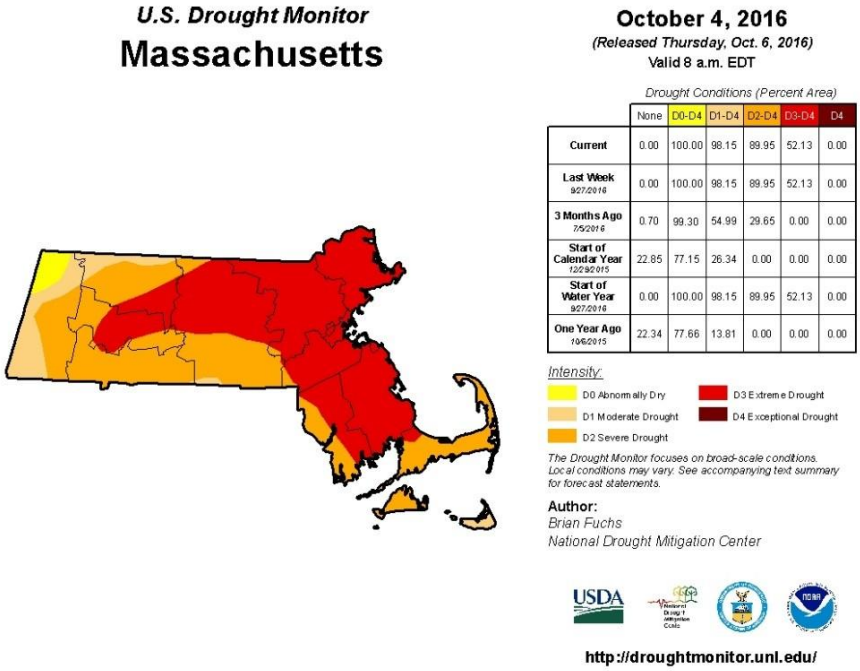

Figure 15. Extreme Drought Conditions in Massachusetts 2016

Source: US Drought Monitor, 2028-2023

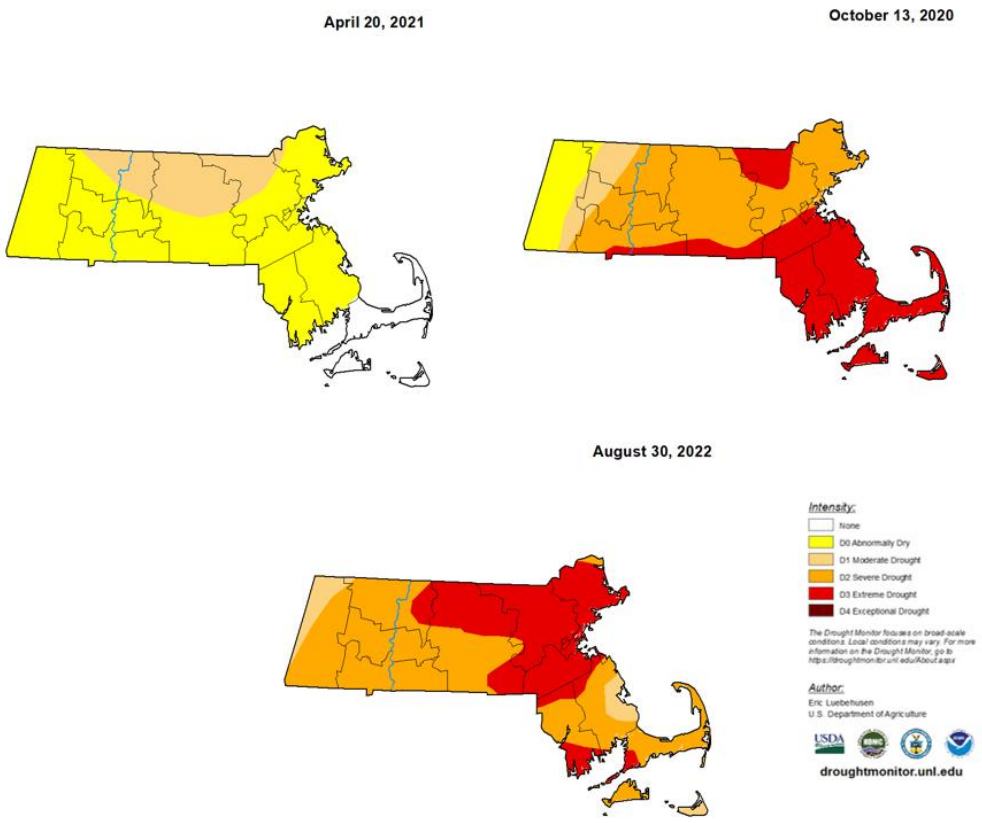

Figure 16. Recent Massachusetts Drought Events (2018-2023)

Source: US Drought Monitor, 2018-2023

6.1.1 POTENTIAL DROUGHT VULNERABILITY

The town's vulnerability to drought could include impacts on public and private water supplies, agriculture, aquatic ecology, wildlife, and fire hazard. More information on municipal water infrastructure is included in the "Critical Infrastructure in Hazard Areas" section. Prolonged drought could lower water tables and reduce the amount of water available from pumping wells. Lowering the water table could also result in reductions in water quality. A severe drought could also increase the risk of wildfire on forested lands and other vegetated areas.

Under a severe long-term drought, the Town of Ashland could be vulnerable to restrictions on water supply. Potential damages of a severe drought could include losses of landscaped areas if outdoor watering is restricted and potential loss of business revenues if water supplies were severely restricted for a prolonged period. As this hazard has never occurred to such a severe degree in Ashland, there are no data or estimates of potential damages, but under a severe long term drought scenario it would be reasonable to expect a range of potential damages from several million to tens of millions of dollars. Because drought tends to be a regional natural hazard, this plan references state data as the best available data for drought. The statewide scale is a composite of the six regions in the state. Regional composite precipitation values are based on monthly values from six stations, and three stations in the smaller regions (Cape and Islands and West regions).

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 the table below for more information.

Table 19. Frequency of Massachusetts Drought Levels

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

Source: 2018 SHMCAP

Drought Emergency

Drought emergencies have been reached infrequently, with 5 events occurring in the period between 1850 and 2012: in 1883, 1911, 1941, 1957, and 1965-1966. The 1965-1966 drought period is viewed as the most severe drought to have occurred in modern times in Massachusetts because of its long duration. On a monthly basis over the 162-year period of record, there is a one percent chance of being in a drought Emergency.

Drought Warning

Drought Warning levels not associated with drought Emergencies have occurred five times, in 1894, 1915, 1930, and 1985, and 2016. On a monthly basis over the 162-year period of record, there is a two percent chance of being in a drought Warning level. As of July 2016, a Drought Warning has been declared for the Northeast region, which includes the Town of Ashland. December 2016 marked the ninth consecutive month of below average rainfall (see Figure).

Drought Watch

Drought Watches not associated with higher levels of drought generally have occurred in three to four years per decade between 1850 and 1950. In the 1980s, there was a lengthy drought Watch level of precipitation between 1980 and 1981, followed by a drought Warning in 1985. The frequency of drought Watches at a rate of three years per decade resumed in the 1990s (1995, 1998, 1999). In the 2000s, Drought Watches occurred in 2001 and 2002. The overall frequency of being in a drought Watch is 8% on a monthly basis over the 162-year period of record.

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 Central region where Ashland 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

EXTREME WEATHER

Extreme weather typically include wind-related hazards which are hurricanes, tropical storms, and tornadoes, as well as high winds during nor'easters and thunderstorms. As with many communities, falling trees that result in downed power lines and power outages are an issue in Ashland. Information on wind related hazards can be found on Map 5 in Appendix A.

Tree damage during high winds has the potential to be a significant hazard in Ashland. Trees can knock out power lines and block major roadways, which hinders emergency response. Since Ashland does experience downed trees that have caused isolated power outages and roadway blockages, maintaining trees in a proactive fashion is essential to minimize the potential impacts of tree damage on the community . Ashland is expanding its tree trimming and maintenance program.

HURRICANES AND TROPICAL CYCLONES

A hurricane is a violent wind and rainstorm with wind speeds of 74 to 200 miles per hour. A hurricane is strongest as it travels over the ocean and is particularly destructive to coastal property as the storm hits land. Given its location not too distant from the coast, the Town of Ashland entire area is vulnerable to hurricanes, which occur between June and November. A tropical storm has similar characteristics, but wind speeds are below 74 miles per hour. Since 1900, 39 tropical storms have impacted New England (NESEC), nine Category 1 hurricanes, five Category 2 hurricanes and one Category 3 hurricane. Massachusetts hurricanes since 1938 are shown in Table 25.

Table 20. Hurricane Records for Massachusetts, 1938 to 2023

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

Source: National Oceanic and Atmospheric Administration

Hurricane intensity is measured according to the Saffir/Simpson scale, which categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential. These are combined to estimate potential damage. Table 26 gives an overview of the wind speeds, surges, and range of damage caused by different hurricane categories:

Table 21. Saffir/Simpson Scale

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

Source: National Oceanic and Atmospheric Administration (NOAA)

A hurricane storm track is the line that delineates the path of the eye of a hurricane or tropical storm. However tropical storms and hurricanes have regional impacts, and Ashland can also experience the impacts of the wind and rain from hurricanes and tropical storms regardless of whether a storm track passes directly through the town.

Only one hurricane has tracked through Ashland, in 1897. Another passed through neighboring Framingham just north of the Ashland border in 1876. In addition, Ashland experiences the impacts of hurricanes and tropical storms regardless of whether the storm track passes directly through the Town, and numerous hurricanes have affected the communities of eastern Massachusetts (see table). The hazard mapping indicates that the 100 year wind speed in Ashland is 110 miles per hour (see Appendix B).

Falling trees and branches are a significant impact of the high winds of hurricanes, which often results in power outages or block traffic and emergency routes when they fall on roads. Rainfall associated with hurricanes can cause flooding in the town's rivers and streams, as well as localized stormwater drainage flooding. Potential hurricane damages to Ashland from a 100-year and 500-year hurricane have been estimated using HAZUS. Hurricanes and tropical storms are considered a town-wide hazard for Ashland.

Probability of Future Occurrences

Based on records of previous occurrences, hurricanes in Ashland 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 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), which allows surveyors to create more precise assessments of tornado severity. The EF-scale is summarized below:

Table 22. Enhanced Fujita Scale

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

Source: SHMCAP 2018

The frequency of tornadoes in eastern Massachusetts is low; on average, there are six tornadoes that touchdown somewhere in the Northeast region every year. The strongest tornado in Massachusetts history was the Worcester Tornado in 1953, killing 94 people, injuring 1,288 and costing $52.1 million in damages (worth $465.3 million today). [3]

Recent tornado events in Massachusetts resulted in significant damage in Springfield in 2011 and in Revere in 2014. The Springfield tornado caused significant damage and resulted in four deaths in June of 2011. The Revere tornado touched down in Chelsea just south of Route 16, moved north into Revere's business district along Broadway, and ended near the intersection of Routes 1 and 60. The path was approximately two miles long and 3/8 mile wide, with wind speeds up to 120 miles per hour. Approximately 65 homes had substantial damage and 13 homes and businesses were rendered uninhabitable. And on August 22, 2016, an F1 tornado passed through part of nearby Concord. It impacted an area 0.85 miles long by 400 yards wide. According to the report from the National Centers for Environmental Information:

"This tornado touched down near the Cambridge Turnpike and headed northeast. Most of the damage was concentrated in an area beginning near the intersection of Lexington Road and Alcott Road and continuing up to the neighborhood of Alcott and Independence Roads. Numerous trees were uprooted or had the tops sheared off. These subsequently blocked roads, damaged homes, and downed power lines, cutting off power to the neighborhood. In addition, utility poles were downed either from the wind or from the downed power lines. Thirty-nine houses in this area were damaged to some degree. Only one house suffered significant structural damage. The tornado continued for a short distance beyond this neighborhood before lifting. The historical home of Louisa May Alcott and her family was right next to the tornado path but was not damaged."

Although there have been no recorded tornados within the limits of the Town of Ashland. Since 1955 there have been 16 additional tornadoes in surrounding Middlesex County recorded by the Tornado History Project. Two of these were F3 tornados, and four were F2. These 17 tornadoes resulted in a total of one fatality and six injuries. While there are no existing estimates for potential damages from tornadoes in Ashland, the best available date for Middlesex County shows that since 1955, 17 recorded tornadoes resulted in an estimated range of damages from $771,000 to $7.7 million, as summarized in Table above.

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

Table 23. Tornado Records for Middlesex County, 1950-2023

Date	Fujita	Fatalities	Injuries	Width	Length	Damage
10/24/1955	1	0	0	10	0.1	$500-$5000
6/19/1957	1	0	0	17	1	$5K-$50K
6/19/1957	1	0	0	100	0.5	$50-$500
7/11/1958	2	0	0	17	1.5	$50K-$500K
8/25/1958	2	0	0	50	1	$500-$5000
7/3/1961	0	0	0	10	0.5	$5K-$50K
7/18/1963	1	0	0	50	1	$5K-$50K
8/28/1965	2	0	0	10	2	$50K-$500K
7/11/1970	1	0	0	50	0.1	$5K-$50K
10/3/1970	3	1	0	60	35.4	$50K-$500K
7/1/1971	1	0	1	10	25.2	$5K-$50K
11/7/1971	1	0	0	10	0.1	$50-$500

7/21/1972	2	0	4	37	7.6	$500K-$5M
9/29/1974	3	0	1	33	0.1	$50K-$500K
7/18/1983	0	0	0	20	0.4	$50-$500
9/27/1985	1	0	0	40	0.1	$50-$500
8/7/1986	1	0	0	73	4	$50K-$500K

Source: Tornado History Project; NOAA National Centers for Environmental Information

Although tornadoes are a potential town-wide hazard in Ashland, tornado impacts are relatively localized compared to severe storms and hurricanes. Damages from any tornado in Ashland would greatly depend on the track of the tornado. The greatest potential damages would be in the most densely developed part of town in the town center.

Based on the record of occurrences since 1950, the likelihood of Tornado events occurring in Massachusetts is high (almost certain to occur at least once in a year) according to the ResilientMass Plan: 2023 SHMCAP. Massachusetts averages two to five tornadoes per year. Only two tornadoes (1953 and 2011) received disaster declarations. Massachusetts has experienced 12 tornadoes since 2018 (EF0 to EF1). Massachusetts experienced six tornadoes in 2021 (EF0), causing under $50,000 in property damage.

Tornadoes and Climate Change

According to the 2023 SHMCAP, current climate models predict an increase in severe thunderstorms, which have the potential to produce tornadoes. However, it is unclear if tornado frequency will increase with climate change. Some studies suggest there will be a decrease in the number of tornado days, but an increase in the number of tornadoes per day. However, scientists have less confidence in the models that seek to project future changes in tornado activity.

OTHER SEVERE WEATHER (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 town's entire area is potentially subject to severe thunderstorms.

The extent of damages from high winds is described by the Beaufort Wind Scale (Table24), which was developed in 1805 by Sir Francis Beaufort of the U.K. Royal Navy.

Table 24. 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-like	Calm, smoke rises vertically

1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-19 ft, white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (18-25 ft) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Twigs breaking off trees, generally impedes progress
9	41-47	Strong Gale	High waves (23-32 ft), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate 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, trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (37-52 ft) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft, sea completely white with driving spray, 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 (Figure below). 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. Ashland is in the Relatively High category of Lightning Risk as shown in Figure below.

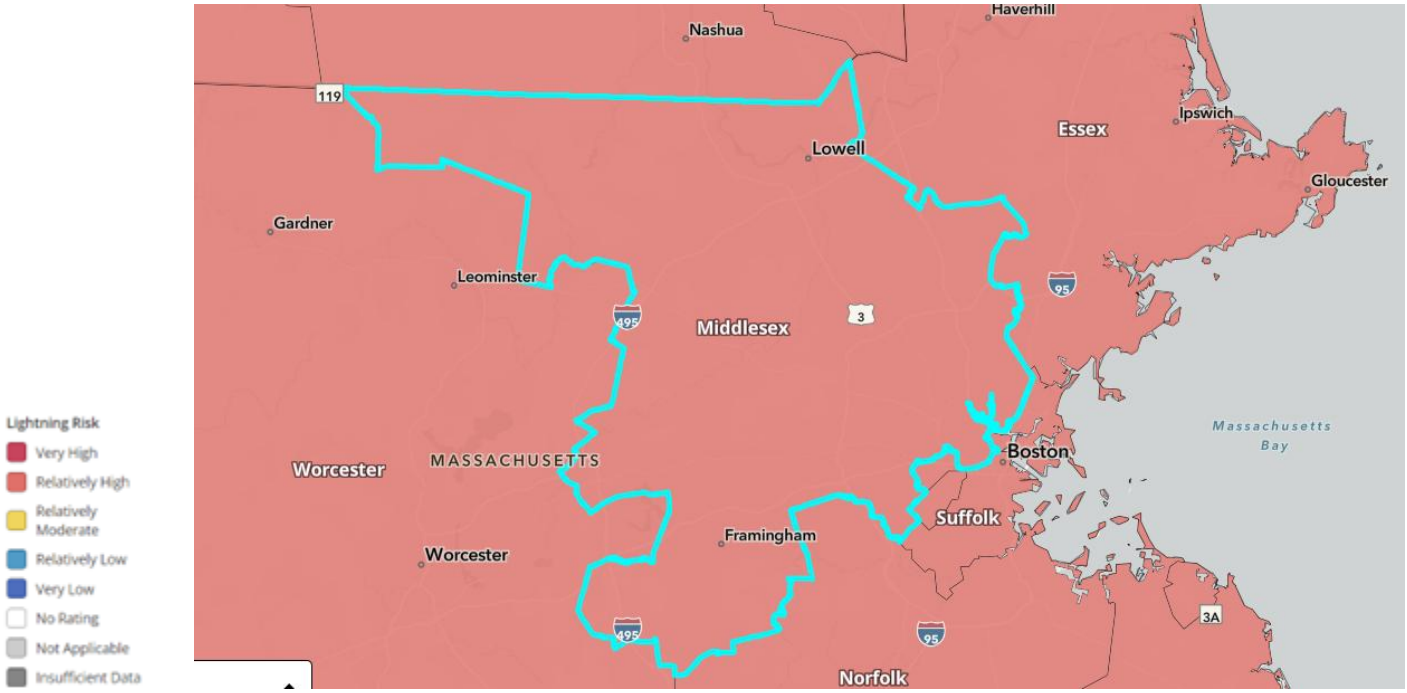

Figure 17. National Risk Index for Lightning

Source: FEMA National Risk Index

The amount of rainfall (rainfall per duration) 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 the Figure below.

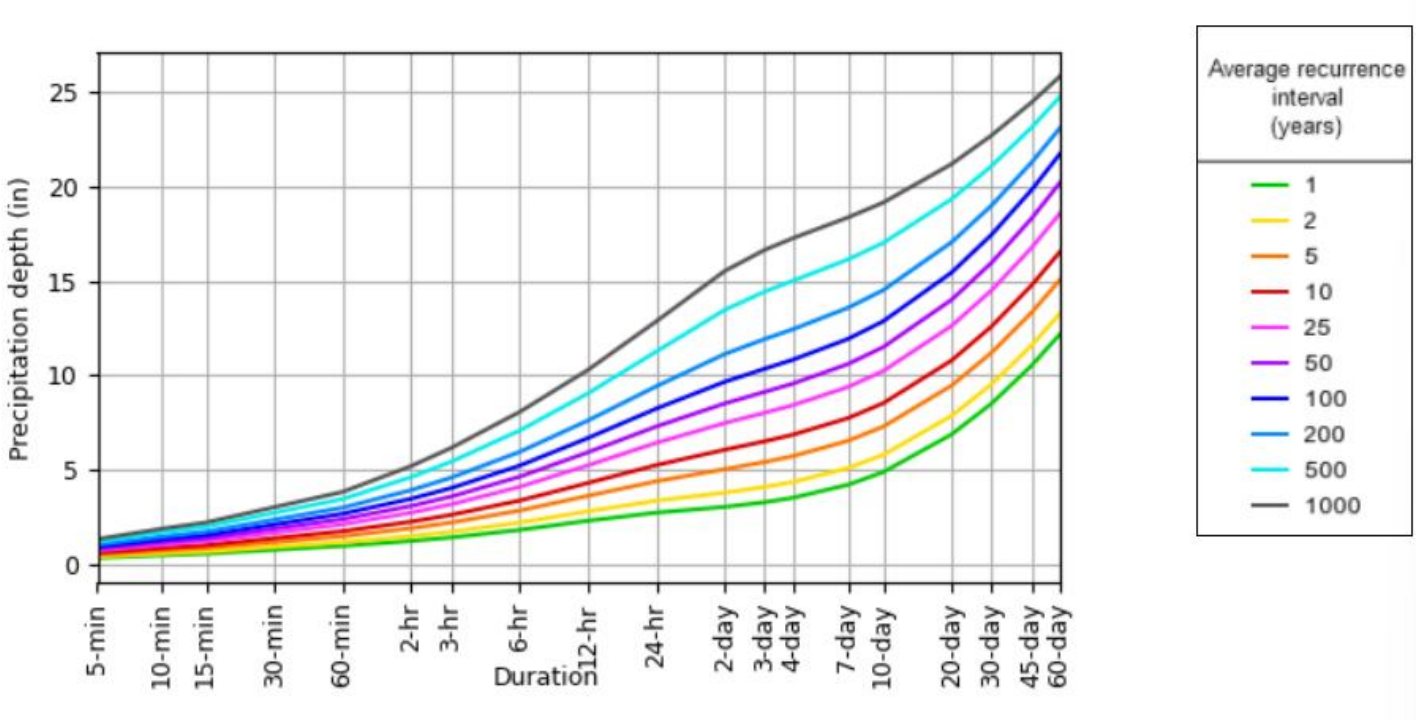

Figure 18. Depth-Duration Frequency Curve

Source: NOAA Atlas 14

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 Ashland is for Middlesex County through the National Climatic Data Center (NCDC). Between n the years 2006 and 2016 NCDC records show 71 thunderstorm events in Middlesex County (Table 10). While there are no existing estimates for potential damages from thunderstorms in Ashland, the best available date for Middlesex County shows that from 2006 to 2016, 71 thunderstorms resulted in $1,617,000 in property damages. There were no injuries or deaths reported.

Table 25. Middlesex County Thunderstorm Events, 2012-2023

Date	Magnitude	Deaths	Injuries	Damage
4/1/2006	50	0	0	8000
5/21/2006	61	0	0	75000
5/21/2006	61	0	0	20000
6/23/2006	50	0	0	30000
7/11/2006	50	0	0	10000
7/21/2006	50	0	0	35000

7/28/2006	50	0	0	15000
8/2/2006	50	0	0	15000
5/16/2007	50	0	0	0
6/27/2007	50	0	0	0
7/6/2007	50	0	0	0
7/9/2007	50	0	0	0
7/15/2007	50	0	0	0
7/28/2007	50	0	0	0
7/29/2007	50	0	0	0
8/17/2007	50	0	0	0
9/8/2007	50	0	0	25000
5/27/2008	50	0	0	8000
6/10/2008	50	0	0	20000
6/23/2008	50	0	0	5000
6/24/2008	50	0	0	5000
6/27/2008	50	0	0	5000
6/29/2008	50	0	0	10000
7/1/2008	50	0	0	20000
7/2/2008	50	0	0	5000
7/3/2008	50	0	0	15000
7/19/2008	50	0	0	8000
7/20/2008	50	0	0	5000
7/27/2008	50	0	0	5000
8/3/2008	50	0	0	5000
8/7/2008	50	0	0	5000

9/9/2008	50	0	0	8000
5/9/2009	50	0	0	2000
5/24/2009	50	0	0	15000
7/7/2009	50	0	0	1000
7/8/2009	50	0	0	20000
7/26/2009	50	0	0	15000
7/31/2009	50	0	0	30000
5/4/2010	50	0	0	30000
6/1/2010	50	0	0	5000
6/3/2010	50	0	0	20000
6/5/2010	50	0	0	40000
6/6/2010	50	0	0	100000
6/24/2010	50	0	0	30000
7/12/2010	50	0	0	50000
7/19/2010	50	0	0	25000
6/1/2011	50	0	0	5000
6/9/2011	50	0	0	15000
8/2/2011	50	0	0	1000
8/19/2011	50	0	0	15000
6/8/2012	50	0	0	25000
6/23/2012	45	0	0	5000
7/4/2012	50	0	0	10000
7/18/2012	70	0	0	350000
9/7/2012	50	0	0	10000
9/8/2012	40	0	0	3000

6/17/2013	50	0	0	25000
6/18/2013	45	0	0	10000
6/24/2013	45	0	0	3000
7/23/2013	50	0	0	20000
7/29/2013	50	0	0	5000
7/3/2014	50	0	0	75000
7/7/2014	87	0	0	100000
7/15/2014	50	0	0	25000
7/28/2014	50	0	0	50000
9/6/2014	50	0	0	15000
5/28/2015	45	0	0	5000
8/4/2015	50	0	0	40000
8/15/2015	50	0	0	25000
2/25/2016	50	0	0	30000
3/17/2016	45	0	0	5000

Source: NOAA, National Climatic Data Center

*Magnitude refers to maximum wind speed

Severe thunderstorms are a town-wide hazard for Ashland. 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 Occurrences:

Based on the record of previous occurrences, severe thunderstorms in Ashland are high frequency events as defined by the 2013 Massachusetts State Hazard Mitigation Plan. This hazard may occur 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. According to ResilientMass, current climate models predict an increase in severe thunderstorms.

OTHER SEVERE WEATHER (HAIL)

Hail events are frequently associated with thunderstorms and other severe storm events. Hail size typically refers to the diameter of the hailstones. Warnings may report hail size through comparisons with real-world objects that correspond to certain diameters as shown in the table below.

Table 26. Hail Size Comparisons

Description	*Diameter (inches)*
Pea	0.25
Marble or mothball	0.50
Penny or dime	0.75
Nickel	0.88
Quarter	1.00
Half dollar	1.25
Walnut or ping pong ball	1.50
Golf ball	1.75
Hen's egg	2.00
Tennis ball	2.50
Baseball	2.75
Teacup	3.00
Grapefruit	4.00
Softball	4.50

Source: NOAA

Potential damages from larger-size hail could include damage to vehicles, windows, and other structures. The best available data on previous hail events are recorded for Middlesex County through NOAA's National Centers for Environmental Information (NCEI) Storm Events Database.

Table 27. Middlesex County Hail Events, 2013-2016

Dat	Magnitude	Deaths	Injuries	Damage
7/18/2000	1	0	0	0
6/20/2001	1.75	0	0	0
7/12/2001	1.5	0	0	0
5/27/2002	0.75	0	0	0
6/2/2002	0.75	0	0	0
8/13/2003	0.75	0	0	0
7/2/2004	0.75	0	0	0
8/20/2004	0.88	0	0	0
5/21/2006	0.75	0	0	0
5/21/2006	0.75	0	0	0
7/11/2006	1	0	0	0
7/28/2006	0.75	0	0	0
6/5/2007	1.25	0	0	0
6/22/2007	0.75	0	0	0

7/9/2007	1	0	0	0
7/28/2007	0.88	0	0	0
6/23/2008	0.75	0	0	0
6/24/2008	0.75	0	0	0
7/1/2008	0.88	0	0	0
7/2/2008	0.75	0	0	0
8/3/2008	0.75	0	0	0
8/7/2008	1	0	0	0
8/10/2008	0.75	0	0	0
5/24/2009	1	0	0	0
6/27/2009	0.88	0	0	0
6/27/2009	0.75	0	0	0
7/7/2009	0.75	0	0	0
7/8/2009	1.75	0	0	0
5/4/2010	0.75	0	0	0
5/7/2011	0.75	0	0	0
6/1/2011	0.75	0	0	0
8/2/2011	0.75	0	0	0
8/19/2011	0.75	0	0	0
3/13/2012	1.25	0	0	0
3/14/2012	1	0	0	0
6/23/2012	0.75	0	0	0
7/18/2012	1	0	0	0
10/30/2012	1	0	0	0
6/17/2013	0.75	0	0	0
5/25/2014	0.75	0	0	0
7/3/2014	1	0	0	0
8/7/2014	0.75	0	0	0
9/6/2014	0.88	0	0	0
8/4/2015	1	0	0	0
8/15/2015	0.75	0	0	0

Source: NOAA, National Centers for Environmental Information
*Magnitude refers to diameter of hail stones in inches

Ice storms are considered to be medium frequency events based on past occurrences, as defined by the Massachusetts State Hazard Mitigation Plan, 2013. This hazard occurs once in 5 years to once in 50 years, with 2% to 20% chance of occurring each year. 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 which can in turn cause property damage and potential injuries.

The Town's vulnerability is primarily related to restrictions on travel on roadways, temporary road closures, school closures, and potential restrictions on emergency vehicle access. The Town works to clear roads and carries out general snow removal operations, and bans on-street parking during snow removal to ensure that streets can be plowed and public safety vehicle access is maximized. Transit operations may also be impacted, as they were in the 2015 blizzard which caused the closure of the MBTA system for one day and limited services on several transit lines for several weeks. Another winter storm vulnerability is power outages due to fallen trees and utility lines.

Probability of Future Occurrences

Winter storms are a potential town-wide hazard in Ashland. The average annual snowfall for the eastern portion of Ashland is 36-48 inches; the western parts of the Town are the range of 48 - 72 inches (see Map 6 in Appendix B).

SEVERE WINTER WEATHER

NOR'EASTERS

A northeast storm, known as a nor'easter, is typically a large counterclockwise wind circulation around a low-pressure center. Featuring strong northeasterly winds blowing in from the ocean over coastal areas, nor'easters are relatively common in the winter months in New England occurring one to two times a year. The storm radius of a nor'easter can be as much as 1,000 miles and these storms feature sustained winds of 20 to 40 mph with gusts of up to 60 mph. These storms are accompanied by heavy rain or snow, depending on temperatures (Commonwealth of Massachusetts, 2013) .

The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin and Louis Uccellini of the National Weather Service (Kocin and Uccellini, 2004) characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10 inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS gives an indication of a storm's societal impacts. This scale was developed because of the impact Northeast snowstorms can have on the rest of the country in terms of transportation and economic impact.

Table 28. Northeast Snowfall Impact Scale [NESIS]

Category	*NESIS Value*	*Value Description*
1	1 – 2.499	Notable
2	2.5-3.99	Significant
3	4-5.99	Major
4	6-9.99	Crippling
5	10.0+	Extreme

Regional Snowfall Index (RSI) | The Northeast Snowfall Impact Scale (NESIS) | National Centers for Environmental Information (NCEI)

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. The table below summarizes each class of storm.

Table 29. Dolan-Davis Classification System for Nor'easters

Storm Class	*Mean Wave Height (m)*	*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 beach	Moderate
Class IV (severe)	5.0	Severe with recession	Loss of structures at community scale

Class V (extreme)	6.8	Extreme	Extensive regional scale losses in millions of dollars

Landsea, C. (2009, February 6). FAQ: Hurricanes, Typhoons, and Tropical Cyclones. Retrieved from http://www.aoml.noaa.gov/hrd/tcfaq/D1.html

Williams, J. (2005, May 17). Hurricane scale invented to communicate storm danger. Retrieved from http://www.usatoday.com/weather/hurricane/whscale.htm

Previous occurrences of nor'easters include the storm events included in the table below. Many of the historic flood events identified in the previous section were precipitated by nor'easters, including the "Perfect Storm" event in 1991. More recently, blizzards in February 2013 (14.8 inches), January 2015 (22.1 inches), and in March 2018 (14.5 inches) were large nor'easters that caused significant total snowfall amounts. The amount of snow for these blizzards showcase the range and intensity of the nor'easters.

Table 30. Nor'easter Events for Massachusetts,

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

Many of the historic flood events identified in the previous section were precipitated by nor'easters, including the "Perfect Storm" event in 1991. More recently, blizzards in December 2010, October 2011, and February 2013 were large nor'easters that caused significant snowfall amounts.

Ashland 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 rivers and streams as well as urban stormwater ponding and localized flooding. Fallen tree limbs as well as heavy snow accumulation and intense rainfall can impede local transportation corridors, and block access for emergency vehicles.

Probability of Future Occurrences

The entire Town of Ashland could be at risk from the wind, rain or snow impacts from a nor'easter, depending on the track and radius of the storm, but due to its inland location the town would not be subject to coastal hazards. Based on the record of previous

occurrences, nor'easters in Ashland are high frequency events as defined by the 2013 Massachusetts State Hazard Mitigation Plan. This hazard may occur more frequently than once in 5 years (greater than 20% per year).

BLIZZARDS & HEAVY SNOW

Winter weather impacts including heavy snow, blizzards, and ice storms, are the most common and most familiar of the region's hazards that affect large geographic areas.

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

The Regional Snowfall Index (RSI) characterizes and ranks the severity of northeast snowstorms. RSI has five categories: Extreme, Crippling, Major, Significant, and Notable. RSI scores are a function of the area affected by the 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 the table below.

Table 31. 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 most significant recent winter event was Winter Storm Kenan (January 29, 2022), which resulted in 30.9" of snow in Massachusetts (Stucker, 2022). The table below shows presidentially declared disasters related to winter weather since 1978.

Table 32. Winter Federal Disaster Declarations, 1978-2023

Disaster Name	Date of Event	Declared Areas
Coastal Storms, Flood, Ice & Snow	February 1978	Barnstable, Bristol, Dukes, Essex, Nantucket, Norfolk, Plymouth, Suffolk
Winter Coastal Storm	December 1992	Barnstable, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester
Blizzard	March 1993	Statewide

Blizzard	January 1996	Statewide
Snowstorm	March 2001	Berkshire, Essex, Franklin, Hampshire, Middlesex, Norfolk, Worcester
Snowstorm	February 2003	Statewide
Snowstorm	December 2003	Barnstable, Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, Worcester
Snowstorm	January 2005	Statewide
Severe Winter Storm, Snowstorm	January 2011	Berkshire, Essex, Hampden, Hampshire, Middlesex, Norfolk, Suffolk
Severe Winter Storm, Snowstorm, Flooding	February 2013	Statewide
Severe winter storm, snowstorm, flooding	January 2015	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester
Severe winter storm and Snowstorm	March 2018	Essex, Middlesex, Norfolk, Suffolk, Worcester
Severe winter storm and flooding	March 2018	Barnstable, Bristol, Essex, Nantucket, Norfolk, Plymouth
Severe winter storm and snowstorm	January 2022	Bristol, Norfolk, Plymouth, Suffolk

Sources: OpenFEMA Dataset: Disaster Declarations and FEMA Declared Disasters

The best available data on past occurrences and impacts of winter storm events are reported for Miidlesex County by NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. From December 2012 through October 2023, Norfolk County experienced many days with recorded blizzards and heavy snow, as shown in the tables below.

Table 33. Blizzards in Middlesex County

Blizzard of 1978	**February 1978**
Blizzard	March 1993
Blizzard	January 1996
Severe Snow Storm	March 2001
Severe Snow Storm	December 2003
Severe Snow Storm	January 2004
Severe Snow Storm	January 2005
Severe Snow Storm	April, 2007
Severe Snow Storm	December 2010
Severe Snow Storm	January 2011
Blizzard of 2013	February 2013
Blizzard of 2015	January 2015

Source: NOAA, National Centers for Environmental Information, Storm Events Database

Blizzards are considered to be high frequency events based on past occurrences, as defined by the Massachusetts State Hazard Mitigation Plan, 2013. This hazard occurs more than once in five years, with a greater than 20 percent chance of occurring each year.

Table 34. Heavy Snow in Middlesex County, 1996-2016

Date	Deaths	Injuries	Property Damage
1/2/1996	0	0	0
1/7/1996	0	0	1400000
1/7/1996	0	0	1500000
1/10/1996	0	0	0
1/12/1996	0	0	0
2/2/1996	0	0	0
2/16/1996	0	0	0
3/2/1996	0	0	0
3/7/1996	0	0	0
4/7/1996	0	0	0
4/9/1996	0	0	0
12/6/1996	0	0	0
12/7/1996	0	0	1360000
3/31/1997	0	0	0
4/1/1997	0	0	0
11/14/1997	0	0	0
12/23/1997	0	0	0
1/15/1998	0	0	0
1/23/1998	0	0	0
1/14/1999	0	0	0
2/25/1999	0	0	0
3/6/1999	0	0	0
3/15/1999	0	0	0
1/13/2000	0	0	0
1/25/2000	0	0	0
2/18/2000	0	0	0
12/30/2000	0	0	0
1/20/2001	0	0	0
2/5/2001	0	0	0
3/5/2001	0	0	0
3/9/2001	0	0	0
3/30/2001	0	0	0
12/8/2001	0	0	0
3/20/2002	0	0	0
3/16/2004	0	0	0
2/24/2005	0	0	0
12/13/2007	0	0	0
12/16/2007	0	0	0
12/19/2007	0	0	0
1/14/2008	0	0	28000
1/14/2008	0	0	20000
1/14/2008	0	0	20000
2/22/2008	0	0	0
3/1/2008	0	0	0
12/19/2008	0	0	0
12/20/2008	0	0	8000
12/21/2008	0	0	0
12/31/2008	0	0	0
1/10/2009	0	0	0
1/11/2009	0	0	0
1/18/2009	0	0	0

3/1/2009	0	0	0
3/2/2009	0	0	0
12/9/2009	0	0	15000
12/9/2009	0	0	500
12/19/2009	0	0	0
12/20/2009	0	0	0
1/18/2010	0	0	0
2/16/2010	0	0	15000
2/23/2010	0	0	8000
1/12/2011	0	0	0
1/26/2011	0	0	0
10/29/2011	0	0	30000
12/29/2012	0	0	0
2/8/2013	0	0	0
2/8/2013	0	0	0
2/23/2013	0	0	0
3/7/2013	0	0	0
3/18/2013	0	0	0
12/14/2013	0	0	0
12/17/2013	0	0	0
1/2/2014	0	0	0
1/18/2014	0	0	0
2/5/2014	0	0	0
2/13/2014	0	0	0
2/18/2014	0	0	0
11/26/2014	0	0	10000
1/24/2015	0	0	0
1/26/2015	0	0	0
2/2/2015	0	0	0
2/8/2015	0	0	0
2/14/2015	0	0	0
2/5/2016	0	0	70000
2/5/2016	0	0	5000
3/21/2016	0	0	0

Source: NOAA, National Centers for Environmental Information, Storm Events Database

Map 6 in Appendix A demonstrates that the average annual snowfall in Ashland is between 36.1-48.0 inches. Winter storms are a potential town-wide hazard in Ashland.

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

Several 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.

ICE STORMS

The ice storm category covers a range of different weather phenomena that collectively involve rain or snow being converted to ice in the lower atmosphere leading to potentially hazardous conditions on the ground. 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).

The extent of ice storms is measured by the Sperry-Piltz Ice Accumulation Index (SPIA®); see table below. 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

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.

Figure 19. Sperry-Piltz Ice Accumulation Index (SPIA®)

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

The best available data on previous ice storm events are recorded at the county level through NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. However, there are no recorded ice storm events recorded for Norfolk County over the last 70 years. Given the regional nature of ice storms, most of the damages occur in the western portions of Middlesex County, where Ashland is located. The Town's location in the milder region closer to the coast and at lower elevations makes it less vulnerable to ice storms.

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 Occurrences

In Ashland, ice storms are considered to be medium frequency events based on past occurrences, as defined by the Massachusetts State Hazard Mitigation Plan, 2013. This hazard occurs once in 5 years to once in 50 years, with 2% to 20% chance of occurring each year.

Climate Change and Ice Storms:

There is some indication that as winters warm, temperatures may be more likely to produce icing conditions.

ICE JAMS

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

Severe 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 Artic 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 (Commonwealth of Massachusetts, 2022) .

GEOLOGICAL HAZARDS

EARTHQUAKES

Damage in an earthquake stem 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.[4]

Seismologists use a Magnitude scale (Richter Scale) to express the seismic energy released by each earthquake. The typical effects of earthquakes in various ranges are summarized below[5].

Table 35. Richter Scale and Effects

Richter Magnitudes	*Earthquake Effects*
Less than 3.5	Generally, not felt, but recorded
3.5- 5.4	Often felt, but rarely causes damage

Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas up to about 100 km. across where people live.
7.0- 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred meters across.

Source: Nevada Seismological Library (NSL), 2005

According to the 2018 State Hazard Mitigation Plan, New England experiences an average of six earthquakes are felt each year. From 1668 to 2016, 408 earthquakes were recorded in Massachusetts.[6] 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 below.

Table 36. Historical 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/Taunton	12/25/1800	NA
MA – Woburn	10/5/1817	4.3
MA - Marblehead	8/25/1846	4.3
MA – Brewster	8/8/1847	4.2
MA – Boxford	5/12/1880	NA
MA - Newbury	11/7/1907	NA
MA - Wareham	4/25/1924	NA
MA – Cape Ann	1/7/1925	4
MA – Nantucket	10/25/1965	NA

MA – Boston	12/27/74	2.3
VA –Mineral	8/23/11	5.8
MA - Nantucket	4/12/12	4.5
ME – Hollis	10/17/12	4.0
CT-Wauregan	1/12/2015	3.3
CT-Wauregan	1/13/2015	2.6
NH-East Kingston	2/15/2018	2.7

Source: Boston HIRA

One measure of earthquake risk is ground motion, which is measured as maximum peak horizontal acceleration, expressed as a percentage of gravity (%g). The range of peak ground acceleration in Massachusetts is from 10 % to 20 %, with a 2% probability of exceedance in 50 years, as shown in Figure 25. Ashland is roughly in the high-middle part of the range for Massachusetts, at 14-18g, making it a moderate area of earthquake risk relative to the state, although Massachusetts as a whole is considered to have a low risk of earthquakes compared to the rest of the country. There have been no recorded earthquake epicenters within Ashland.

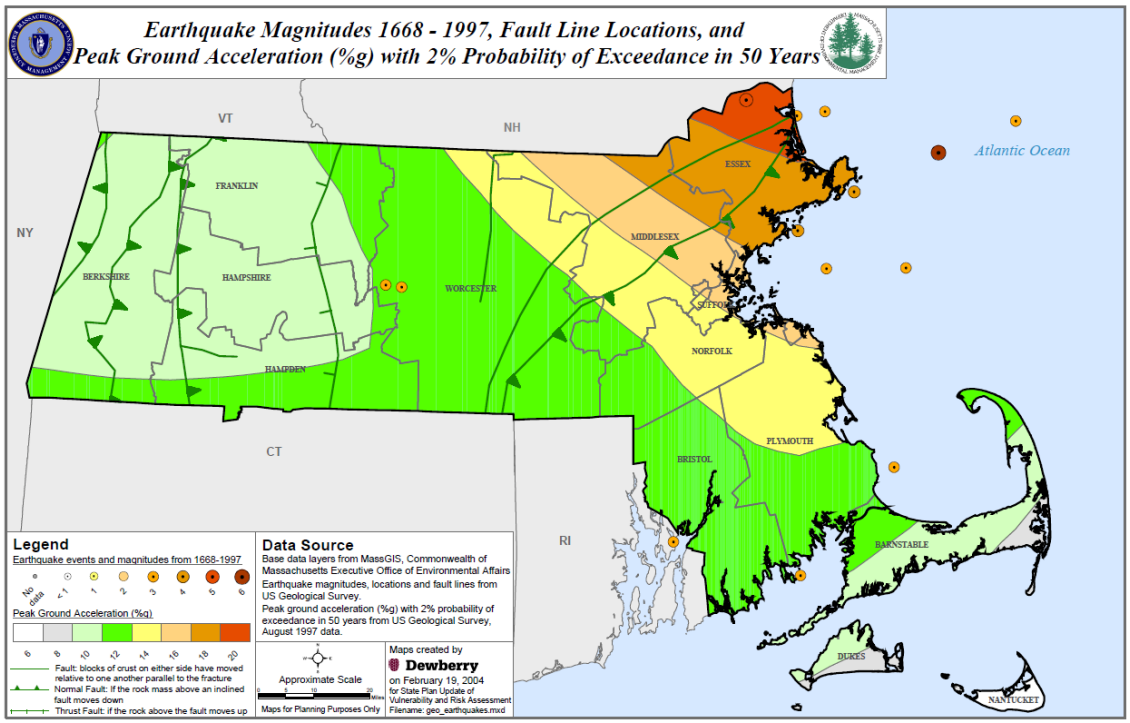

Figure 20. State of Massachusetts Earthquake Probability Map

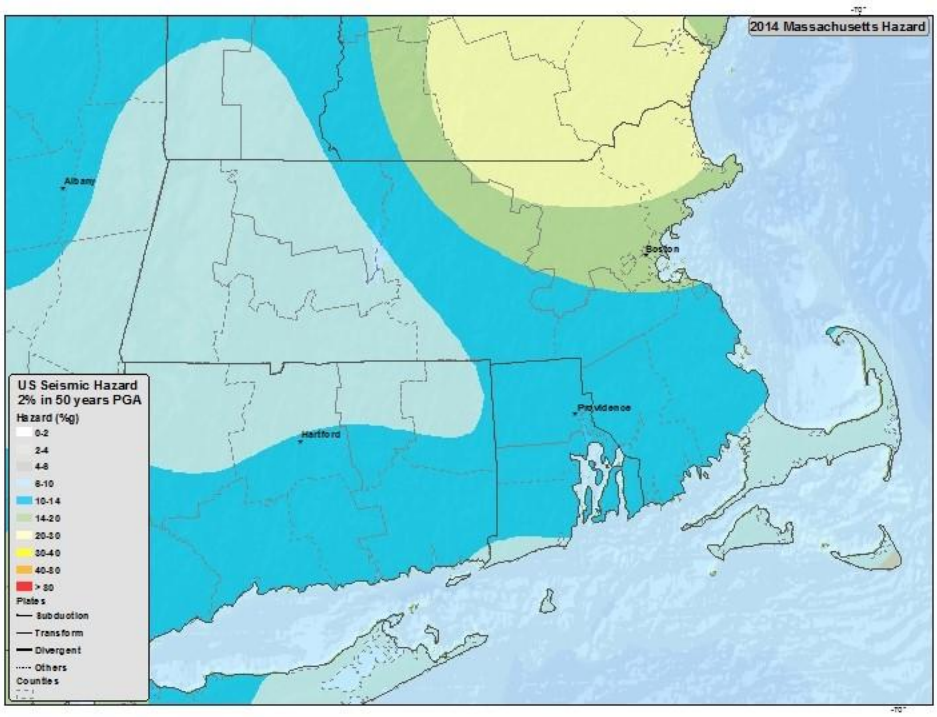

Figure 21. Massachusetts Seismic Hazard Map (2014)

Source: United States Geological Survey

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.

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 Ashland. The Town has many older buildings that pre-date current building code which could be vulnerable in the event of a severe earthquake. Potential earthquake damages to Ashland have been estimated using HAZUS-MH. Total building damages are estimated at $245 million for a 5.0 magnitude earthquake and $2.2 billion for a 7.0 magnitude earthquake. Other potential impacts are detailed in Table 23.

Probability of Future Occurrence

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. The Resilient MA Plan classifies earthquakes as medium frequency events. This hazard is likely to occur once every 50 years (two or more occurrences in the next century).

LANDSLIDES

According to the US Geological Survey (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” (USGS 2023). 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. The table below 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.

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

Table 37. Landslide Volume and Velocity

Estimated Volume	**Expected Landslide Velocity**		
($m^{3)}$	Fast moving landslide (Rock fall)	Rapid moving landslide (Debris flow)	Slow moving landslide (Slide)
<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

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

Most of Ashland has been classified as having a low risk for landslides (see Map 4, Appendix A). There are not many steep slopes in the town and the Local Team concurs that landslides are not a major threat or occurrence in Ashland. Rather, there may be localized issues of erosion during construction, as a result of development, or as a result of clearing vegetation.

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 infrastructure, and localized road closures. The value of potential damages would depend on how many properties were affected and the assessed value of property in Ashland. However, there is no data available on landslide damages in Ashland, as there are no records of any damages caused by landslides in the town. Injuries and casualties, while possible, would be unlikely given the low extent and impact of landslides in Ashland.

Probability of Future Occurrences

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

Ashland 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 temperatures for Massachusetts are: winter (Dec-Feb) Average = 32.4°F and summer (Jun-Aug) Average = 71.8°F.[9] Extreme temperatures are a town-wide hazard.

EXTREME COLD

For extreme cold, temperature is typically measured using Wind Chill Temperature Index, which is provided by the National Weather Service (NWS). The latest version of the index was implemented in 2001 and it meant to show how cold conditions feel on unexposed skin. The index is provided in Figure 27 below.

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 wind chill is the apparent temperature felt on exposed skin due to the combination of air temperature and wind speed. The National Weather Service (NWS) issues a Wind Chill Advisory if the Wind Chills of -5F to -19F are expected. A Wind Chill Warning issued when wind chills of -20F or lower are expected.[10]

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 elderly and people with disabilities are often most vulnerable.

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.

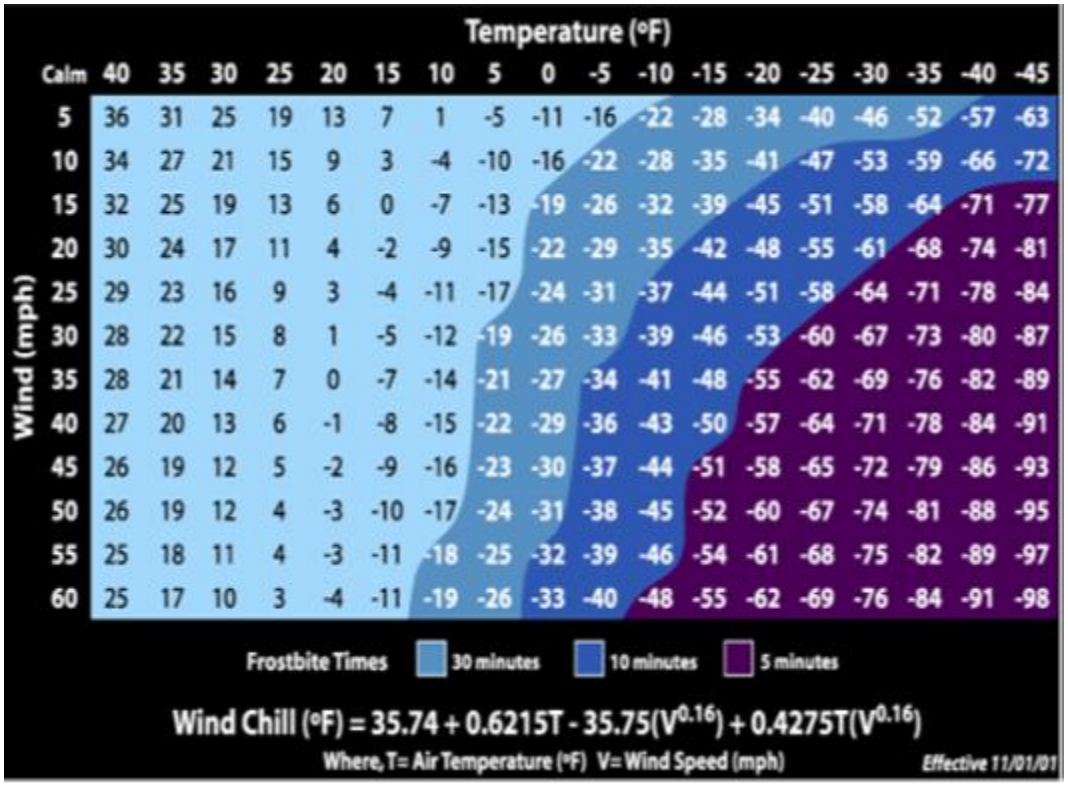

Figure 22. Wind Chill Temperature Index and Frostbite Risk

Source: National Weather Service.

The Town of Ashland does not collect data for previous occurrences of extreme cold. The best available local data are for Middlesex County, through NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. There are four extreme cold and wind chill events on record from December 2012 to October 2023, which caused zero deaths, injuries or property damage. See the table below for more information. Extreme cold is considered a town-wide hazard for Ashland.

Table 38. Middlesex County Extreme Cold and Wind Chill Occurrences, 2013 - 2023

Date	Deaths	Injuries	Property Damage
2/15/2015	0	0	0
2/16/2015	0	0	0
2/14/2016	0	0	0

Source: NOAA, Center for Environmental Information, Storm Events Database

Extreme Cold and Climate Change

Climate change in the near term is also likely to contribute more severe winter storms, bringing colder temperatures, even if the winter season overall is shorter.

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 below) 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 above 105 degrees F.

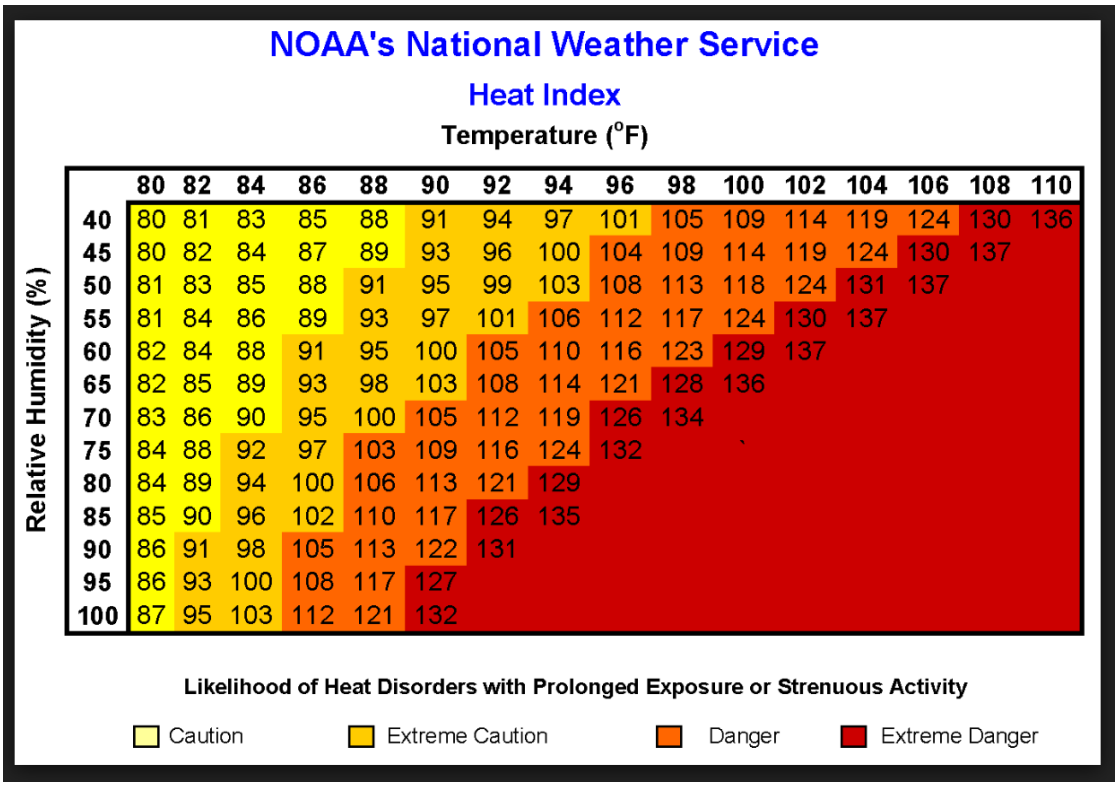

Figure 23. Heat Index Chart

Source: National Weather Service

Extreme heat poses many health risks. Prolonged exposure to high temperatures can cause heat-related illnesses, such as heat cramps, heat exhaustion, heat stroke, and in severe cases, death. Heat exhaustion is the most common heat-related illness and if untreated, it may progress to heat stroke. Prolonged heat exposure can also exacerbate pre-existing conditions, including respiratory illnesses, cardiovascular disease, and mental illnesses.

Senior adults are particularly high risk to heat for several reasons. They may not adjust to sudden changes in temperature as quickly as younger people, they are more likely to have a chronic medical condition whose symptoms may be exacerbated by heat, and they are more likely to be taking prescription medications that affect their ability to control body temperature.[11,12]

Power failures can occur during heat waves because of increased electricity demand for air conditioning coupled with aging infrastructure. This occurred in June 2017 in the Town of Belmont, MA where intense heat cause a spike in electricity demand. With its aging infrastructure, the combination of these factors led to equipment failure.[13] Loss of electricity not only impair a resident's ability to cool, but can cause significant medical emergency for those who require electronic medical equipment or from food-borne illnesses from contaminated food, ingested after loss of refrigeration.

The Town of Ashland does not collect data on excessive heat occurrences. The best available local data are for Middlesex County, through NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. There have been three days of excessive heat recorded from December 2013-October 2023, which caused zero deaths, injuries or property damage. See the table below for more information. Extreme heat is considered a town-wide hazard for Ashland.

Table 39. Middlesex County Extreme Heat Occurrences

Date	Deaths	Injuries	Damage
7/6/2010	0	0	0
7/7/2010	0	0	0
7/5/2013	1	0	0

Source: NOAA, Centers for Environmental Information, Storm Events Database

According to ResilientMass, inland areas are very likely to experience extreme temperatures.

Extreme Temperatures and Climate Change

Data from the 2022 MA Climate Change Assessment related to changes in temperature is included in an earlier section of this chapter. Those projections predict an increase in average temperature and in the number of extreme heat days. The 2022 Assessment also highlights the following climate impacts for the Central Region (where Ashland is located), related to temperatures:

- 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 incidence 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 track buckling during high heat events.
- 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 (Commonwealth of Massachusetts, 2022).

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.

Extreme Heat and Climate Change

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

WILDFIRES

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

- **Surface fires** are the most common type and burn along the floor of a forest, moving slowly and killing or damaging trees;
- **Ground fires** are usually started by lightning and burn on or below the forest floor;
- **Crown fires** spread rapidly by wind, jumping along the tops of trees.

A wildfire differs greatly from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to unexpectedly change direction, and its ability to jump gaps such as roads, rivers, and fire breaks. Wildfire season can begin in March and usually ends in late November. Most 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. The National Wildfire Coordinating Group (NWCG) classifies the severity of wildfires based on their acreage as follows:

- 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) .

The most susceptible fuels are pitch pine, scrub oak and oak forests. Topography can affect the behavior of fires, as fire spreads more easily uphill. Fires can present a hazard where there is the potential to spread into developed or inhabited areas, particularly residential areas where sufficient fuel materials might exist to allow the fire the spread into homes. Protecting structures from fire poses special problems and can stretch firefighting resources to the limit. If heavy rains follow a fire, other natural disasters can occur, including landslides, mudflows, and floods. If the wildfire destroys the ground cover, then erosion becomes one of several potential problems. The most common cause of wildfires is the careless disposal of smoking materials and untended campfires.

Potential Wildfire Hazard Areas

The 2023 ResilientMass Plan includes a map that depicts statewide fire risk into 7 categories, from Low to High. See Figure 29 below for more information. Middlesex County is designated as 1 of the 6 counties most at risk, according to ResilientMass.

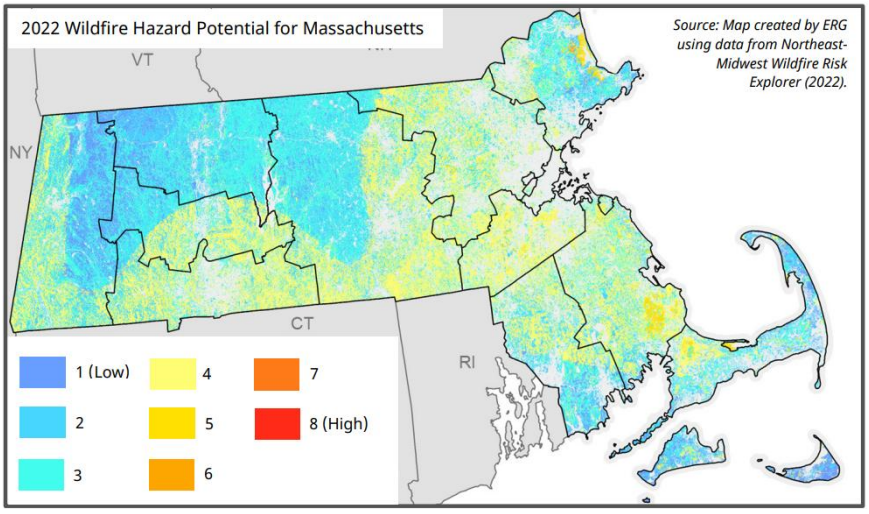

Figure 24. 2022 Wildfire Hazard Potential for Massachusetts

Source: ResilientMass Plan, Map created by ERG using data from Northeast-Midwest Wildfire Risk Explorer (2022)

The areas in Ashland with the highest incidence of brush fires are the Warren Woods, Ashland State Park, and Hopkinton State Park. Several other areas were also identified and mapped by the local team, which are listed below. The Map ID numbers correspond to the areas labelled on Map 8 (Appendix B).

Table 40. Locally Identified Potential Fire Hazard Areas

MAP ID	Potential Fire Hazard Areas
19	Captain Ames Condos
20	Spy Glass Hill Drive
21	Mountain Gate
22	Town Forest
23	Warren Woods
24	Ashland State Park
25	Hopkinton State Park
26	Pond Street Area

Wildfires in Massachusetts are measured by the number of fires and the sum of acres burned. The most recent data available for wildfires in Massachusetts, shown in Figure 4 below, indicates that the wildfire extent in Ashland consists of 9 to 26 acres burned, with 51 to 100 recordable fires from 2001 to 2009.

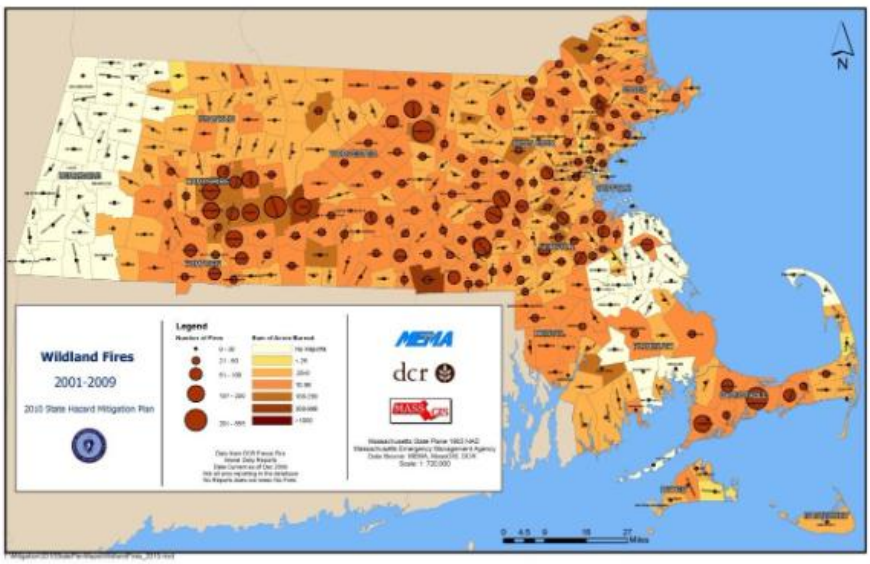

Figure 25. Massachusetts Wildfires 2001-2009

Source: Massachusetts State Hazard Mitigation Plan

However, according to local officials, natural fires in Ashland are not a significant issue. There are generally fewer than 20 brush fires annually. Less than 1% result in property damage and there have been no deaths as a result of brush fires. Since the 2008 plan there was one significant brushfire in the spring of 2015 where 17 acres were burned, but no property damage or injuries were reported.

Potential damages associated with a large brushfire would most likely involve the cost of restoration and management of burned areas to prevent erosion and restore vegetation for recreational use and habitat, which could cost from a few thousand dollars for a small area to tens of thousands for a more extensive area. However there are no existing estimates of such costs for the town of Ashland.

Potential vulnerabilities to wildfires in Ashland include damage to structures and other improvements and impacts on natural resources such as wildlife habitat. Should a wildfire occur in Ashland or in other nearby communities, the resulting smoke could have negative impacts on air quality. This could have public health impacts, particularly for those with respiratory conditions such as asthma.

Probability of Future Occurrences

Based on past occurrences and the Massachusetts Hazard Mitigation Plan 2013, brushfires are of Medium frequency, events that occur from once in 5 years to once in 50 years (2% to 20% probability per year).

Wildfire 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 Massachusetts Climate Assessment cites anticipated forest health degradation from increasing wildfire frequency for the Central Region, where Ashland is located.

Summary of Locally Identified Hazards

Below is a table summarizing the hazard areas as identified by the Local Team. More information can be found on the maps in Appendix A.

Table 41. Locally Identified Hazards in Ashland

Locally Identified Hazards Site ID	Name	Type	Comments
1	Megunko Hill Stream	Flooding	Flooding
2	Central Street/Alden Street	Flooding	Flooding
3	Metcalf Avenue @ railroad tracks	Flooding	Flooding
4	Mill Pond Dam	Flooding	Flooding
7	Oak Street/Oregon Street	Flooding	Flooding
9	Howe Street Capped Landfill	Other	Capped Landfill
10	Edgewood Drive (end)	Flooding	Flooding
11	Concord Street Bridge	Flooding	Flooding
13	Mulhall Road/Wesson Road	Flooding	Flooding
14	Beaver dam at end of Mulhall Road	Flooding	Flooding
15	Beaver dam off Greenwood Road	Flooding	Flooding
16	Beaver dam at Coldstream Brook off Main Street	Flooding	Flooding
17	South Street Boat Landing at Ashland Reservoir	Flooding	Flooding

5	Ashland Reservoir Dam	Flooding	Dam
6	Hopkinton Reservoir Dam	Flooding	Dam
18	Hopkinton State Park Pool	Flooding	Dam
19	Captain Ames Condos	Brush Fire	Brush Fires
20	Spy Glass Hill Drive	Brush Fire	Brush Fires
21	Mountain Gate	Brush Fire	Brush Fires
22	Town Forest	Brush Fire	Brush Fires
23	Warren Woods	Brush Fire	Brush Fires

LAND USE AND DEVELOPMENT TRENDS

EXISTING LAND USE

The most recent land use statistics available from the state are from aerial photography done in 2016. Table 43 shows the acreage and percentage of land in 22 categories. The majority of the Town is comprised of residential-single family at 25.72%. The next largest land use category is Open Land at 21.32%. These land use categories have changed over time, with the largest land use category in 2005 being Medium-density residential.

The most recent land use statistics available for Massachusetts communities are from aerial imagery completed in 2016. Some change has certainly occurred in Ashland since then, but this data provides the most detailed city-wide description of land use available. Land use is shown on Map 2 in Appendix A. Table 43 shows the acreage and percentage of land uses in categories. If the three residential categories are aggregated, residential uses make up 41.5% of the area of the city (3421 acres). Commercial land makes up 2.52 %, or 208 acres and 2.66% of the Town is land used for Industrial purposes.

Table 42. Town of Ashland, MA 2016 Land Use

Land Use	Acres	Percentage
Unknown	94	1.14
Open land	977	11.86
Commercial	208	2.52
Industrial	219	2.66
Recreation	2	0.02
Tax exempt	2551	30.96
Mixed use, primarily residential	66	0.79
Residential - single family	2768	33.59
Residential - multi-family	587	7.12
Mixed use, other	14	0.17
Right-of-way	548	6.65
Water	207	2.51
Total	8241	100

Source: MassGIS Land Use Database

[Note: Numbers have been rounded off to nearest whole and second decimal place for acres and percentage respectively]

For more information on how the land use statistics were developed and the definitions of the categories, please go to https://www.mass.gov/info-details/massgis-data-2016-land-coverland-use. Refer to the "Community Profile" in Section 3 for more information on Ashland's natural, cultural, and historic resources.

NATURAL, CULTURAL, AND HISTORIC RESOURCE AREAS

Ashland is 12.9 square miles and located within MAPC's MetroWest Regional Collaborative (MWRC) subregion along with Framingham, Holliston, Marlborough, Natick, Southborough, Wayland, Wellesley, and Weston. Ashland is near several major Massachusetts highways (I-495, I-90, and I-95) and Massachusetts State Routes 9 and 85. Route 135 runs through Ashland. The town has a MBTA Commuter Rail stop, Ashland Station, on the Framingham/ Worcester Line, and numerous bus routes connect Ashland to destinations in the region. Once a manufacturing town, Ashland has since become a popular suburb of Boston with wonderful schools and green spaces. Ashland offers many amenities that make it a desired destination: the Town's school system (recently ranked 33rd best in the state) attracts families, its location near Interstate 90 and the Commuter Rail provides access to regional employment centers and transportation into Boston and Worcester, and its spacious parks and historical/cultural assets provide for enriching recreational activities.

The Town of Ashland is working in partnership with its residents to update the Town's Comprehensive Plan, last revised in 2003. The new comprehensive plan will guide the Ashland community in deciding what is important for the coming decade. It will guide the Town's land use and zoning policies and long-term planning but will also serve as an important resource in capital improvements planning, budgeting, and in the consideration of key policy changes in Ashland. It will provide a shared community vision and will cover, at minimum, seven key elements: 1)Land Use and Zoning, 2) Demographics & Housing, 3) Economic Development, 4) Open Space, Natural Places, Ecosystems, and Sustainability, 5) Cultural & Historic,6) Transportation & Mobility, and 7) Municipal Services, Assets, Services and Recreation

DEVELOPMENT TRENDS

Under current zoning, the Town of Ashland has land available for potential development in and near its downtown as well as near its boundary with Sherborn, lesser amounts available in other parts of Town.

Development trends throughout the metropolitan region are tracked by MAPC's Development Database, which provides an inventory of new development over the last decade. The database tracks both completed developments and those currently under construction. The database includes 19 proposed developments in the Town of Ashland since 2007 (see Table 20).

The database also includes several attributes of the new development, including site acreage, housing units, and commercial space. They are a mix of commercial, housing, office, and retail. The 19 developments in Ashland include a total of 877 housing units, 115,220 square feet of commercial space, and are sited on a total of almost 266 acres.

In order to characterize any change in the town's vulnerability associated with new developments, a GIS mapping analysis was conducted which overlaid the development sites with the FEMA Flood Insurance Rate Map. The analysis shows that none of these developments are located within a flood zone.

In addition to flood hazards, all of the developments are within the area designated as low incidence for landslides. With respect to average annual snowfall, five of the sites are within the zone of 36 to 48 inches, and the remaining 14 are in the zone of 48 to 72 inches average annual snowfall. With respect to wind, there is no variation across the town of Ashland; the entire town is in the same category, which has a 100-year wind maximum speed of 110 miles per hour. Overall, Ashland's new development does not significantly increase the town's vulnerability to natural hazards.

Table 43. Summary of Ashland Developments 2017-2024

Site ID	Development Name	Development Type	Status (complete/not complete/ partially complete)
A	The Preserve	Development	Planned
B	Oak Hill Estates	Development	Planned
E	Hill Crest Estates	Development	Completed
G	Megunko Hill Developments	Development	Not completed
H	3 Parcel Development	Development	Planned
J	250 West Union Street	Development	Planned
L	Commercial and subdivision development	Development	Planned
M	125 Front Street	Development	Not completed
N	Overlook Commons	Development	Not completed
O	Union Street Public Safety Building	Development	Completed
P	Village of America	Development	All phases complete
Q	Signature Estates II	Development	Planned
R	East Union Street multi-family development	Residential/40B	Not complete/ in permitting phase
S	Butterfield Road three adjacent developments	Development	Planned
T	Chestnut Street Senior Community	Development	Completed
U	Olive Street Subdivision	Development	Completed
V	Main Street Mixed-Use Project	Development	Completed
W	Whittemore Drive Subdivision	Development	Completed
X	The Residences at West Union Street	Development	Not complete/ Planned
Y	Village Square	Development	Not complete
Z	West Union Street Site #1	Development	Not complete/Planned
AA	Charles Street Site	Development	Planned
BB	West Union Street Site #2	Development	Not complete
CC	Ameresco Solar	Development	Planned
DD	128 Main Street	Mixed Use	Completed
EE	12 Pond Street	Mixed use	Completed
GG	1 Cirrus Drive	Residential	Completed
FF	Arbella at Ashland	Residential 40B	Not complete/Permitted
HH	501 Street	Mixed Use	Not complete/Permitted
II	Starbucks	Commercial	Completed
JJ	Village of the Americas -- 100 Chestnut	Mixed Use	Complete

KK	9-49 Homer Ave	Mixed Use	Not completed/Permitted
LL	Clover Road Brewery	Commercial	Completed
MM	Ashland Texas Market	Commercial	Completed
NN	10-60 Main Street Sanctuary at Ashland Mills	Residential 40B	Not complete/ Permitted
OO	YMCA (New)	Commercial	Not complete/ Permitted
PP	David Mindess School	Town Facilities	Completed

Future Development in Hazard Areas

MAPC consulted with town planning staff to determine areas that may be developed in the future, based on the Town's comprehensive planning efforts and current trends and projects. These areas are listed below and shown on the maps in Appendix A and in Table 45.

In order to characterize any change in the town's vulnerability associated with new developments, a GIS mapping analysis was conducted which overlaid the development sites with the FEMA Flood Insurance Rate Map. This information is provided so that planners can ensure that development proposals comply with flood plain zoning and that careful attention is paid to drainage issues and other natural hazards. The analysis shows that 13 of the 29 planned developments are on the edge of 0.2% flood zones. Overall, Ashland's new development does not significantly increase the town's vulnerability to natural hazards.

Table 44. Future Development Sites in Hazard Areas

Site ID	Site Name	FEMA Flood Zones	Hotspots	Landslides
A	The Preserve	44.38% in X: 0.2% Annual Chance of Flooding		Low incidence
B	Oak Hill Estates			Low incidence
E	Hill Crest Estates			Low incidence
G	Megunko Hill Developments			Low incidence
H	3 Parcel Development			Low incidence
J	250 West Union Street	6.71% in A: 1% Annual Chance of Flooding, no BFE		Low incidence
L	Commercial and subdivision development			Low incidence
M	125 Front Street			Low incidence
N	Overlook Commons			Low incidence
O	Union Street Public Safety Building			Low incidence

P	Village of America		0.95% in top 5% hottest land surface temperature in MAPC	Low incidence
Q	Signature Estates II			Low incidence
R	East Union Street multi-family development			Low incidence
S	Butterfield Road three adjacent developments	23.37% in A: 1% Annual Chance of Flooding, no BFE		Low incidence
T	Chestnut Street Senior Community			Low incidence
U	Olive Street Subdivision	5.38% in A: 1% Annual Chance of Flooding, no BFE		Low incidence
V	Main Street Mixed-Use Project			Low incidence
W	Whittemore Drive Subdivision	16.24% in A: 1% Annual Chance of Flooding, no BFE		Low incidence
X	The Residences at West Union Street			Low incidence
Y	Village Square			Low incidence
Z	West Union Street Site #1			Low incidence
AA	Charles Street Site			Low incidence
BB	West Union Street Site #2	8.65% in AE: Regulatory Floodway		Low incidence
CC	Ameresco Solar			Low incidence
DD	128 Main Street			Low incidence
EE	12 Pond Street			Low incidence
GG	1 Cirrus Drive			Low incidence
FF	Arbella at Ashland			Low incidence
HH	501 Street			Low incidence
II	Starbucks			Low incidence
JJ	Village of the Americas -- 100 Chestnut			Low incidence
KK	9-49 Homer Ave			Low incidence

LL	Clover Road Brewery			Low incidence
MM	Ashland Texas Market	100.0% in AE: 1% Annual Chance of Flooding, with BFE	2.21% in top 5% hottest land surface temperature in MAPC	Low incidence
NN	10-60 Main Street Sanctuary at Ashland Mills	71.13% in AE: 1% Annual Chance of Flooding, with BFE , and 1.42% in AE: Regulatory Floodway		Low incidence
OO	YMCA (New)			Low incidence
PP	David Mindess School		0.0% in top 5% hottest land surface temperature in MAPC	Low incidence

CRITICAL FACILITIES & INFRASTRUCTURE IN HAZARD AREAS

Critical facilities and infrastructure include facilities that are important for disaster response and evacuation (such as emergency operations centers, fire stations, water pump stations, etc.) and facilities where additional assistance might be needed during an emergency (such as nursing homes, elderly housing, day care centers, etc.). The purpose of mapping the natural hazards and critical infrastructure is to present an overview of hazards in the community, how they relate to critical infrastructure, and to better understand which facilities may be vulnerable to particular natural hazards. There are 62 facilities identified in Ashland. These are listed in Table 45 and are shown on the maps in Appendix A.

Explanation of Columns in Table below:

- ***Column 1: ID #:*** The first column in Table 46 is an ID number which appears on the maps that are part of this plan. See Appendix A.
- ***Column 2: Name***: The second column is the name of the site. If no name appears in this column, this information was not provided to MAPC by the community.
- ***Column 3: Type:*** The third column indicates what type of site it is.
- ***Column 4: Landslide Risk:*** The fourth column indicates the degree of landslide risk for that site. This information came from NESEC. 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.
- ***Column 5: FEMA Flood Zone:*** The fifth column addresses the risk of flooding. A "No" entry in this column means that the site is not within any of the mapped risk zones on the Flood Insurance Rate Maps (FIRM maps). If there is an entry in this column, it indicates the type of flood zone.
- ***Column 6: Snowfall***. Areas designated "low" receive an annual average of 36.1 to 48.0 inches of snow. Areas designated "high" receive an annual average of 48.1 to 72 inches of snow, as shown on Map 6 in Appendix A.
- ***Column 7*: Located in a Hot Spot:** 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.

Table 45. Critical Facilities and Relationship to Hazard Areas in Ashland

ID	Name	Type	Landslides	FEMA Flood Zone	Local Flooding Area	Within Brush Fire Area	Average Annual Snowfall	Located in Hot-Spot
1	Ashland High School	School	Low incidence	No	No	No	G 36.1 - 48.0	Yes
2	Ashland Middle School	School	Low incidence	No	No	No	H 48.1 - 72.0	No
3	Mindess School	School	Low incidence	No	No	No	H 48.1 - 72.0	No
4	Warren Elementary School	School	Low incidence	No	No	No	G 36.1 - 48.0	No
5	Warren Conference Center	Place of Assembly	Low incidence	No	No	No	G 36.1 - 48.0	No
6	Town Hall	Municipal	Low incidence	No	No	No	H 48.1 - 72.0	No
7	Pittaway School	School	Low incidence	No	No	No	H 48.1 - 72.0	No
8	Market Basket	Grocery Store	Low incidence	No	No	No	G 36.1 - 48.0	No
9	Shaws	Grocery Store	Low incidence	No	No	No	G 36.1 - 48.0	No
10	CVS Pharmacy	Pharmacy	Low incidence	No	No	No	G 36.1 - 48.0	Yes

11	Matarese Funeral Home	Mortuary	Low incidence	No	No	No	H 48.1 - 72.0	No
12	Ashland Water Treatment Plant	Waste Water Treatment	Low incidence	No	No	No	H 48.1 - 72.0	No
13	Ashland Fire Station - 2	Fire Station	Low incidence	No	No	No	G 36.1 - 48.0	No
14	Ashland Police Station	Police Station	Low incidence	No	No	No	H 48.1 - 72.0	No
15	Ashland Animal Care Center	Veterinary Facility	Low incidence	No	No	No	G 36.1 - 48.0	No
16	Millpond Rest Home	Nursing Home	Low incidence	No	No	No	H 48.1 - 72.0	No
17	MBTA Train Station	Transportation Facility	Low incidence	No	No	No	H 48.1 - 72.0	No
18	Connect Community Church	School	Low incidence	No	No	No	H 48.1 - 72.0	No
19	Pincushion Hill Montessori School	School	Low incidence	No	No	No	G 36.1 - 48.0	No
20	Little Folk Farm	Child Care	Low incidence	No	No	No	G 36.1 - 48.0	No

21	Just A Wee Day Care	Child Care	Low incidence	No	No	No	G 36.1 - 48.0	Yes
22	Kindercare	Child Care	Low incidence	No	No	No	G 36.1 - 48.0	No
23	Champions - Warren School	Child Care	Low incidence	No	No	No	G 36.1 - 48.0	No
24	Pincushion Hill Montessori School	Child Care	Low incidence	No	No	No	G 36.1 - 48.0	No
25	SMOC Head Start Ashland	Child Care	Low incidence	No	No	No	H 48.1 - 72.0	No
26	Police Administrative Offices & Emergency Operations Center (EOC)	Emergency Operations Center	Low incidence	No	No	No	G 36.1 - 48.0	No
27	Ashland Fire Station - 1	Fire Station	Low incidence	No	Megunko Hill Stream	No	H 48.1 - 72.0	No
28	Nyanza EPA Site	Hazardous Material Site	Low incidence	No	No	No	H 48.1 - 72.0	No
29	Four Rohwers	Child Care	Low incidence	No	No	No	G 36.1 - 48.0	No

30	Ashland House	Elder Housing	Low incidence	No	No	No	H 48.1 - 72.0	No
31	Ashland Housing Authority	Elder Housing	Low incidence	No	No	No	H 48.1 - 72.0	No
32	Rite-Aid Pharmacy	Pharmacy	Low incidence	No	No	No	H 48.1 - 72.0	No
33	Ashland Commoms	Low-Income Housing	Low incidence	X: 0.2% Annual Chance of Flooding	No	No	H 48.1 - 72.0	No
34	Ashland Community Center	Place of Assembly	Low incidence	No	No	No	H 48.1 - 72.0	No
35	CVS Pharmacy	Pharmacy	Low incidence	No	No	No	H 48.1 - 72.0	No
36	Rite-Aid Pharmacy	Pharmacy	Low incidence	No	No	No	G 36.1 - 48.0	No
37	Cedar Street Water Storage Tank & Town Communications Center	Water Storage Tank	Low incidence	No	No	No	G 36.1 - 48.0	No
38	Woodridge Water Storage Tank & Town	Water Storage Tank	Low incidence	No	No	No	H 48.1 - 72.0	No

	Communications Center							
39	Russett Hill Pump Station & Town Communications Center	Water Storage Tank	Low incidence	No	No	No	H 48.1 - 72.0	No
40	Chestnut Sewer Pump Station	Sewer Pump Station	Low incidence	AE: 1% Annual Chance of Flooding; with BFE	No	No	G 36.1 - 48.0	No
41	Brackett Sewer Pump Station	Sewer Pump Station	Low incidence	X: 0.2% Annual Chance of Flooding	No	No	G 36.1 - 48.0	No
42	Ledgemere Farms Sewer Pump Station	Sewer Pump Station	Low incidence	No	No	No	G 36.1 - 48.0	No
43	Fountain Street Sewer Pump Station	Sewer Pump Station	Low incidence	No	No	No	G 36.1 - 48.0	No
44	DPW Facility	Municipal	Low incidence	No	No	No	H 48.1 - 72.0	No

45	Johnson Street Sewer Pump Station	Sewer Pump Station	Low incidence	No	No	No	H 48.1 - 72.0	No
46	Baldwin Circle Sewer Pump Station	Sewer Pump Station	Low incidence	No	No	No	H 48.1 - 72.0	No
47	Prospect Street Sewer Pump Station	Sewer Pump Station	Low incidence	No	No	No	G 36.1 - 48.0	No
48	Lucy French Sewer Pump Station	Sewer Pump Station	Low incidence	No	No	No	H 48.1 - 72.0	No
49	Workman's Circle Sewer Pump Station	Sewer Pump Station	Low incidence	No	No	Captain Ames Condos	G 36.1 - 48.0	No
50	Mill Pond Dam	Dam	Low incidence	AE: Regulatory Floodway	Mill Pond Dam	No	H 48.1 - 72.0	No
51	Ashland Reservoir Dam	Dam	Low incidence	No	Ashland Reservoir Dam	No	G 36.1 - 48.0	No
52	Hopkinton Reservoir Dam	Dam	Low incidence	No	Hopkinton Reservoir Dam	No	H 48.1 - 72.0	No

53	Cedar Street Dam near Fire Station #2	Dam	Low incidence	No	No	No	G 36.1 - 48.0	No
54	Pleasant Street Dam & Bridge	Dam/Bridge	Low incidence	AE: 1% Annual Chance of Flooding; with BFE	No	No	H 48.1 - 72.0	No
55	Police Substation at 39 Pond Street	Police Station	Low incidence	No	No	No	G 36.1 - 48.0	No
56	Hillcrest Estates Pump Station	Sewer Pump Station	Low incidence	No	No	No	H 48.1 - 72.0	No
57	Nursing Home	Nursing Home	Low incidence	No	No	No	H 48.1 - 72.0	No
58	SET Metrowest	After School/Summer Camp	Low incidence	No	No	No	G 36.1 - 48.0	No
59	Assisted Living	Assisted Living	Low incidence	No	No	No	G 36.1 - 48.0	No
60	Ashland Public Safety Building		Low incidence	No	No	No	G 36.1 - 48.0	No

61	Oak Street Pumping Station		Low incidence	No	No	No	H 48.1 - 72.0	No
62	Oak Street Pumping Station		Low incidence	No	No	No	H 48.1 - 72.0	No

VULNERABILITY ASSESSMENT

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

HAZUS is a computer program developed by FEMA to estimate losses due to a variety of natural hazards. The following overview of HAZUS is taken from the FEMA website. For more information on the HAZUS software, go to https://www.fema.gov/flood-maps/products-tools/hazus

"FEMA's Hazus Program provides standardized tools and data for estimating risk from earthquakes, floods, tsunamis, and hurricanes. Hazus models combine expertise from many disciplines to create actionable risk information that increases community resilience. Hazus software is distributed as a GIS-based desktop application with a growing collection of simplified open-source tools. Risk assessment resources from the Hazus program are always freely available and transparently developed. The Hazus Program is managed by FEMA's Natural Hazards Risk Assessment Program (NHRAP), within the Risk Management Directorate."

There are three modules included with the HAZUS software: hurricane, flooding, and earthquakes. There are also three levels at which HAZUS 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 Ashland, it does not capture all relevant information. In fact, the HAZUS training manual notes that the default data is "subject to a great deal of uncertainty."

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

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

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

Table 46. Estimated Damages from Hurricanes

	100- Year	500 Year
Building Characteristics		
Estimated total number of buildings	6,045	
Estimated total building replacement value (2006 $)	$2,201,000,000	
Building Damages		
# of buildings sustaining minor damage	162	916
# of buildings sustaining moderate damage	12	138
# of buildings sustaining severe damage	0	7
# of buildings destroyed	0	2
Population Needs		
# of households displaced	4,000	42
# of people seeking public shelter	0	8

Debris		
Building debris generated (tons)	5,069	13,603
Tree debris generated (tons)	2,469	5,901
# of truckloads to clear building debris	26	124
Value of Damages		
Total property damage (buildings and content)	$15,835,000	$52,209,000
Total losses due to business interruption	$422,000	$2,720,000

ESTIMATED DAMAGES FROM EARTHQUAKES

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

Table 47. Estimated Damages from Earthquakes

	Magnitude 5.0	**Magnitude 7.0**
Building Characteristics		
Estimated total number of buildings	6,000	
Estimated total building replacement value (2010 $)	$2,200,000,000	

Building Damages		
# of buildings sustaining slight damage	1,774	172
# of buildings sustaining moderate damage	936	1,220
# of buildings sustaining extensive damage	250	1,751
# of buildings completely damaged	62	2,890
Population Needs		
# of households displaced	233	3,559
# of people seeking public shelter	120	1,838
Debris		
Building debris generated (tons)	500	4,400
# of truckloads to clear debris (@ 25 tons/truck)	2,160	17,720
Value of Damages (Millions of dollars)		
Total property damage	$245,810,000	$2,171,170,000
Total losses due to business interruption	$41,230,000	$264,200,000

ESTIMATED DAMAGES FROM FLOODING

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

Table 48. Estimated Damages from Flooding

	100 Year Flood	500 Year Flood
Building Characteristics		
Estimated total number of buildings	6,045	
Estimated total building replacement value (2010 $)	$2,201,000,000	
Building Damages		
# of buildings sustaining moderate damage	62	76
# of buildings sustaining extensive damage	12	14
# of buildings substantially damaged	1	3
Population Needs		
# of households displaced	353	369
# of people seeking public shelter	660	709
Value of Damages		
Total property damage	$32,830,000	$39,480,000
Total losses due to business interruption	$360,000	$370,000

SECTION 7 HAZARD MITIGATION GOALS

The Ashland Local Hazard Mitigation Planning Team identified the following hazard mitigation goals for the Town:

The Ashland Local Hazard Mitigation Planning Team reviewed and discussed the goals from the 2017 Hazard Mitigation Plan for the Town of Ashland. All of the goals are considered critical for the Town and they are not listed in order of importance.

Goal 1: Prevent and reduce the loss of life, injury, public health impacts and property damage resulting from all major natural hazards.

Goal 2: Identify and seek funding for measures to mitigate or eliminate each known significant flood hazard area.

Goal 3: Integrate hazard mitigation planning as an integral factor in all relevant municipal departments, committees and boards.

Goal 4: Prevent and reduce the damage to public infrastructure resulting from all hazards.

Goal 5: Encourage the business community, major institutions and non-profits to work with the Town to develop, review and implement the hazard mitigation plan.

Goal 6: Work with surrounding communities, state, regional and federal agencies to ensure regional cooperation and solutions for hazards affecting multiple communities.

Goal 7: Ensure that future development meets federal, state and local standards for preventing and reducing the impacts of natural hazards.

Goal 8: Take maximum advantage of resources from FEMA and MEMA to educate Town staff and the public about hazard mitigation.

***Goal 9:** Consider the potential impacts of climate change and incorporate climate sustainability and resiliency into hazard mitigation planning.

***Goal 10:** Integrate environmental justice considerations into natural hazard mitigation efforts by identifying hazard impacts, tailoring mitigation measures, and engaging climate-vulnerable populations. This is particularly critical in Ashland, given its designation as a 'double-EJ' community, home to both minority and low-income populations residing in flood-prone areas.

***Goal 11**: Partner with public utilities and communications such as Eversource, Verizon, Comcast, MWRA for better outreach during natural hazards.

* Indicates new goals.

SECTION 8 EXISTING MITIGATION MEASURES

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

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

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

A. EXISTING TOWN-WIDE MITIGATION FOR FLOOD-RELATED HAZARDS

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

1. Participation in the National Flood Insurance Program (NFIP) – Ashland participates in the NFIP with 32 policies in force as of December 9, 2024. FEMA maintains a database on flood insurance policies and claims.

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.

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

3. Street sweeping – Every street gets swept once a year or as needed. Street sweeping is done by the town.

4. Catch basin cleaning – Catch basins are cleaned out on a rotating 4-year cycle with 25% of the basins being cleaned annually.

5. Roadway treatments – The town uses a mixture of one part sand to four parts salt for de-icing purposes. This is done to minimize the amount of sand that enters catch basins and streams.

6. Subdivision Rules and Regulations – The subdivision rules and regulations contain a number of requirements that address flood hazard mitigation. Some of these provisions also relate to other hazards. Section 344-14 of the Town Code regarding Subdivision Drainage requires that all drainage infrastructure be designed to permit the unimpeded flow of all natural watercourses, to ensure adequate drainage of all low points along streets, to control erosion, intercept stormwater at reasonable intervals and meet BMPs outlined in the 2001 MA DEP Stormwater Policy and Technical Handbook.

7. Zoning Regulations – The town adopted a new stormwater bylaw in 2007. It requires that a stormwater permit be required for any land disturbance greater than 10,000 square feet or on 5,000 square feet if the area of disturbance is sloped with 15 percent slope or greater.

    - Section 282-31, Erosion Control, requires a special permit from the Planning Board prior to any grading on slopes of greater than a 3:1 horizontal/vertical ratio.
    - Site Alteration, Section 232-34 of Town Bylaw, requires a Site Alteration Permit from the Planning Board prior to clearing greater than 5000 SF or grading more than 100 cubic yards.
    - Site plan review requirements for drainage, Section 282-6, require that the site plan show adequate measures to prevent pollution of surface or ground water, to minimize erosion and sedimentation and to prevent changes in groundwater levels, increased volume and rate of runoff and potential for flooding. Runoff may not increase in rate or volume, groundwater recharge must be maximized and neighboring properties may not be impacted.
    - Section 282-43, Groundwater Protection District, requires a special permit from the Planning Board for any use that will render impervious more than 15% of any lot or 2500 square feet, whichever is greater.
    - The Groundwater Protection District includes part of Hopkinton and the Weston Nurseries Development.

B. EXISTING DAM FAILURE MITIGATION MEASURES

8. The Comprehensive Emergency Management Plan – The CEMP addresses dam safety. The Town is in the process of updating the CEMP.

9. Permits required for construction – State law requires a permit for the construction of any dam.

10. DCR dam safety regulations – All dams are subject to the Division of Conservation and Recreation's dam safety regulations.

C. EXISTING TOWN-WIDE MITIGATION FOR WIND-RELATED HAZARDS

11. Massachusetts State Building Code – The town enforces the Massachusetts State Building Code whose provisions are generally adequate to mitigate 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.

12. Tree-trimming program – The town owns and uses equipment to trim, remove trees and grind branches and stumps as needed. It also subcontracts this work out as needed.

D. EXISTING TOWN-WIDE MITIGATION FOR WINTER-RELATED HAZARDS

13. Snow plowing and disposal – The town provides snow disposal as needed from municipal sites. The town clears all but parts of Route 126 and Cordaville Road, which is plowed by the Massachusetts Highway Department.

E. EXISTING TOWN-WIDE MITIGATION FOR FIRE-RELATED HAZARDS (TOWN-WIDE)

14. Permits Required for Outdoor Burning – The Fire Department requires a written permit for outdoor burning. The property-owner must come into the Fire Station, read the outdoor burning regulations, sign a form and pay the outdoor burning permit fee.

15. Subdivision Review – The Fire Department is involved in reviewing all subdivision plans.

F. EXISTING TOWN-WIDE MITIGATION FOR EARTHQUAKE HAZARDS

16. The town does have shelters and backup facilities (see multi-hazard mitigation below).

17. Massachusetts State Building Code – The State Building Code contains a section on designing for earthquake loads (780 CMR 1612.0). Section 1612.1 states that the purpose of these provisions is "to minimize the hazard to life to occupants of all buildings and non-building structures, to increase the expected performance of higher occupancy structures as compared to ordinary structures, and to improve the capability of essential facilities to function during and after an earthquake". This section goes on to state that due to the complexity of seismic design, the criteria presented are the minimum considered to be "prudent and economically justified" for the protection of life safety. The code also states that absolute safety and prevention of damage, even in an earthquake event with a reasonable probability of occurrence, cannot be achieved economically for most buildings.

Section 1612.2.5 sets up seismic hazard exposure groups and assigns all buildings to one of these groups according to a 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.

18. The town does have an evacuation plan as specified in its Comprehensive Emergency Management Plan (CEMP).

G. EXISTING TOWN-WIDE MITIGATION FOR LANDSLIDE HAZARDS

19. The town's Subdivision Regulations include standards for maximum slopes to ensure stable development.

20. The town has an Earth Removal bylaw with standards for grading and slopes.

H. EXISTING MULTI-HAZARD MITIGATION MEASURES

21. There are several mitigation measures that impact more than one hazard. These include the Comprehensive Emergency Management Plan (CEMP), the Massachusetts State Building Code and participation in a local Emergency Planning Committee.

22. 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, dam failures and winter storms. Therefore, the CEMP is a mitigation measure that is relevant to many of the hazards discussed in this plan.

23. Local Emergency Management Planning Committee (LEPC) – The LEPC consists of town and school officials including Fire and Police personnel. The committee meets about every month to coordinate the integral roles each department will be responsible for when responding to an emergency. The Committee has been updating the comprehensive emergency management plan for the Town. Its members have been trained in Incident Command and Disaster Training.

24. Multi-Department Review of Developments – Multiple departments, such as Planning, Zoning, Health, Public Works, Fire, Police, and Natural Resources, review all subdivision and site plans prior to approval.

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

26. Emergency Preparedness public education is available on the town's website.

27. The town has a reverse 911 system and names can be added to the database via the town's website.

28. The Police and Fire Stations have backup generators.

COMPILATION OF EXISTING MITIGATION

The following table summarizes the many existing natural hazard mitigation measures already in place in Ashland.

Table 49. Existing Natural Hazard Mitigation Measures

Hazard	Area	Mitigation Measure	
Flood-Related	Town-Wide	A. Participation in the National Flood Insurance Program	Effective
		B. Annual catch basin cleaning and annual street sweeping	Make any changes needed for MS4 Permit
		C. Drainage system maintenance is performed as needed, and under a general maintenance permit issued by the Natural Resources Commission	
		D. Flood Plain Conservancy District	
		E. Wetlands Protection By-Law	Revisions to comply with MS4 permit
		F. Massachusetts Stormwater Policy	
		G. Stormwater Requirements in Subdivision Regulations and Site Plan Review	
		H. Open Space Residential Developments allowed	Revisions for MS4 Permit
		I. Protected open space and proactive land preservation programs	

		J. Public Education on stormwater through the NPDES MS4 Permit	
Dams	Town-Wide	A. DCR Dam Safety Regulations B. Construction permits required C. Comprehensive Emergency Management Plan addresses dam safety	Effective
	4	Mill Pond Dam	Regularly inspect and repair dams
	14	Beaver dam at end of Mulhall Road	
	15	Beaver dam off Greenwood Road	
	16	Beaver dam at Coldstream Brook off Main Street	
	5	Ashland Reservoir Dam	
	6	Hopkinton Reservoir Dam	
Wind-Related	Town-Wide	A. Tree Maintenance Program by Public Works B. Requirement for new developments to install underground utilities C. Town continually removing existing overhead wires and installing them underground	Consider hiring a tree warden; acquire a tree chipper and cherry picker
Winter-Related	Town-Wide	A. Standard snow operations, restricted salt B. Overnight parking ban November – April	Effective

		C. Public Education on snow operations and winter maintenance is planned for town website D. Snow and Ice Disposal Bylaw E. Sufficient space for municipal snow storage F. Assessment of Municipal Structures for Susceptibly to Snow Loads - The town owns structures that may not be able to withstand snow loads during extreme conditions. A priority for the town is to provide an assessment of those facilities that are at risk for collapses from snow loads, and what the best mitigation would be. In some cases the solution may be a structural retrofit, but in other cases it may just be a matter of knowing which buildings to clear snow from.	Acquire V plow, sidewalk plow, sander, and dump truck Assess town structures for snow loads
Fire-Related	Town-Wide	A. Open burning permits required B. Fire Department reviews all development plans C. Fire Dept. provides public education on its website D. Fire Dept. operates ATV fire vehicle and tanker truck	Effective Acquire 4x4 off-road fire equipment
Geologic - Earthquake	Town-Wide	A. Shelters and backup facilities available B. Evacuation plan in CEMP	Evaluate public buildings
Geologic - Landslides	Town-Wide	A. Maximum slopes for subdivision roads B. Earth Removal Bylaw	Effective

Multi-Hazard	Town-Wide	A. Multi-department review of developments B. Comprehensive Emergency Management Plan (CEMP) C. Enforcement of State Building Code D. Emergency Preparedness public education on the town website E. Reverse 911 F. Police and Fire Stations have backup generators G. Citizen Emergency Response Team (CERT)	Periodically update CEMP Emergency generators for 5 public buildings.

J. MITIGATION CAPABIITIES AND LOCAL CAPACITY FOR IMPROVEMENT

Under the Massachusetts system of "Home Rule," the Town of Ashland 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

The Town of Ashland has recognized several existing mitigation measures that require implementation or improvements, and has the capacity based on these Home Rule powers within its local boards and departments to address these. The Ashland Department of Public Works will address the needs for catch basin cleaning, repairs and upgrades to drainage infrastructure. The town's Planning Board will address the updates to the Master Plan and implementation of the Zoning Ordinance, Floodplain District, and Subdivision Rules and Regulations. The Conservation Commission will oversee implementation of the Wetlands Bylaw and the Open Space Plan. The Department of Public Works together with the Planning Board and Conservation Department will coordinate implementation and enforcement of the Stormwater Bylaw.

SECTION 9 MITIGATION MEASURES FROM THE 2017 PLAN

IMPLEMENTATION PROGRESS FROM THE PREVIOUS PLAN

At a meeting of the Ashland Hazard Mitigation Planning Committee, the local team comprising of town staff reviewed the mitigation measures identified in the 2017 Ashland Hazard Mitigation Plan and determined whether each measure had been implemented or deferred. Of those measures that had been deferred, the committee evaluated whether the measure should be deleted or carried forward into this Hazard Mitigation Plan 2025 Update. The decision on whether to delete or retain a particular measure was based on the committee's assessment of the continued relevance or effectiveness of the measure and whether the deferral of action on the measure was due to the inability of the Town to act on the measure.

Table 50 summarizes the status of mitigation measures from the 2017 plan that are being continued as part of the 2025 plan update, and shows their priority ranking in the previous plan compared to the 2025 plan update.

Ashland has made considerable progress on implementing mitigation measures identified in the 2008 Hazard Mitigation Plan.

Moving forward into the next five-year plan implementation period there will be many more opportunities to incorporate hazard mitigation into the Town's decision-making processes.

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

Table 50. Status of Mitigation Measures from the 2017 Plan

Recommended Mitigation Measures 2017 Hazard Mitigation Plan		Current Status 1. Completed 2. Partially Completed 3. Not Completed *[Notes given, if 'Not Completed']*	For 2025 Plan Update 1. Keep in the 2025 Plan 2. Revise for 2025 Plan 3. Change Priority for2025 4. Delete from the 2025 Plan *Describe any revisions for 2025*
INLAND FLOODING			
A.	Conduct a comprehensive drainage management assessment of the downtown area west from Pleasant/ High Streets/ Cordaville Road, east to Route 135/Front Street, south to Route 135 and Summer Street and north to Myrtle Street. Some analysis done for Pleasant and High streets and Cordaville Road to determine how much capacity is needed for current catch basins. Needing funding to complete the work. Currently the culverts are overwhelmed. Major development is being built nearby and required to contain potential run-off on-site. *Include Chemical Brook and Charlie's Brook (near Federal Superfund site?)*	Partially completed	Keep
B.	Implement more frequent maintenance of town-owned drainage facilities, such as more frequent removal of sediment. Additional funding sources need to be developed. At the time of this plan update, FY 2015 was the year the town was able to fund the entire town's catch basin cleaning, prior to that it had been taking the Town about two - four years	Completed Measures implemented with respect to MS4 requirements	Delete from 2025 Plan

	to complete street and catch basin cleaning for the entire town. A new proposed 2017 measure would be to complete the primary roads twice a year, and the remainder of the Town once a year. Costs for inspection, cleaning and disposal for the entire town in FY 2015 was approx. $100,000.		
C.	Develop an ongoing wetlands education program for local residents, builders and landscapers on the importance of preserving wetlands functions, especially flood storage capacity. Town to send examples of programs	Partially Completed	Keep
D.	Repair drainage for the Megunko Hill Stream neighborhood area including Megunko Road and approaching a nearby Rail Transit District (RTD) with 450 future dwelling units.	Completed • 450 units built • 40B (adjacent) is being built	Delete
E.	Install new drain lines and catch basins along the length of Tri Street. A new culvert has been installed. This section of road needs to have camera inspection and drain lines excavated and replaced accordingly.	Completed (limited catch basins)	Delete, but potentially revise if new street drainage lines are required
F.	Repair culverts along Central Street and Alden Streets.	Not completed	Keep
G.	Develop a drainage assessment and mitigation plan for the Edgewood Drive neighborhood.	Completed	Delete
H.	Acquire open space parcels recommended by the Open Space Committee.	Partially completed *55 acres of UCC land has been acquired*	Keep
I.	Implement the planning with the Stormwater Advisory Committee to create a Stormwater Utility for infrastructure maintenance.	Completed	Delete
J.	Replace the Cordaville Road bridge: the bridge is under deteriorating conditions according to the latest MassDOT report. The bridge was constructed decades ago and will need replacement soon. The water	Partially completed	Keep

	volumes under the bridge may not have changed, but when it floods the infrastructure is affected more. Add the other bridge		
K.	Develop a town-based GIS wetlands mapping capacity that would include all local wetland delineations and filings. Process change to require digital GIS files with coordinates to map future areas using CAD files.	Partially completed	Keep
L.	Acquire a mobile, 4-6" gasoline powered pump to help mitigate flooding at specific locations during storm events.		Delete
M.	Develop an enhanced stormwater outreach and education program. There is ongoing work with the Stormwater Committee and MS4 permit.	Completed	Delete
N.	Upgrade the drain line along Oregon Road starting from the intersection of Oregon Road and Oak Street. Similar issue at Fruit street near the Warren School, where the drain from the catch basin currently outlets into the woods and flooding that area.	Completed	Delete
O.	Install a water lowering device at Spring Street where a bridge has box culverts and beavers are building dams in it. Similar issue adjacent to Indian Brook Rd, where there is an adjacent landfill and there is a danger of potential contamination. The town hired Beaver Solutions to do analysis for both sites. Need funding to maintain sites and analysis in order to apply for Notification of Intent.	Completed	Delete
DAMS			
P.	Regularly inspect and repair dams. Specifically, the following three local Town dams: Sudbury Dam, Cedar Street Dam, and Mill Pond Dam. Additionally, the following two dams under State control should be inspected: Ashland State Park Dam, and Hopkinton State Park Dam.	Partially completed/ Ongoing	Keep

MULTI-HAZARDS			
Q.	Acquire five new fixed generators in Town-owned public safety and emergency shelter buildings: Town Hall, Senior Center, and three sewer pumping stations.	Partially completed	Keep
R.	Acquire additional radio frequencies and bands to increase inter-operability between emergency response providers, departments and agencies. Need to acquire some for DPW.	Partially completed	Keep
WINTER STORMS			
S.	Conduct an assessment of municipal structures for susceptibility to snow loads. The town owns structures that may not be able to withstand snow loads during extreme conditions. An assessment should identify those facilities that are at risk for collapses from snow loads, and what the best mitigation would be. In some cases the solution may be a structural retrofit, but in other cases it may just be a matter of knowing which buildings to clear snow from.	Schools, DPW and wastewater treatment	Keep
T.	Acquire an additional V plow, sidewalk plow, sander, and dump truck, to aid in winter plowing and winter storm mitigation. Recently bought V plow, sidewalk plow and a dump truck.. Need to purchase more V-plows since the current old ones are rusting out and need replacements.	Partially Completed Bucket truck to be added.	Keep
WILDFIRES			
U.	Acquire a 4x4-wheel-drive, off-road vehicle to combat brush fires.	Partially completed 1 unit acquired	Keep
EARTHQUAKES			

V.	Conduct an evaluation of options to enhance the earthquake resilience of public safety buildings; and implement any feasible measures.	Partially completed	Keep
EXTREME TEMPERATURES			
W.	Implement a Site Design review process for new and redevelopment projects with green infrastructure requirements for cooling buildings and properties.	Partially completed Sustainability checklist has been created.	Keep
X.	Acquire a backup power generator for the community center, which serves as a cooling center.	Partially completed	Revise /Delete
DROUGHT			
Y.	Draft a drought management plan to build upon the Emergency Management Plan, utilize information from the water conservation by-law that was completed, used and amended. Need to communicate with Ashland Police Dept. for an updated Emergency Management Plan.	Completed	Delete
Z.	Provide a supplemental water connection to the MWRA. The Town took action at the Fall 2016 Town Meeting on this matter. Currently, the Town shares the Hopkinton Reservoir as its only water source.	Completed	Delete
SEVERE WEATHER HAZARDS			
AA.	Acquire a tree chipper and cherry picker truck to augment tree trimming.	Partially completed	Keep
BB.	Hire a tree warden.	Completed	Delete

SECTION 10 HAZARD MITIGATION STRATEGY

A. WHAT IS HAZARD MITIGATION?

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

http://www.fema.gov/government/grant/hmgp/index.shtm

http://www.fema.gov/government/grant/pdm/index.shtm

http://www.fema.gov/government/grant/fma/index.shtm

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)

B. IDENTIFICATION OF 2025 PLAN MITIGATION MEASURES

During the local hazard team meetings, officials in Ashland determined possible mitigation measures for the various natural hazards that have impacted or could impact the town. In addition, MAPC solicited suggestions for mitigation measures when it collected hazard information from town officials and from other town plans and studies. MAPC compiled all suggested potential mitigation measures in matrix below.

The summary table is then followed by series of considerations that were factored into determining mitigation measures. These include regional and inter-community issues, regional partners and facilities, and new development and infrastructure. Following those considerations, the Hazard Mitigation Strategy chapter of the plan then provides an explanation of the prioritization process of the potential mitigation measures to be included in the updated mitigation plan, as well as a prioritized matrix of the measures.

INTRODUCTION TO 2025 PLAN MITIGATION MEASURES

Description of the Mitigation Measure – The description of each mitigation measure is brief and cost information is given only if cost data were already available from the community. The cost data 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 27, 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 has specific eligibility requirements that would need to be taken into consideration. In most instances, the measure will require a number of different funding sources. Identification of a potential funding source in this table does not guarantee that a project will be eligible for, or selected for funding. Upon adoption of this plan, the local team responsible for its implementation should begin to explore the funding sources in more detail.

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

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

Massachusetts Emergency Management Agency (MEMA) – The grants page http://www.mass.gov/dem/programs/mitigate/grants.htm has a useful table that compares eligible projects for the Hazard Mitigation Grant Program and the Flood Mitigation Assistance Program.

Abbreviation that may be used in Table below:

FEMA Mitigation Grants includes:
- FMA = Flood Mitigation Assistance Program.
- HMGP = Hazard Mitigation Grant Program.
- PDM = Pre-Disaster Mitigation 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
Mass DOT = Massachusetts Department of Transportation

Table 51. Mitigation Measures for the 2025 Hazard Mitigation Strategy

	MITIGATION ACTION	PRIORITY	LEAD IMPLEMENTATION	ESTIMATED TIME FRAME	ESTIMATED COST	POTENTIAL FUNDING SOURCES
	Inland Flood Mitigation					
A.	Conduct a comprehensive drainage management assessment of the downtown area west from Pleasant/ High Streets/ Cordaville Road, east to Route 135/Front Street, south to Route 135 and Summer Street and north to Myrtle Street, Cordaville road/High Street to Cold Spring Brook. Some analysis done for Pleasant and High streets and Cordaville Road to determine how much capacity is needed for current catch basins. Needing funding to complete	High	Ashland DPW	2025- 2028	$500,000	Ashland General Fund/FEMA

	the work. Currently the culverts are overwhelmed. Major development is being built nearby and required to contain potential run-off on-site.					
C.	Develop an ongoing wetlands education program for local residents, builders and landscapers on the importance of preserving wetlands functions, especially flood storage capacity.	Medium	Ashland Conservation Department	2025- 2028	$10,000	Ashland General Fund /FEMA
E.	Install new drain lines and catch basins along the length of Nickerson Road. A new culvert has been installed. This section of road needs to have camera inspection and drain lines excavated and replaced accordingly.	Medium	Ashland DPW	2025-2030	$1Million	Ashland General Fund /FEMA
F.	Identify and repair/replace culverts that are failing or undersized (townwide) like Shore Road, Central and Alden, Oak St., State Road. Prioritize any that are undersized in regulatory floodways. Franklin Road at the end of Olive St. Replace piping and drainage to address stormwater related flooding.	High	Ashland DPW	2025-2030	$100K- 3M	Ashland General Fund /FEMA
New	Identify and replace existing high priority catch basins with deep sub catch basin structures.	TBD	Ashland DPW and Engineering	2025-2029	TBD	A shland General Fund /FEMA
New	Retrofitting town properties with Stormwater control measures	TBD	Ashland DPW and Engineering	2025-2028	TBD	Ashland General Fund /FEMA
New	Investigate townwide measures for beaver control (including beaver mitigation plan) including Flow Control Devices, Decoy Dams.	TBD	Ashland DPW, Conservation Dept.	2025-2030	TBD	Ashland General Fund
H.	Acquire open space parcels recommended in the most recent version of the OSRP by the Open Space Committee. *Note:55 acres of UCC land have been acquired*	Medium	Open Space Committee coordinated with Ashland Conservation Commission	2025-2030	TBD	Town bonding, Community Preservation Act, Urban Self Help Grants, development mitigation funding
J.	Replace the Cordaville Road bridge and Main St. Bridges due to deteriorating conditions for public safety	High	Ashland DPW	2025-2030	12M	Ashland General Fund/Capital Improvements

K.	Develop a town-based GIS wetlands mapping capacity that would include all local wetland delineations and filings. Process changes to require digital GIS files with coordinates to map future areas using CAD files.	Medium	Ashland Conservation Department	2025-2030	52 staff hours per year	Ashland General Fund/FEMA
	Dam Mitigation					
P.	*Regularly inspect and repair dams. Specifically the following three local Town dams: Sudbury Dam, Cedar Street Dam, and Mill Pond Dam. Additionally, the following two dams under State control should be inspected: Ashland State Park Dam, and Hopkinton State Park Dam.*	*Medium*	*Ashland Fire/DPW*	2025-2030	$ 10,500 per Inspection on all three dams.	Ashland General Fund
New	*Design, construction and removal of the Sudbury river dams*	Medium	*Ashland Engineering/DPW*	2025-2029		Ashland General Fund
	Winter Storm Mitigation					
S.	Conduct an assessment of municipal structures for susceptibly to snow loads. The town owns structures that may not be able to withstand snow loads during extreme conditions. An assessment should identify those facilities that are at risk for collapses from snow loads, and what the best mitigation would be. In some cases the solution may be a structural retrofit, but in other cases it may just be a matter of knowing which buildings to clear snow from.	Medium	Ashland DPW, Building Dept.	2025-2030	$50,000 for Assessment; Retrofits TBD	Ashland General Fund
T.	Acquire an additional V plow, sidewalk plow, sander, dump truck, and bucket truck to aid in winter plowing and winter storm mitigation. Recently bought V plow, sidewalk plow and a dump truck. There is a need to purchase more V-plows since the current old ones are rusting out and need replacements.	Medium	Ashland DPW	TBD	>$500,000 pending confirmation of costs	Ashland General Fund
New	Replace existing salt barn with a new barn	Low	Ashland DPW	2025-2029	$750,000	Ashland General Fund
	Wildfire Mitigation					
U.	Acquire a 4x4-wheel-drive, off-road vehicle to combat brush fires.	High	Ashland Fire Department	2025-2028	$150,000	Ashland General Fund

	Earthquake Mitigation					
V.	Conduct an evaluation of options to enhance the earthquake resilience of public safety buildings; and implement any feasible measures.	Low	Ashland Fire Department	2025-2030	$5,000 for Evaluation Retrofits TBD	Ashland General Fund
New	Include analysis of site with respect to fault lines and education on water and sewer lines in new development sites.	Low	Ashland Fire Department	2025-2029	$50 K	Ashland General Fund
	Extreme Temperature Mitigation					
W.	Implement a Site Design review process which includes a sustainability checklist for new and redevelopment projects with green infrastructure requirements for cooling buildings and properties.	Medium	Planning Department	2025-2029	Staff time	Ashland General Fund
	Drought Mitigation					
New	*Management of infrastructure and emergency water interconnection between Ashland and Southborough*	TBD	TBD	2025-2029	TBD	TBD
New	*Identify and acquire additional water supply sources and groundwater wells.*	TBD	TBD	2025-2029	TBD	TBD
New	*Replace existing water storage standpipe (2 M gallons) with a higher capacity tank.*	TBD	TBD	2025-2030	TBD	TBD
	Severe Weather (Thunderstorms and Hail, Hurricanes and Tornadoes) Mitigation					
AA.	Acquire a tree chipper and cherry picker truck to augment tree trimming.	High	DPW	2025-2030	$100,000	Ashland General Fund
	Invasive Species					
New	Create and implement a townwide invasive management plan	Low	TBD	TBD	TBD	TBD
New	Acquire an invasives disposal unit bin (with waste management would take to incinerator)	Medium	TBD	TBD	<$2000 per year	TBD
New	*Evaluating contributing factors to cyanobacteria growth and address them to keep beaches open during extreme heat events (Ashland and Hopkinton state park, Mill Pond boat launch)*	Low	TBD	2025-2029	TBD	TBD
	Multi-Hazards Mitigation					
Q.	Hazards addressed: All hazards including Inland Flooding, Drought, Extreme Temperatures, Geologic	*High*	*Ashland Fire, Police, Facilities, and DPW*	2025-2030	*$30,000*	Ashland General Fund/FEMA

	Hazards, Severe Weather, Severe Winter Weather/Storms and Wildfires) *Acquire five new fixed generators in Town-owned public safety and emergency shelter buildings: Town Hall, Senior Center, and three sewer pumping stations.*					
R.	Hazards addressed: All hazards including Inland Flooding, Drought, Extreme Temperatures, Geologic Hazards, Severe Weather, Severe Winter Weather/Storms and Wildfires) *Acquire additional radio frequencies and bands to increase inter-operability between emergency response providers, departments and agencies. Need to acquire some for DPW.*	*Medium*	*Ashland Fire and Police*	2025-2030	*$100,000*	Ashland General Fund/FEMA
	Climate Mitigation					
New	Hazards addressed: Extreme Temperatures, Severe Weather Create an urban tree management plan that would involve planting of trees to regulate cooling and air quality	TBD	TBD	2025-2030	$100K -$150K	TBD
New	Hazards addressed: All hazards including Inland Flooding, Drought, Extreme Temperatures, Geologic Hazards, Severe Weather, Severe Winter Weather/Storms and Wildfires) Conduct a Vulnerability Assessment of town facilities and infrastructure for climate change. Add Waste water and INI- sewer information..	TBD	TBD	2025-2030	TBD	TBD
New	Hazards addressed: Inland Flooding Annual inspection and management of town owned Howe St. landfill and leaching because of heavy rain to address public health concerns.	TBD	TBD	2025-2030	TBD	TBD

SECTION 11 PLAN ADOPTION AND MAINTENANCE

PLAN ADOPTION

The Ashland Hazard Mitigation Plan 2025 Update was adopted by the Board of Selectmen on *[ADD DATE]*. See Appendix D for documentation. The plan was approved by FEMA on [*ADD DATE*] for a five-year period that will expire on [*ADD DATE*].

PLAN MAINTENANCE

Although several of the mitigation measures from the Town's previous Hazard Mitigation Plan have been implemented, since that plan was adopted there has not been an ongoing local process to guide the implementation of the plan. Such a process is needed over the next five years for the implementation of this plan update and will be structured as described below.

MAPC worked with the Local Planning Team to prepare this plan. After approval of the plan by FEMA, this group will meet to function as the Hazard Mitigation Implementation Team, with the Fire Chief 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 five-year planning cycle. As updates and a review of the plan are conducted dam by the Hazard Mitigation Implementation Team, these will be placed on the Town's web site. Any public 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 Implementation 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 Fire Chief, will have primary responsibility for tracking progress, evaluating, and updating the plan.

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

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

Prepare and Adopt an Updated Local Hazard Mitigation Plan –Once the resources have been secured to update the plan, the Hazard Mitigation Implementation Team may decide to undertake the update themselves, contract with the Metropolitan Area Planning Council to update the plan or to hire another consultant. However the Hazard Mitigation Implementation Team decides to update the plan, the group will need to review the current FEMA hazard mitigation plan guidelines for any changes. The Ashland 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

Upon approval of the Ashland Hazard Mitigation Plan 2025 Update by FEMA, the Local Hazard Mitigation Team will provide all interested parties and implementing departments with a copy of the plan and will initiate a discussion regarding how the plan can be integrated into that department's ongoing work. During updates of any Town department's plans or policies, the relevant portions of this mitigation strategy will be incorporated. The plan will be reviewed and discussed with the following departments:

- Fire Department
- Police Department
- Department of Public Works
- Community Development Department
- Economic Development Department
- Sustainability Department
- Conservation Department
- Planning Board
- Planning Department
- Health Department
- Engineering Department

Other groups that will be coordinated with the town include large institutions, Chamber 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 2017 Ashland HMP was integrated into the concurrent MVP 2.0 Process, and the Community Decarbonization Report. In addition, portions of the 2017 HMP have been integrated into various iterations of the Capital Improvement Plan. Ashland has not conducted a Master plan during the timeframe of the 2017 HMP. The 2025 Ashland Hazard Mitigation Plan will be integrated into other town plans and policies as they are updated and renewed, including the Open Space and Recreation Plan, Envision Ashland Comprehensive Plan, Comprehensive Plan, and Capital Improvement Plan.

SECTION 12 LIST OF REFERENCES

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SECTION 13 APPENDIX A: HAZARD MAPPING

The MAPC Data Services Department produced a series of maps. 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 thirteen maps as described below. The maps in this appendix are necessarily reduced scale versions for general reference. Full sized higher resolution PDF's of the maps can be requested.

Map 1.	Population Density
Map 1a.	Environmental Justice
Map 2.	Land Use
Map 3.	Flood Zones
Map 3b.	Flood Zones and 2010 Flood Claims
Map 4.	Earthquakes and Landslides
Map 5.	Hurricanes and Tornadoes
Map 6.	Average Snowfall
Map 7.	Composite Natural Hazards
Map 8.	Local Hazard Areas
Map 9.	Land Surface Temperature
Map 11.	Wildfire Risk

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 1a: 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.

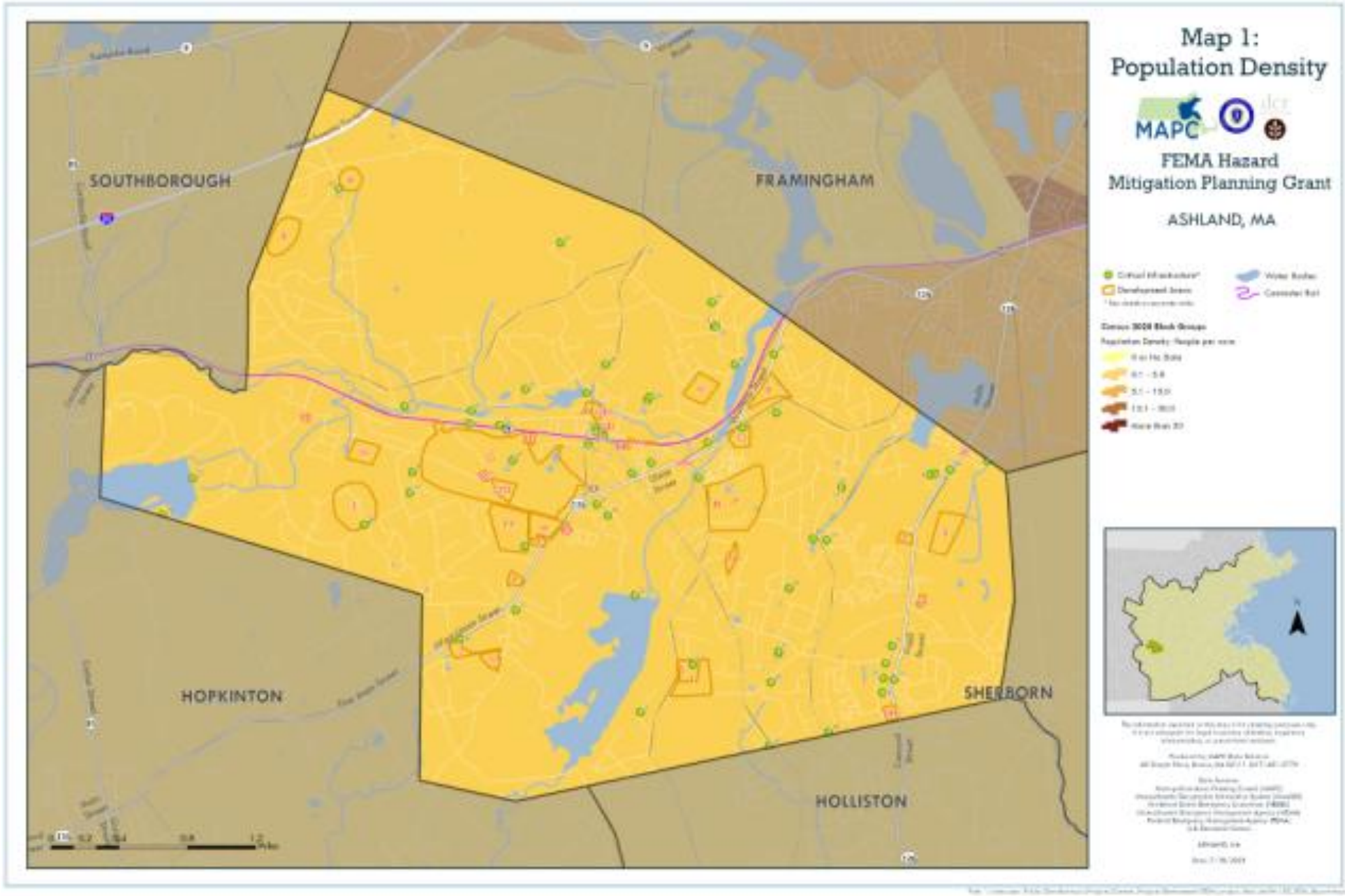
Map 7: Composite Natural Hazards (Regional) - This map shows four categories of composite natural hazards for areas of existing development. The hazards included in this map are 100-year wind speeds of 110 mph or higher, low and moderate landslide risk, FEMA Q3 flood zones (100 year and 500 year) and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

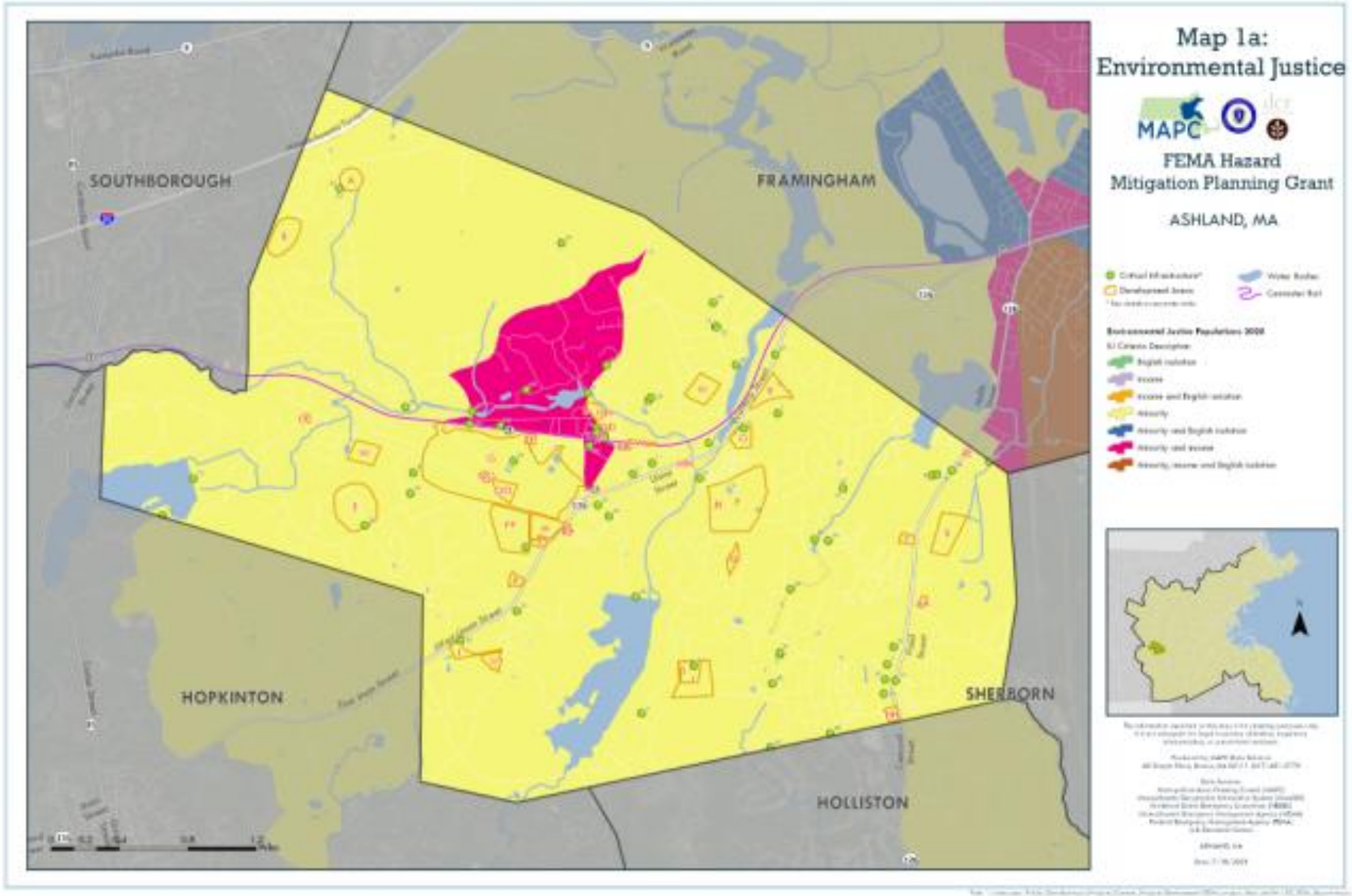
Map 8: Local Hazard Areas – For each community, locally identified hazard areas are overlaid on an aerial photograph/ The critical infrastructure sites and planned development areas are also shown. The source of the aerial photograph is Mass GIS

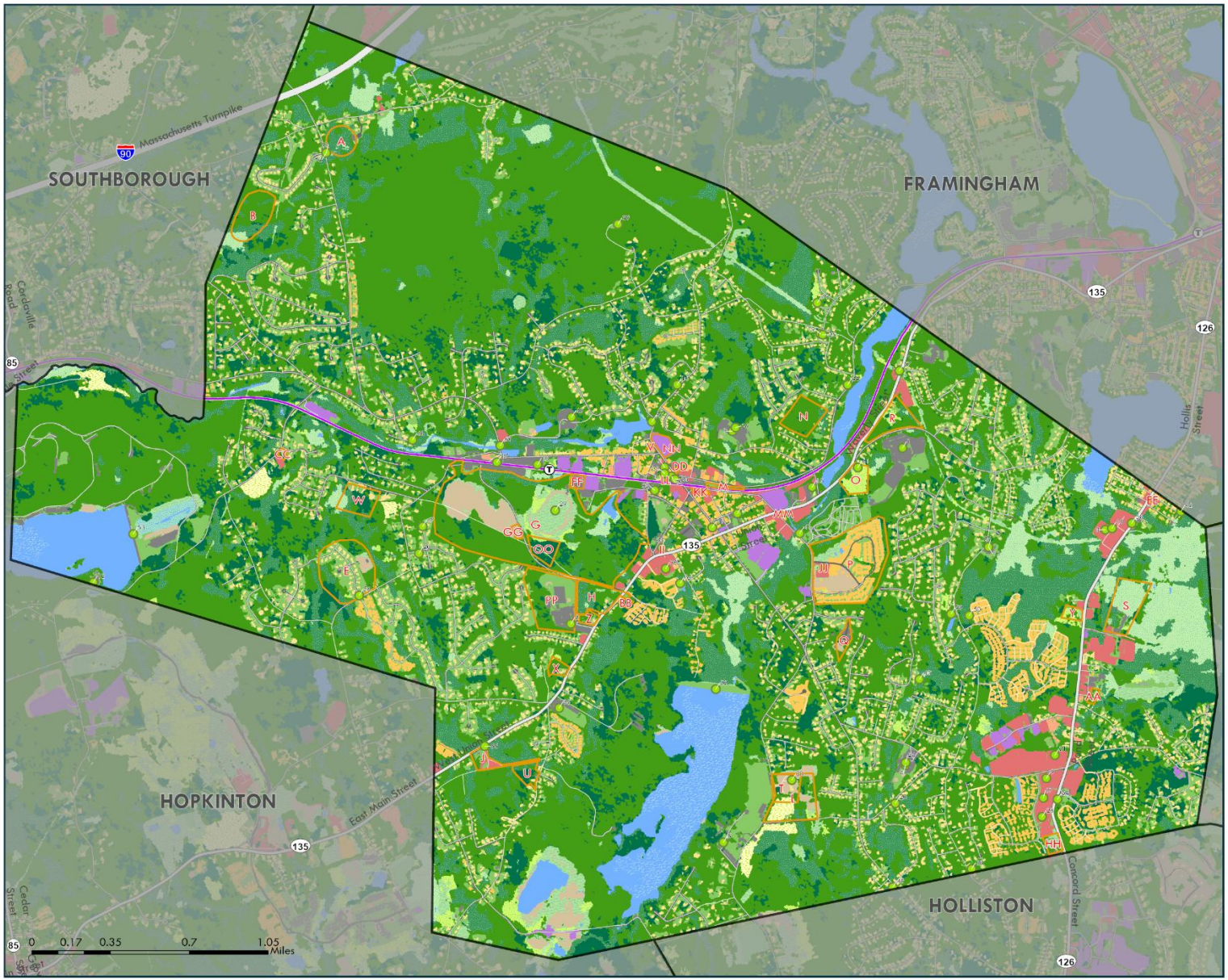
Map 9: Land Surface Temperatures – MAPC's Statewide Land Surface Temperature (LST) Index was created by combining estimates of surface temperature from days in 2018, 2019, and 2020 where the daily air temperature maximum exceeded 70 degrees Fahrenheit. The Statewide LST Index "Hot Spots" data depicts 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 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.

The full map set described above is included on the subsequent pages.


Map 1:
Population Density
MAPC
FEMA Hazard
Mitigation Planning Grant
ASHLAND, MA
SOUTHBOROUGH
FRAMINGHAM
HOPKINTON
SHERBORN
HOLLISTON


Map 1a:
Environmental Justice
MAPC
FEMA Hazard
Mitigation Planning Grant
ASHLAND, MA
SOUTHBOROUGH
FRAMINGHAM
HOPKINTON
SHERBORN
HOLLISTON



Map 2: Land Use

MAPC dcr

FEMA Hazard Mitigation Planning Grant

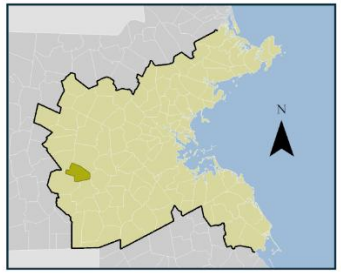
ASHLAND, MA

- Critical Infrastructure*
- Development Areas
- Commuter Rail

* See details in separate table

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



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

ASHLAND, MA

Date: 7/18/2025

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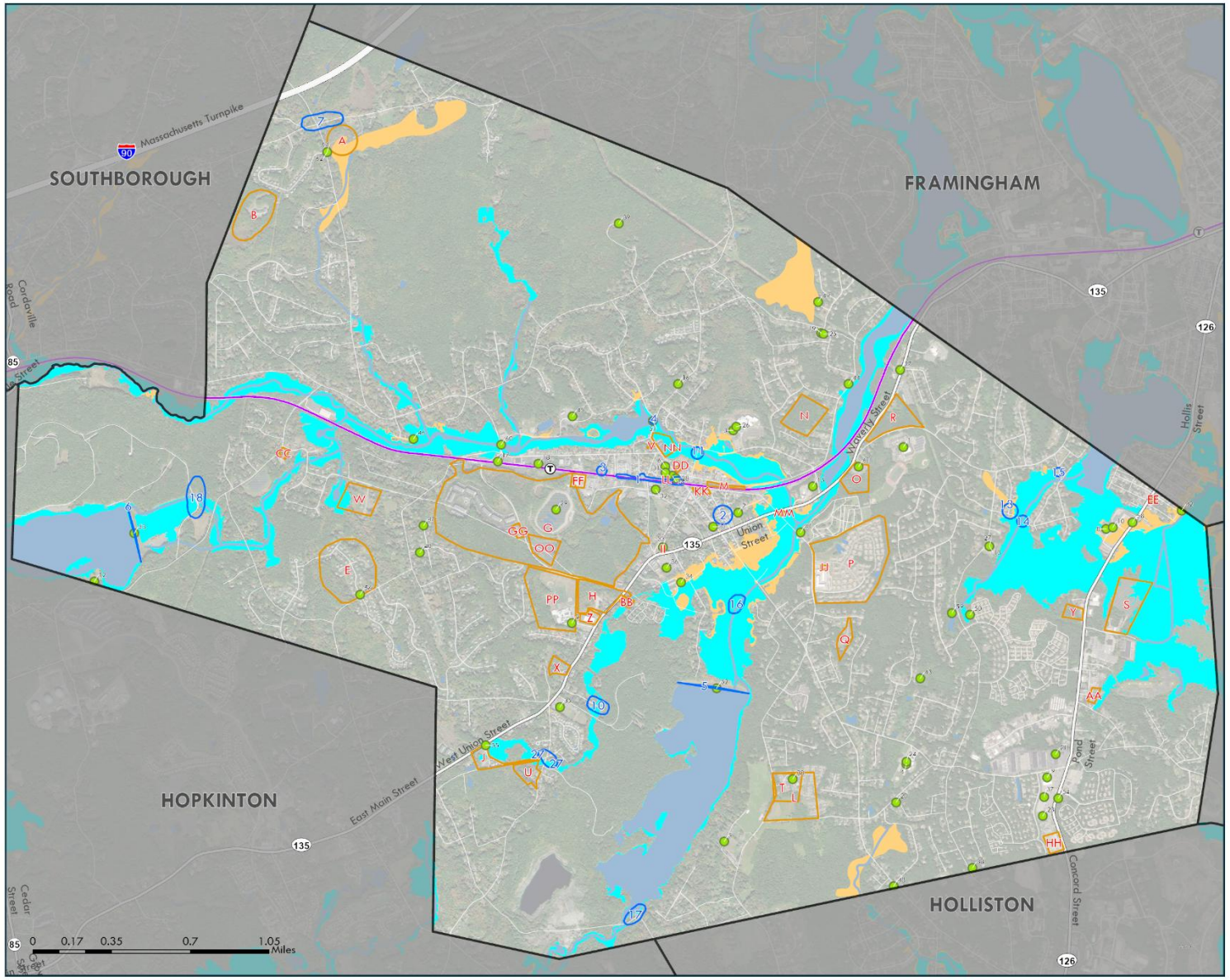


Map 3: Flood Zones

MAPC dcr

FEMA Hazard Mitigation Planning Grant

ASHLAND, MA

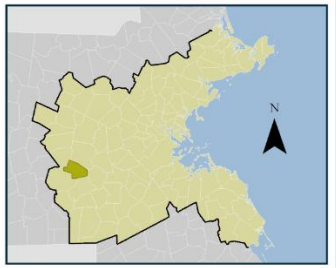
- Critical Infrastructure*
- Development Areas
- Flood Hazards

* 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



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

ASHLAND, MA

Date: 7/18/2025

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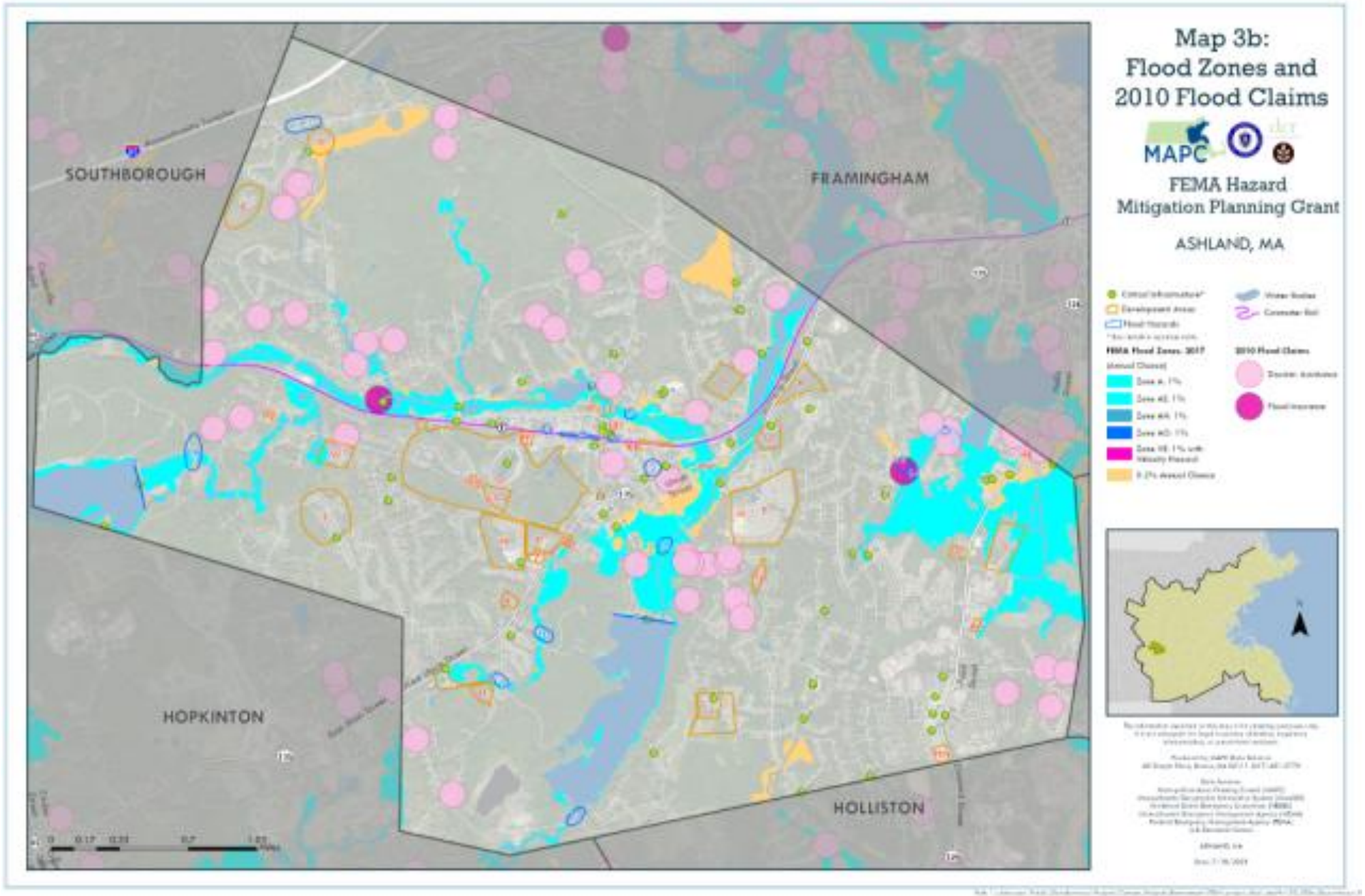
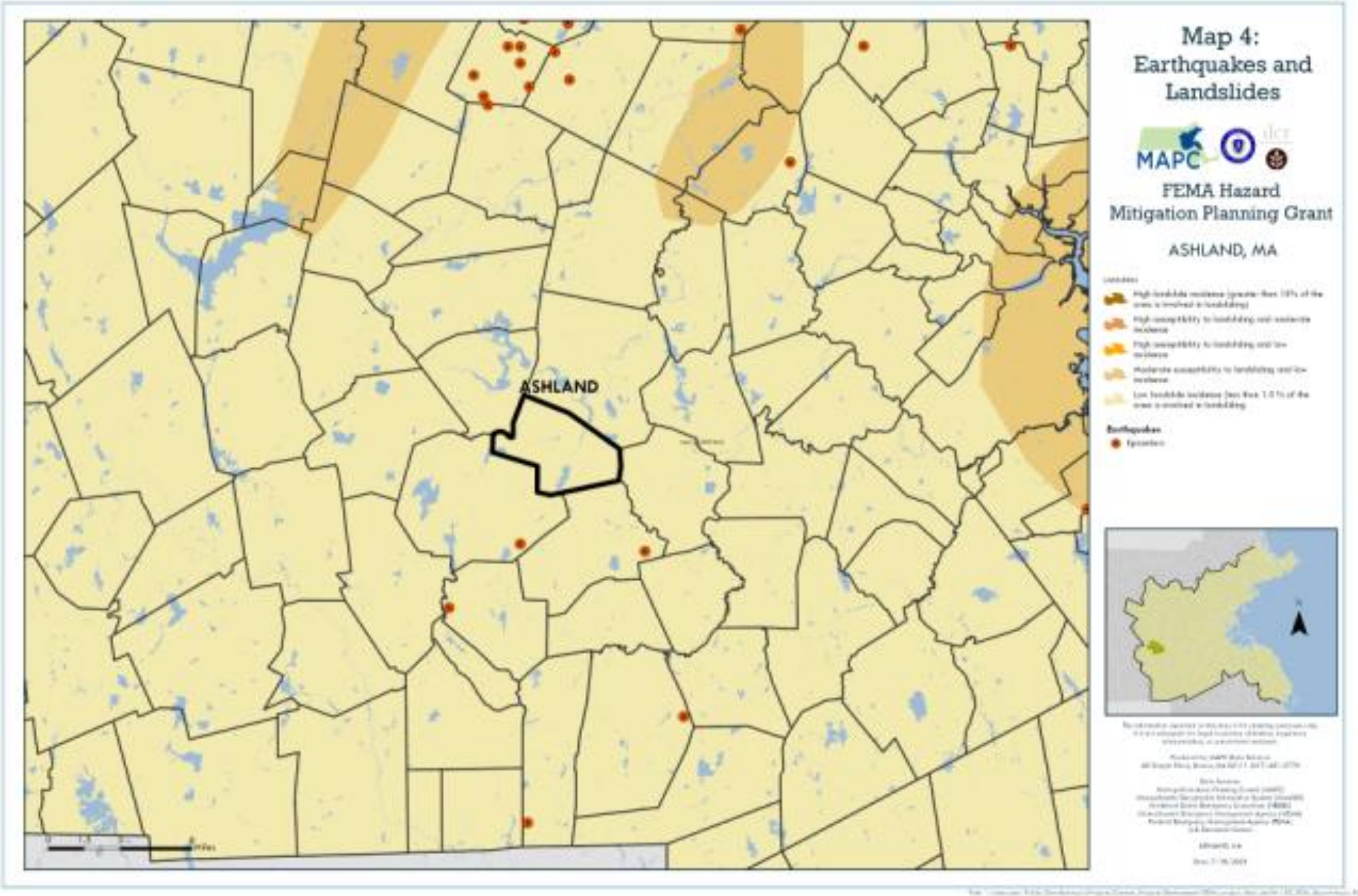
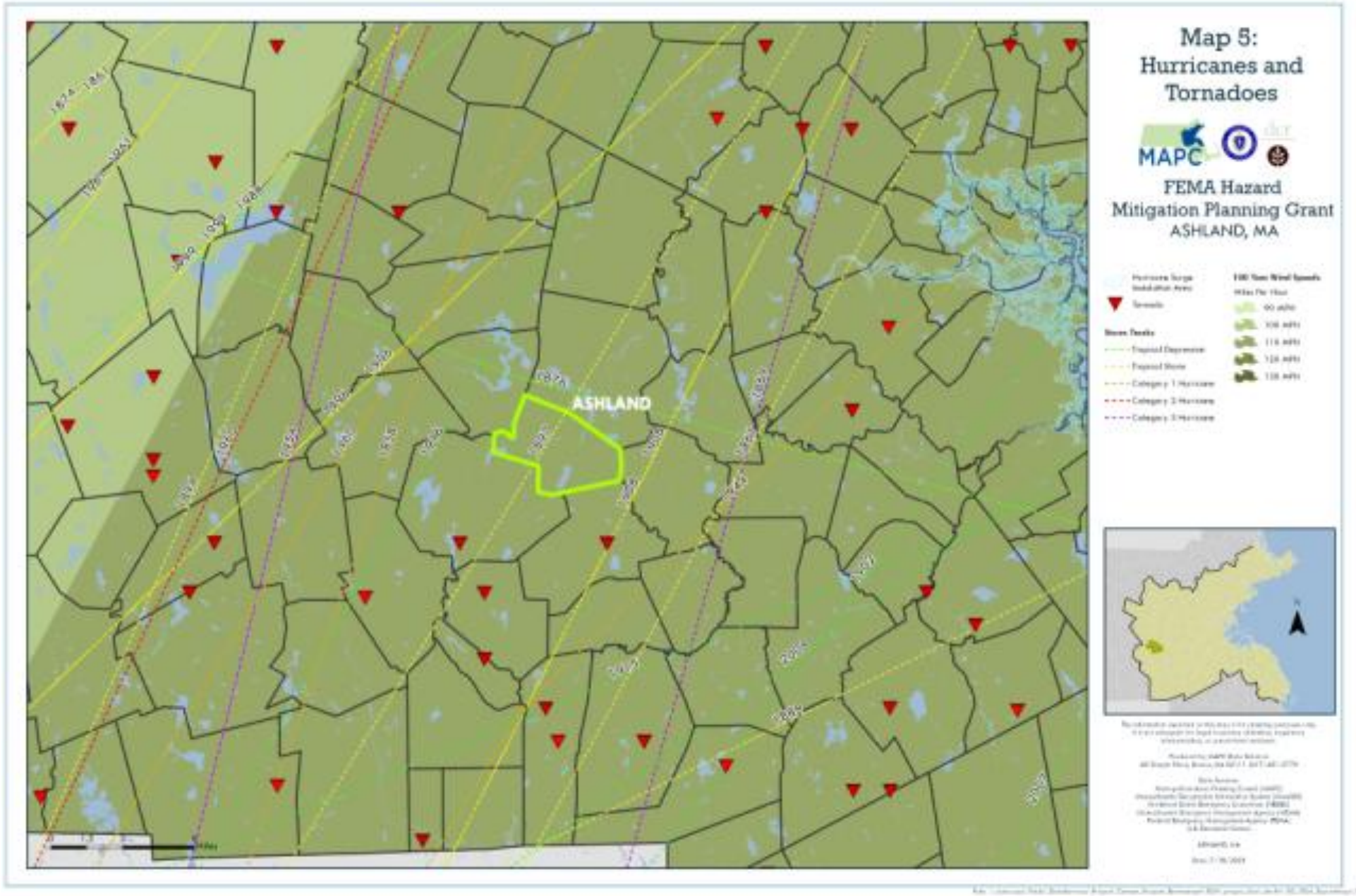
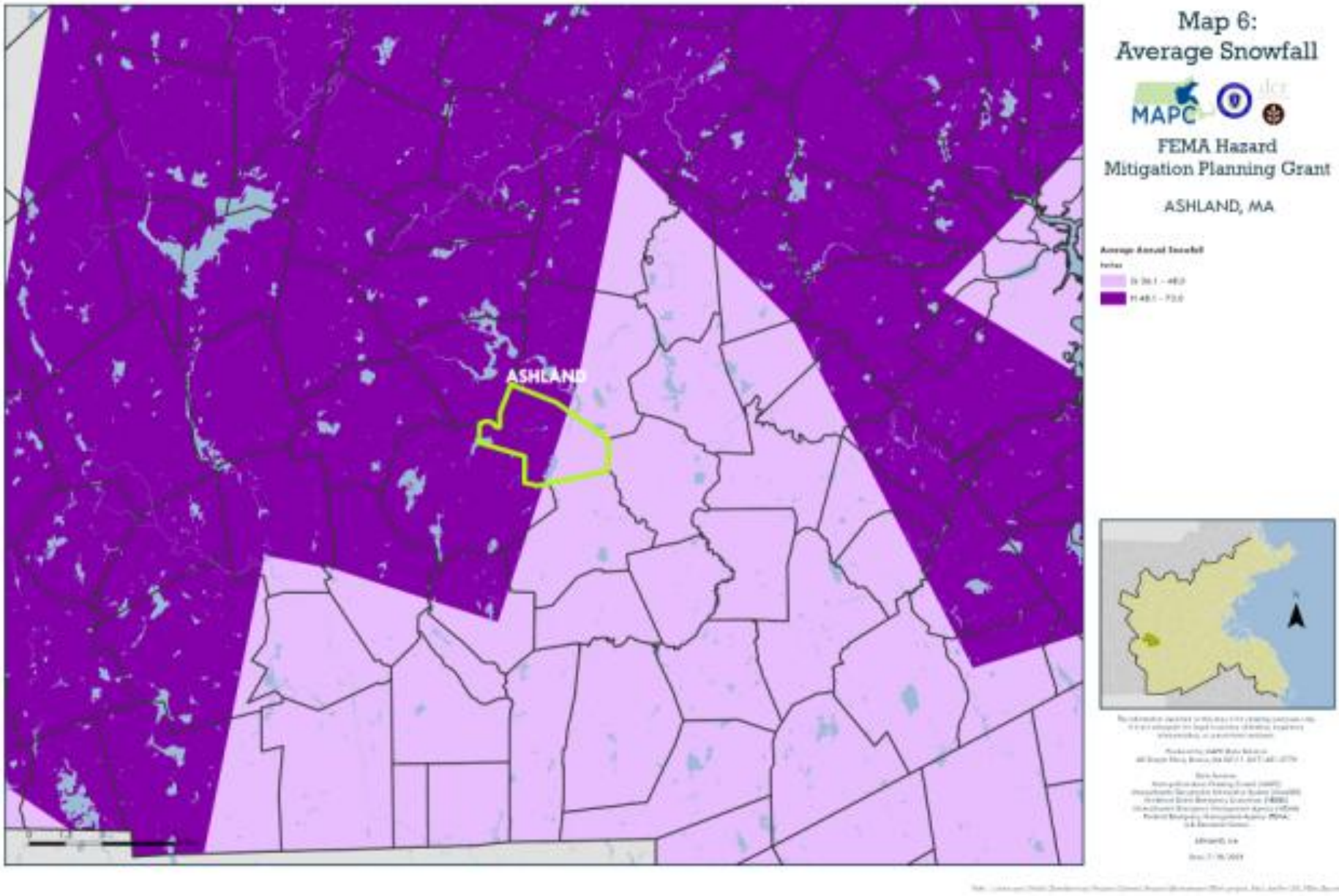
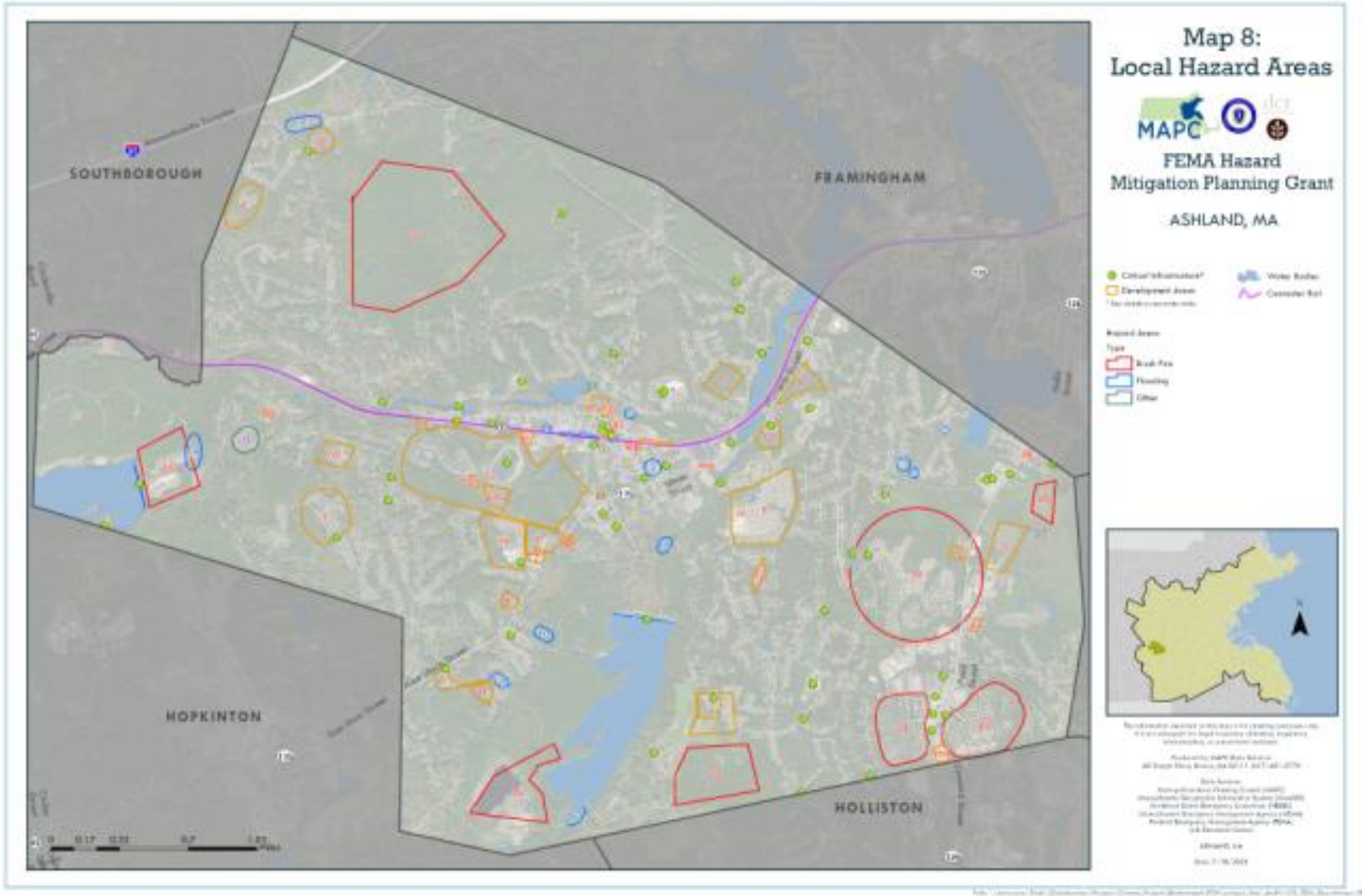
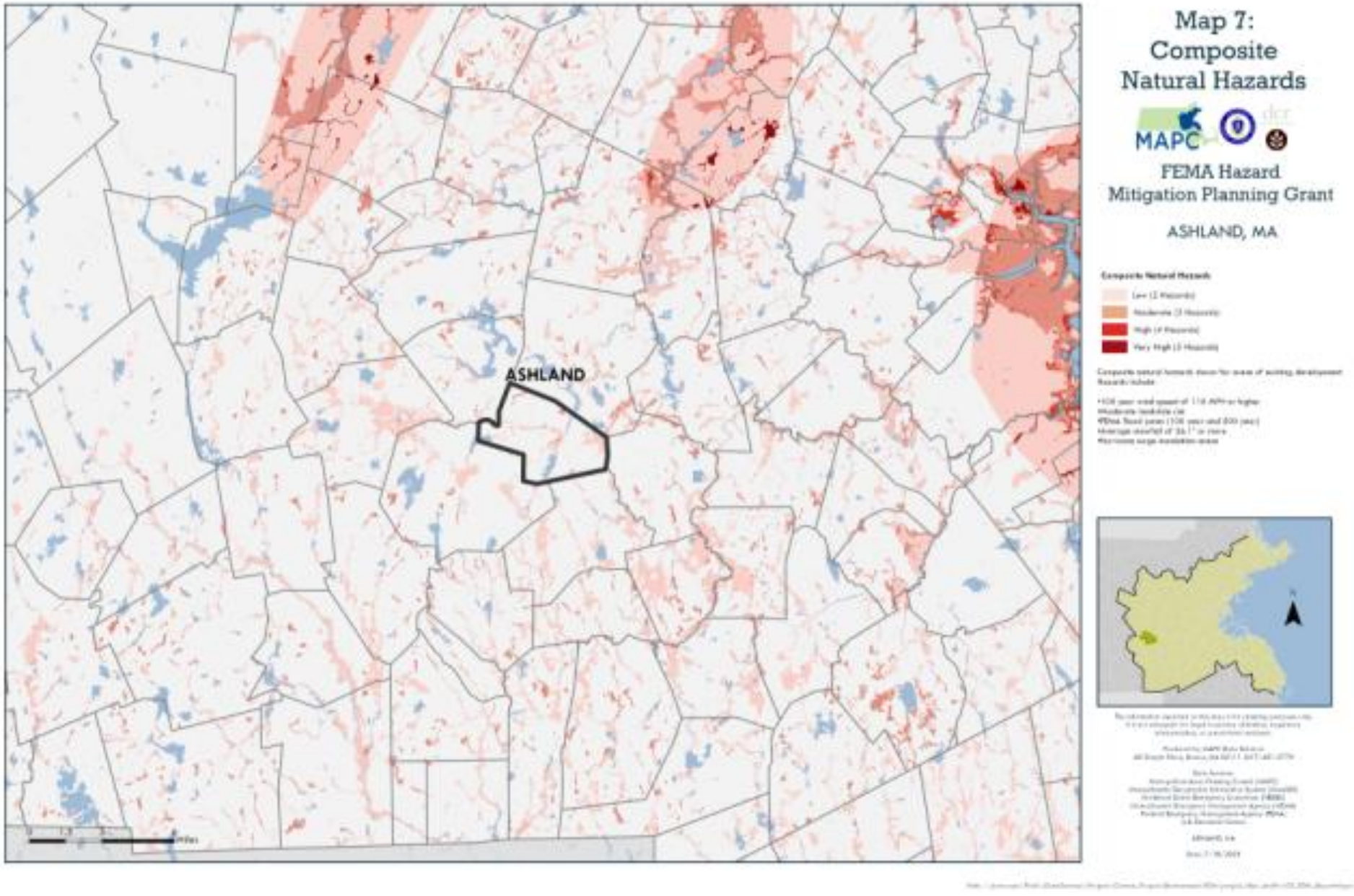

SOUTHBOROUGH
FRAMINGHAM
HOPKINTON
HOLLISTON
Map 3b:
Flood Zones and
2010 Flood Claims
MAPC
FEMA Hazard
Mitigation Planning Grant
ASHLAND, MA

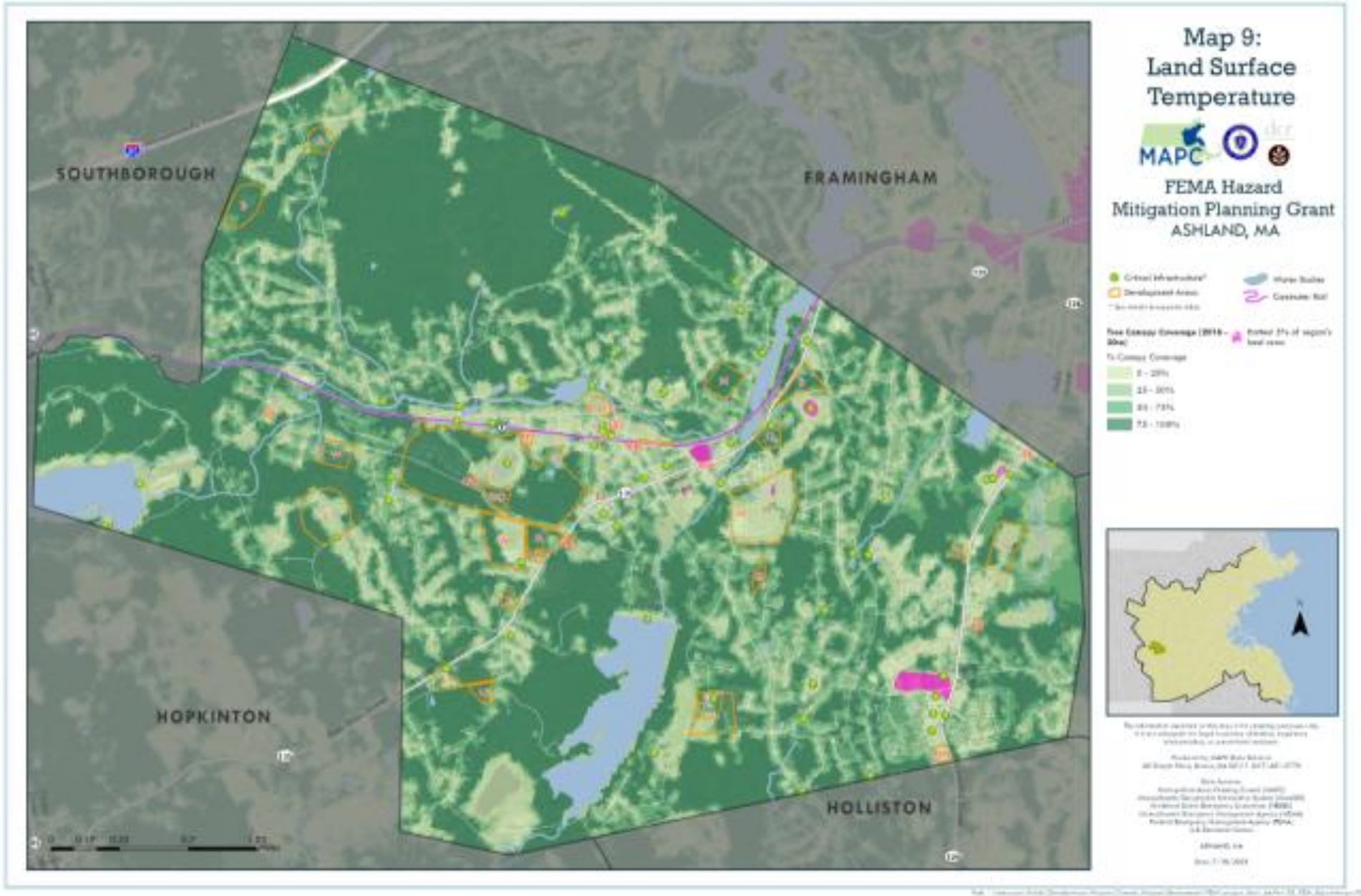

Map 4:
Earthquakes and
Landslides
MAPC
FEMA Hazard
Mitigation Planning Grant
ASHLAND, MA
ASHLAND

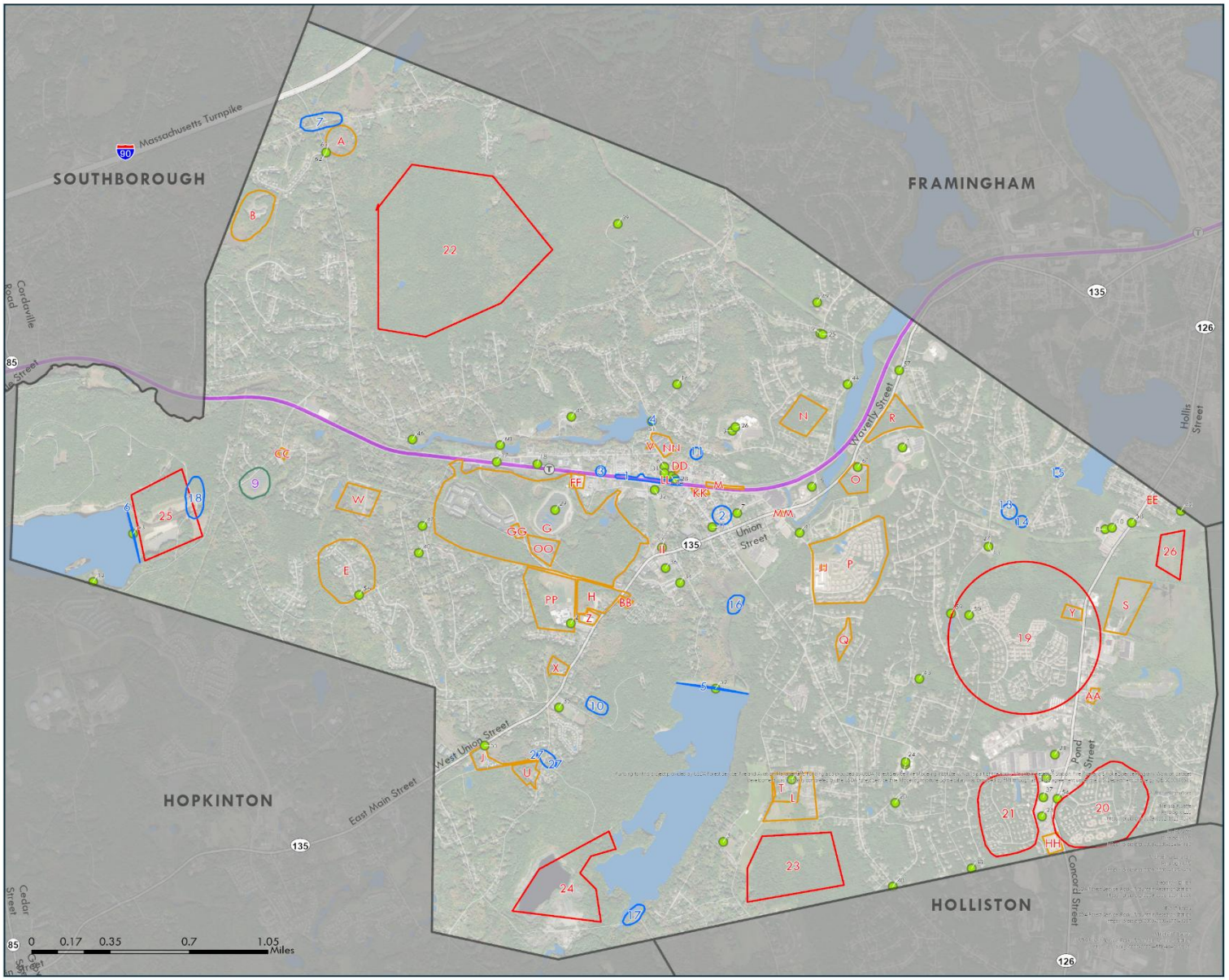

Map 5:
Hurricanes and
Tornadoes
MAPC
FEMA Hazard
Mitigation Planning Grant
ASHLAND, MA
ASHLAND


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


Map 8:
Local Hazard Areas
MAPC
FEMA Hazard
Mitigation Planning Grant
ASHLAND, MA
SOUTHBOROUGH
FRAMINGHAM
HOPKINTON
HOLLISTON


Map 7:
Composite
Natural Hazards
MAPC
FEMA Hazard
Mitigation Planning Grant
ASHLAND, MA
ASHLAND


Map 9:
Land Surface Temperature
MAPC
FEMA Hazard
Mitigation Planning Grant
ASHLAND, MA
SOUTHBOROUGH
FRAMINGHAM
HOPKINTON
HOLLISTON



Map 10: Wildfire Risk

MAPC dcr

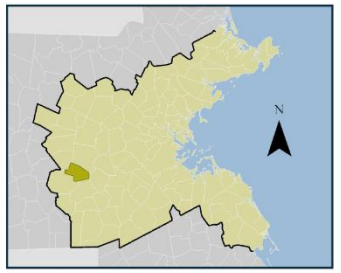
FEMA Hazard Mitigation Planning Grant

ASHLAND, 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



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.

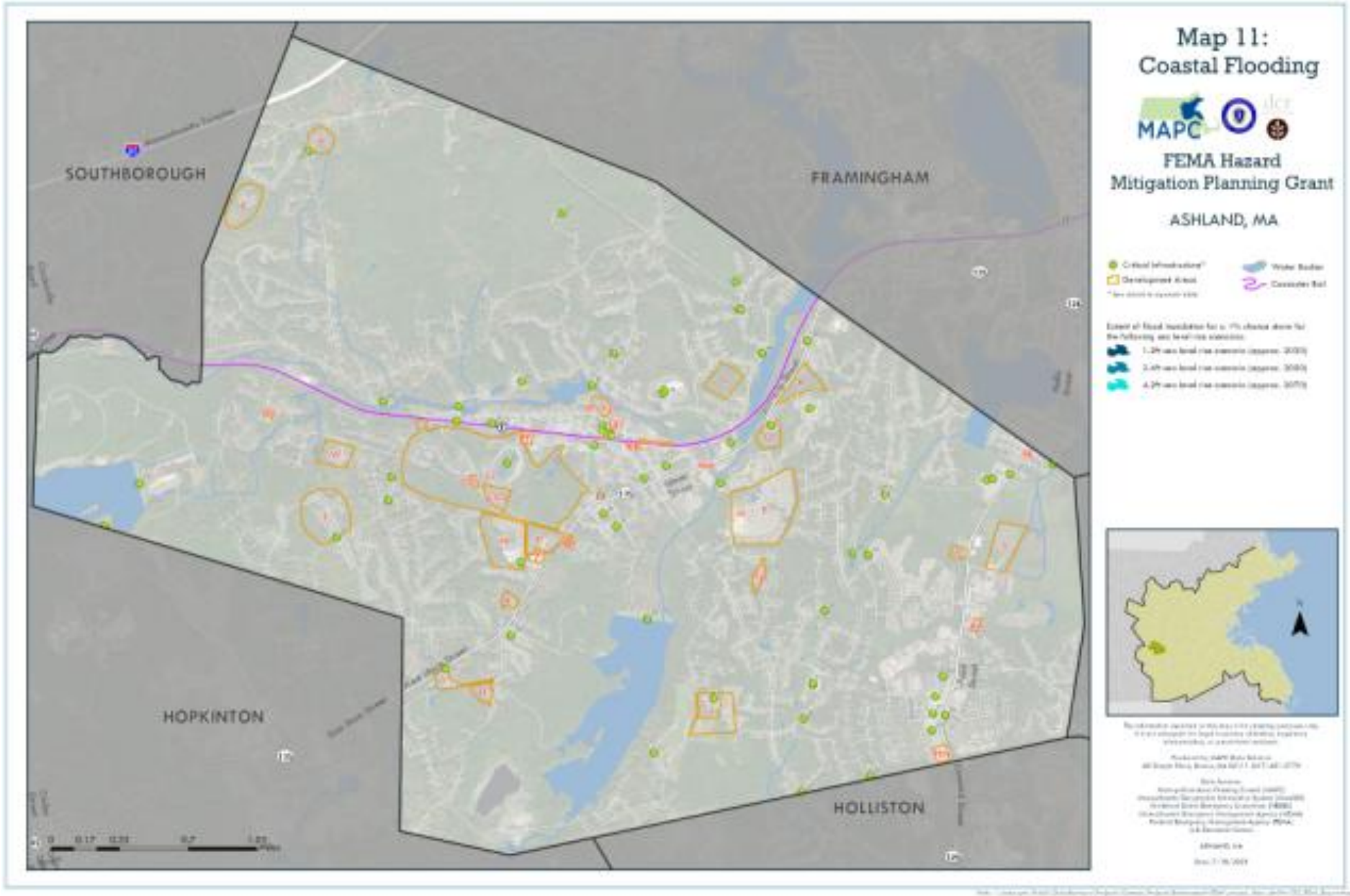
Produced by MAPC Data Services
60 Temple Place, Boston, MA 02111 (617) 451-2770

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

ASHLAND, MA

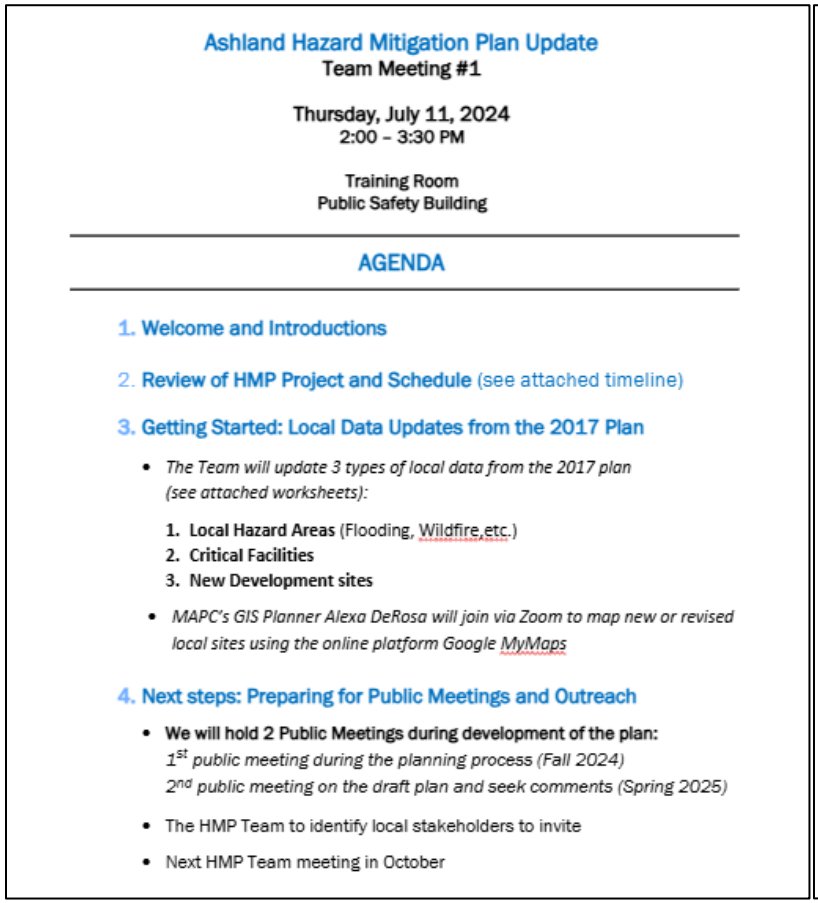
Date: 7/18/2025

Path: \\data-sync\Public\DataServices\Projects\Current_Projects\Environment\PDM\project_files\ArcPro\03_PDM_ExportMaps\


Map 11:
Coastal Flooding
MAPC
FEMA Hazard
Mitigation Planning Grant
ASHLAND, MA
SOUTHBOROUGH
FRAMINGHAM
HOPKINTON
HOLLISTON

SECTION 14 APPENDIX B: LOCAL TEAM MEETINGS

A total of four local team meetings were held in-person at the Ashland Public Safety Building in Ashland. The agenda for each of these meetings are documented below.



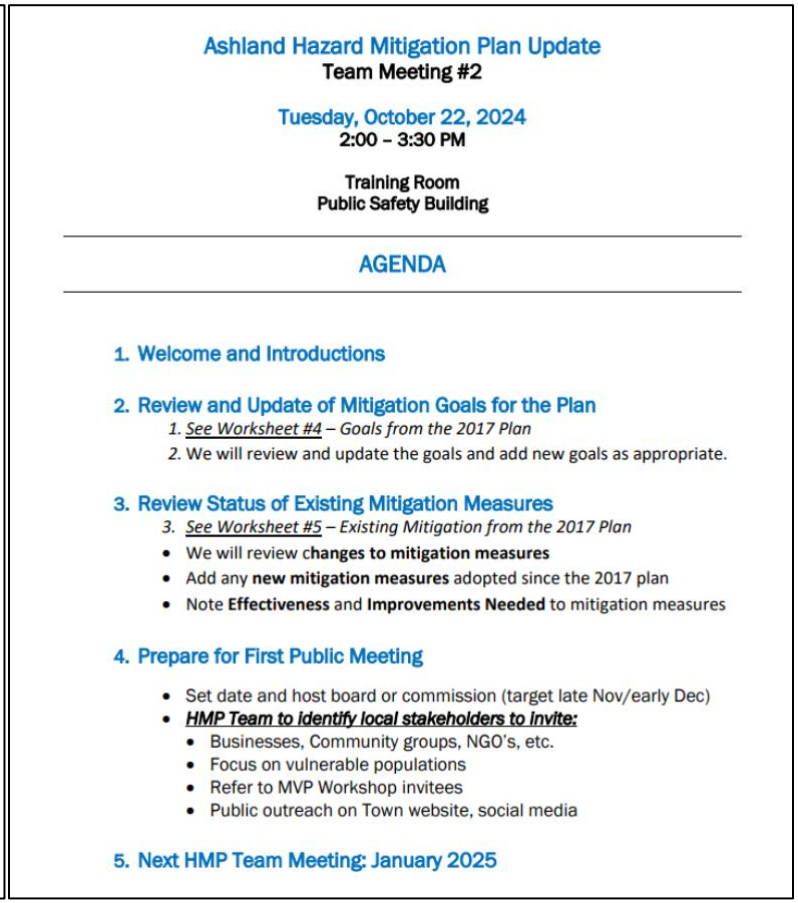
Ashland Hazard Mitigation Plan Update
Team Meeting #1

Thursday, July 11, 2024
2:00 – 3:30 PM

Training Room
Public Safety Building

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



Ashland Hazard Mitigation Plan Update
Team Meeting #2

Tuesday, October 22, 2024
2:00 – 3:30 PM

Training Room
Public Safety Building

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 late Nov/early Dec)
   - ***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

Ashland Hazard Mitigation Plan Update

Team Meeting #3

Wednesday, January 22
2:00 – 3:00 PM

Training Room
Public Safety Building

AGENDA

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1. Welcome and Project Update

2. Review Status of Mitigation Strategies from the 2017 Plan

The Team will review the recommended mitigation measures from the 2017 plan.

- Note their current status: completed, in progress, not implemented.
- For those not implemented, note why
- Note any measures to be changed or deleted for the 2025 plan

See the attached worksheet to note the status of mitigation recommendations.

3. Review of Next Steps

- **Public Meeting– February 5**
  - MAPC Presentation hosted at the Select Board meeting
  - Seeking public input, comments or concerns about hazards
- **Final Team Meeting–April**
  - Finalize mitigation recommendations for the 2025 plan
- **Second Public Meeting–May**
  - Presentation of the draft plan at a public meeting
  - Draft plan to be posted online for public review period
- **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

Ashland Hazard Mitigation Plan Update
Local Team Meeting #4 (Final Meeting)

Thursday, May 22, 2025
2:00 – 3:30 pm

AGENDA

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1. Welcome and Project Update

2. Finalize the Mitigation Strategies for 2025 Plan

- The Team will review the draft recommended mitigation measures for the 2025 plan
- We will confirm the recommendations, lead agencies, timeframes, and costs
- *See the attached worksheet.*

3. Next Steps

- **Second Public Meeting / Review of Draft Plan**
  - **Schedule Public Meeting**
  - Meeting notice and social media outreach, please advise on public engagement
  - Presentation of the draft plan and public questions/comments
  - Draft plan to be posted on the Town's website for public review

Amanda Linehan, Communications Manager, Metropolitan Area Planning Council
617-933-0705, alinehan@mapc.org

CALENDAR LISTING / MEDIA ADVISORY

Ashland Hazard Mitigation Plan 2025 update
To be discussed
At February 5 Public Meeting

Who: Ashland residents, business owners, institutions, and non-profit organizations, and others interested in preventing and reducing damage from natural hazards.

What: At a public meeting on *Wednesday, February 5 at 7:00 PM*, a presentation on the *Ashland Hazard Mitigation Plan 2025 Update* will be given at a meeting of the Ashland Select Board. This meeting will be held in person with the option to join remotely; see details below. The presentation will be given by the Metropolitan Area Planning Council, who is assisting the Town's Hazard Mitigation Team in preparing the plan.

The Town of Ashland is preparing an updated Hazard Mitigation Plan to document natural hazards that affect the Town, such as floods, hurricanes, nor'easters, and severe winter storms. The plan will recommend mitigation actions the Town can take to reduce its vulnerability to these natural hazards.

By preparing an updated Hazard Mitigation Plan, the Town of Ashland will be eligible for FEMA grants to fund mitigation projects such as drainage improvements.

When: **Wednesday, February 5, 2025, 7:00 PM**

Where: **Ashland Select Board Meeting**
Town Hall
101 Main St.
Ashland, MA 01721

***Hybrid meeting option via Zoom**: Please see www.ashlandmass.com*

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

Amanda Linehan, Director of Communications, Metropolitan Area Planning Council
617-933-0705, alinehan@mapc.org

CALENDAR LISTING / MEDIA ADVISORY

ASHLAND's *HAZARD MITIGATION PLAN 2025 UPDATE* TO BE PRESENTED ON AUGUST 6th AT PUBLIC MEETING

Who: Ashland residents, business owners, institutions, and non-profit organizations, and others interested in preventing and reducing damage from natural hazards.

What: A presentation of the draft Ashland *Hazard Mitigation Plan 2025 Update* will be given at a meeting of the Ashland Select Board on Wednesday, August 6 at 7:00 PM. The presentation will be given by the Metropolitan Area Planning Council, which has assisted the town's Hazard Mitigation Team in the preparation of the plan.

The Town of Ashland has prepared the draft *Ashland Hazard Mitigation Plan 2025 Update* to evaluate natural hazards that affect the Town, such as floods, hurricanes, and severe winter storms. The draft plan provides recommended mitigation actions the town can take to reduce its vulnerability to those hazards. The plan will also enable the town to apply for grants from FEMA to fund mitigation projects.

The draft plan will be available online for public review after the meeting, and the public's questions and comments are welcome.

When: Wednesday, August 6, 2025, 7:00 PM

Where: Ashland Select Board Meeting
Town Hall
101 Main St.
Ashland, MA 01721

Hybrid meeting option via Zoom: Please see www.ashlandmass.com

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

<OFFICIAL TOWN LETTERHEAD>

CERTIFICATE OF ADOPTION
BOARD OF SELECTMEN
TOWN OF ASHLAND, MASSACHUSSETS

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

WHEREAS, the Town of Asland established a Hazard Mitigation Planning Team, coordinated by the Fire Chief, to prepare the *Town of Ashland Hazard Mitigation Plan 2025 Update*; and

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

WHEREAS, duly-noticed public meetings were held by the Select Board on February 5, 2025, and by the Select Board of Selectmen on August 6, 2025

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

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

ADOPTED AND SIGNED this Date. _____

Name(s)
Title(s)
Signature(s)