Town of Medway

Hazard Mitigation Plan

2023 Update

MAPC

Medway
MASSACHUSETTS

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I. ACKNOWLEGEMENT AND CREDITS

This plan was prepared for the Town of Medway 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).

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Medway Local Hazard Mitigation Planning Team

Allison Potter	Assistant Town Manager
Jeff Lynch	Fire Chief
Barbara Saint Andre	Community and Economic Development Director
Pete Pelletier	Director of Department of Public Works
Derek Kwok	Health Agent
Bridget Graziano	Conservation Agent
Courtney Riley	Director of Council on Aging
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Public Meeting Participants and Community Stakeholders

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

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IV. 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 Medway Hazard Mitigation Plan, which was approved by FEMA on September 12, 2018. The original plan was approved by FEMA on May 7, 2010. The Hazard Mitigation Plan update was led by the Medway Local Hazard Mitigation Planning Team (or "Local Team"), composed of staff from Town Departments including Emergency Management, Community and Economic Development, DPW, Health and Social Services, Town Administration, Sustainability, Council on Aging, Conservation. The Local Team met on the following dates:

- March 1, 2023
- April 24, 2023
- July 20, 2023
- September 14, 2023

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:

- August 14, 2023
- December 4, 2023

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 see Appendix C for more information about the public comments received, and VI: Planning Process & Public Participation for more information about the outreach and engagement efforts that informed this plan update.

RISK ASSESSMENT

The Medway 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 B).

The Medway Local Hazard Mitigation Planning Team identified 55 Critical Facilities. These are also shown on the map series and listed in Table 41, identifying which facilities are located within the mapped hazard zones.

A Hazus analysis, which can be found in full in Appendix C, provided estimates of damages from Hurricanes of 1% and 0.2% Annual Chance at $25 million and $75 million, respectively. Earthquakes of magnitudes 5 and 7 analysis provided $666 million to $3 billion respectively in property damages. Flood damage for the 1% and the 0.2% Annual Chance Flood at $21 million and $32 million respectively.

HAZARD MITIGATION GOALS

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

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

2. Identify and seek funding for measures to mitigate, remediate, and work to eliminate as many or eliminate each known significant flood hazard area as possible.

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

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

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

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

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

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

9. Consider the impacts of climate change. Incorporate climate resilience and clean energy in hazard mitigation planning.

10. Partnering and working with traditionally underrepresented communities and climate vulnerable populations to reduce disproportionately experienced hazards.

HAZARD MITIGATION STRATEGY

The Medway 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 & UPDATE PROCESS

The process for developing Medway's Hazard Mitigation Plan 2023 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 B. 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 2023 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 X: Mitigation Measures from the 2018 Plan*, the Town has made progress implementing mitigation measures identified in the 2018 HMP. Below is a summary of the progress:

- **7** projects were completed, including Choate Dam restoration and repairs, water management upgrades, drainage improvements, and updated communication and education systems.
- **20** of the mitigation measures from the 2018 plan were carried over to this 2023 plan update, most of which are partially complete. These partially completed measures are being improved or progressed by the town.
- **2** mitigation measures from the 2018 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 XI: Hazard Mitigation Strategy*, the town has identified new mitigation measures to pursue.

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

Of the **29** total recommendations included in Section XI of this 2023 plan update, **14** are high priority, **11** are medium priority, and **4** are low priority.

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.

Figure 1. A photo of the Charles River flowing through the Town of Medway

V. 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.

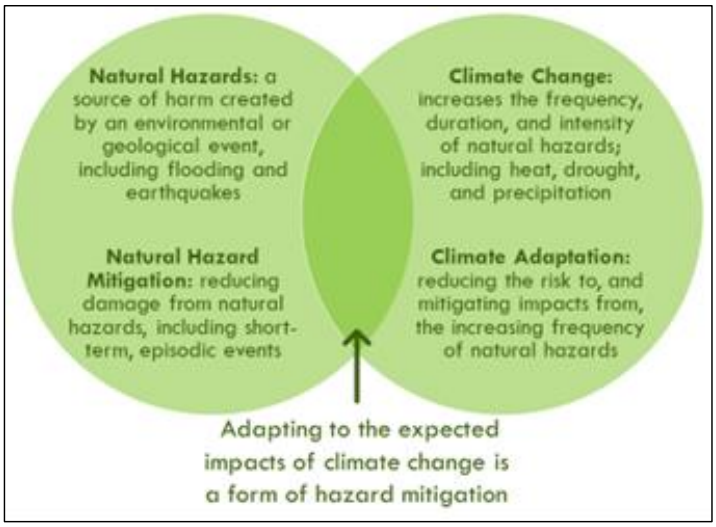
Federal hazard mitigation planning and grant programs are administered by the Federal Emergency Management Agency (FEMA) in collaboration with the states. These programs are administered in Massachusetts by the Massachusetts Emergency Management Agency (MEMA) in partnership with the Department of Conservation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

The Town of Medway contracted with the Metropolitan Area Planning Council (MAPC), to assist the Town in updating its local Hazard Mitigation Plan, which was adopted in 2018. 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 2. Natural Hazards and Climate Change



PREVIOUS FEDERAL/STATE DISASTERS

Since 1991, there have been 36 natural hazard events that triggered disaster declarations that included Norfolk County. These are listed in Table 2 below. The majority of these events involved flooding and winter weather, while others were due to hurricanes or the COVID-19 pandemic.

Table 2. Presidentially 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.

FEMA FUNDED MITIGATION PROJECTS

Town of Medway has received funding from FEMA for one mitigation project under the Hazard Mitigation Grant Program (HMGP). This project totaled $680,719. The project is summarized in Table 3 below.

Table 3. 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 Medway is a bucolic residential town in the southwestern suburbs of Boston with easy access to Route 495. It is predominantly a single-family home community with a handful of apartments and condos. Henry Gamsey was the first settler in town. Beginning in 1700 with the first modest home built by Henry for his wife Sarah, settlers filtered in and by 1713 residents had petitioned for a new town charter, and the town, to be known as Medway, was incorporated. By 1800, there had been many saw and grist mills and several textile mills established and Medway continued to grow over the years as an industrial center because of its location along its rivers (Chicken Brook and Charles River). Campbell Brothers ran a paper mill from 1854 to 1890 and the Sanford Mill was in operation in 1885. The establishment of a railroad through Medway did much to attract new mills to town. The charter for the railroad was granted by the state legislature in 1847 and served all the towns in the area, extending as far as Blackstone. The first post office was established in 1803, at which time there were just eight homes, a grist mill, two sawmills, and a store. Because of its proximity to Route 495 and other highways, Medway residents are confident the town will continue to grow residentially, industrially and commercially.

The town of Medway is located in Eastern Massachusetts and is bordered by Holliston on the north; Medway on the east; Norfolk, Franklin, and Bellingham on the south; and Milford on the west. Medway is 25 miles southwest of Boston, 24 miles southeast of Worcester, and 30 miles north of Providence, Rhode Island. Route 495, the outer belt around Boston, passes along the western border of Medway. State Routes 109 and 126 also serve the town. Commuter rail service to Back Bay Station and South Station is available in neighboring Franklin. Medway is not affiliated with a regional transit authority. Brush Hill Transportation provides rush hour service to Boston from West Medway-F. The Norfolk Airport, a General Aviation (GA) facility, is easily accessible. It has a 2,700' asphalt runway with a copter approach. The following regional facilities are located in Medway; the Medway Country Manor and Mary-land Rest Home.

Medway belongs to the Southwest subregion of the Metropolitan Area Planning Council. Medway is also a member of the 495/MetroWest Partnership. Through its participation in these organizations, Medway has participated in regional efforts addressing water resources, traffic problems, open space issues, economic development, town center development, and other issues. The town is governed by a Select Board with a Town Administrator. The town operates under the open town meeting format. Medway's population grew from 12,448 in 2000 to 13,393 in 2022 and the number of housing units grew by about 500 units over the same period.
The town maintains a website at http://www.townofMedway.org/.

Challenges facing Medway when planning for natural disasters include:

- 23.2% of the housing units are old (built before modern building codes)
- 13.2% of the units are renter-occupied
- 5.4% of households do not own a car, posing challenges for evacuations
- 6.7% of households speak a language other than English at home and may need multi-lingual emergency communications

Table 4. Medway Characteristics

Population = 13,393
6.3% are under age 5 25.2% are under age 18
12.7% are over age 65
6.7% households speak a language other than English at home (over age 5)
5.4% of households have no vehicle
3.5% have a disability (over age 5)
Number of Housing Units = 4,738
13.2% are renter-occupied housing units
21% of housing units were built before 1939

Source: American Community Survey 2017-2021

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

- Medway has a diverse landscape that ranges from densely developed to rural and agricultural creating a bucolic and ideal community environment. [1]
- A defining characteristic of Medway is its rivers and streams, the Charles River, Hopping Brook, and Chicken Brook. These rivers and streams are all prone to extensive flood in severe storms or localized flooding during more frequent, minor storms.
- 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 six different departments were present.
- Medway is home to historic structures surrounded by fields and forests[2] and sites that are irreplaceable and bring economic value to the town.

[1] PGC Associates. 2010. Town of Medway Open Space and Recreation Plan.

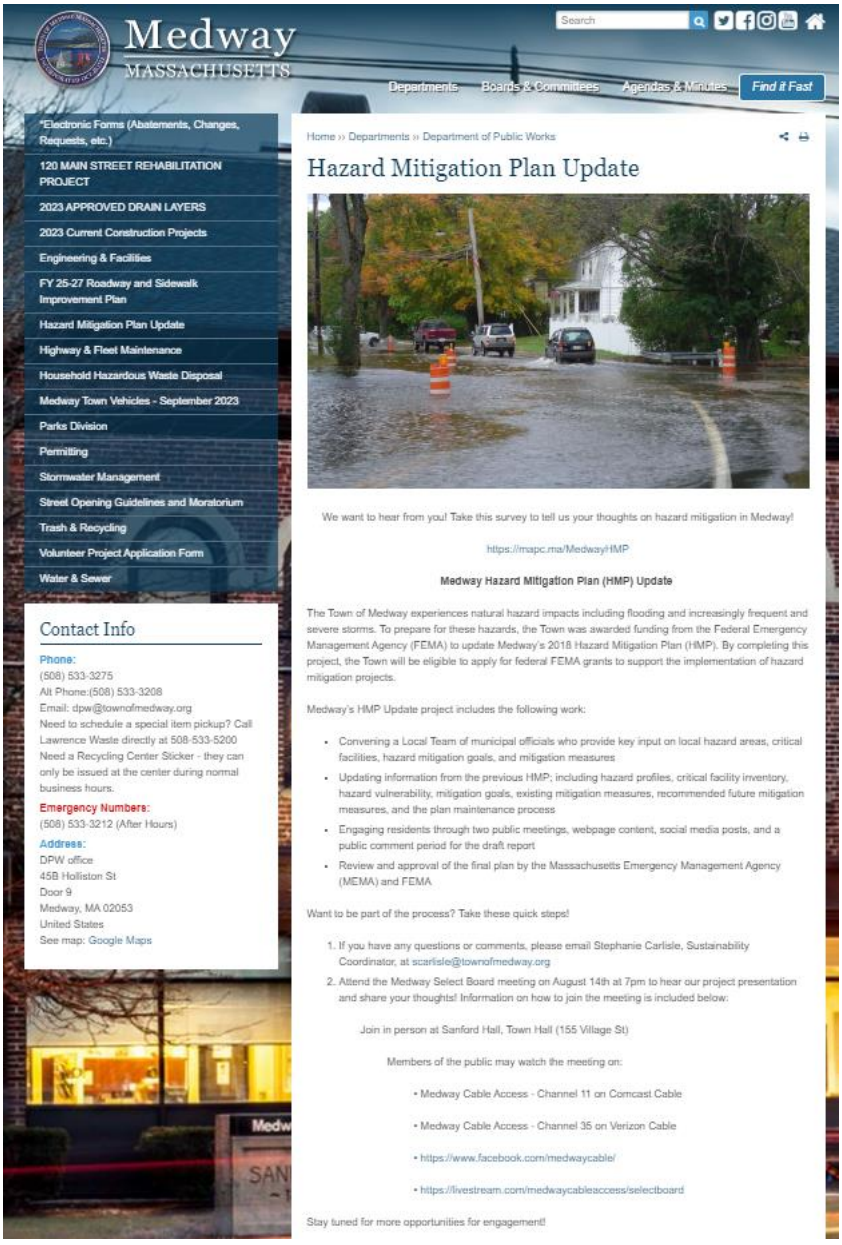
- Medway contains several major roadways that provide emergency routes for evacuation and for routes to medical facilities.
- Medway has some bridge crossings and dams that could be at risk in the event of flooding.
- Medway would be a good candidate for flood-related grants due to the potential impact 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.

VI. PLANNING PROCESS & PUBLIC PARTICIPATION

MAPC employs a six-step planning process based on FEMA's hazard mitigation planning guidance focusing on local needs and priorities but maintaining a regional perspective matched to the scale and nature of natural hazard events. 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.townofmedway.org/department-public-works/pages/hazard-mitigation-plan-update and shown in Figure 3.
- Launching a public comment period at the second public meeting, and posting the draft plan to the project website to facilitate public comment

Figure 3: A Screenshot of the Medway HMP Update Project Website



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 4. Six-Step Planning Process

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

    - Town of Medway, General Bylaws
    - Town of Medway, Zoning Bylaw

- Town of Medway Master Plan, 2022
- Town of Medway Open Space and Recreation Plan, 2020
- Affordable Housing Trust Action Plan, 2011
- Commonwealth of Massachusetts, Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP), 2023
- Commonwealth of Massachusetts, Massachusetts Climate Change Assessment, 2022
- New England Seismic Network, Boston College Weston Observatory, http://aki.bc.edu/index.htm
- NOAA National Centers for Environmental Information, 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
- American Community Survey, 2022
- DCR, Community Information System, Community Overview, 2022
- FEMA, Local Mitigation Planning Policy Guide, 2022
- FEMA, Disaster Declarations for States and Counties, 2023
- FEMA, Flood Insurance Rate Maps for Norfolk County, Massachusetts, 2012
- FEMA, HAZUS, 2022
- MA Dept of Public Health, Massachusetts Environmental Public Health Tracking: Community Profile for Medway, 2022
- Massachusetts Office of Dam Safety, Inventory of Massachusetts Dams 2018
- MA Department of Early Education and Care, Licensed Child Care Programs, 2022
- US Census Bureau, 2021
- MA Climate Change Adaptation Report, 2011
- Blue Hill Observatory
- Mass. Emergency Management Agency, State Hazard Mitigation Plan, 2013
- NOAA, National Centers for Environmental Information, Storm Events Database
- Tornado History Project
- USDA Forest Service, Wildfire Risk to Communities
- U.S. Global Change Research Program, Fourth National Climate Assessment, 2018
- USACE Ice Jam Database

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 XI.

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

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

2018 PLAN IMPLEMENTATION & MAINTENANCE

The 2018 Town of Medway 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 Medway. 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 5. Membership of the Medway Hazard Mitigation Planning Team

Name	Role
Allison Potter	Assistant Town Manager
Jeff Lynch	Fire Chief
Barbara Saint Andre	Director of Community and Economic Development
Pete Pelletier	Director of the Department of Public Works
Derek Kwok	Health Agent with Health & Social Services
Bridget Grazian	Conservation Agent
Courtney Riley	Director of Council on Aging
Stephanie Carlisle	Sustainability Coordinator

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

- **March 1, 2023**: to discuss the project overview and update local hazard areas and critical facilities inventory
- **April 24, 2023**: to update hazard mitigation goals and existing mitigation measures

- **July 20, 2023**: to update the recommended mitigation strategies from the 2018 HMP and prepare for Public Meeting #1
- **September 14, 2023**: to develop new recommended mitigation measures and prepare for Public Meeting #2

On additional meeting was conducted to inform the plan update:

- **January 26, 2023**: Kickoff meeting

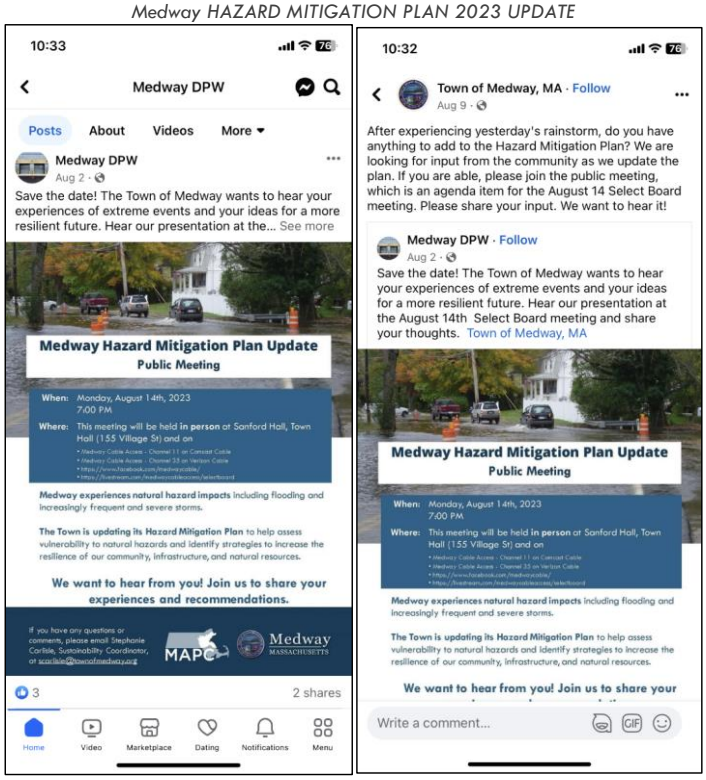
PUBLIC MEETINGS, SURVEY, & PUBLIC COMMENT

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 August 14, 2023 and one once the draft plan was complete and ready for review on December 4, 2023.

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.

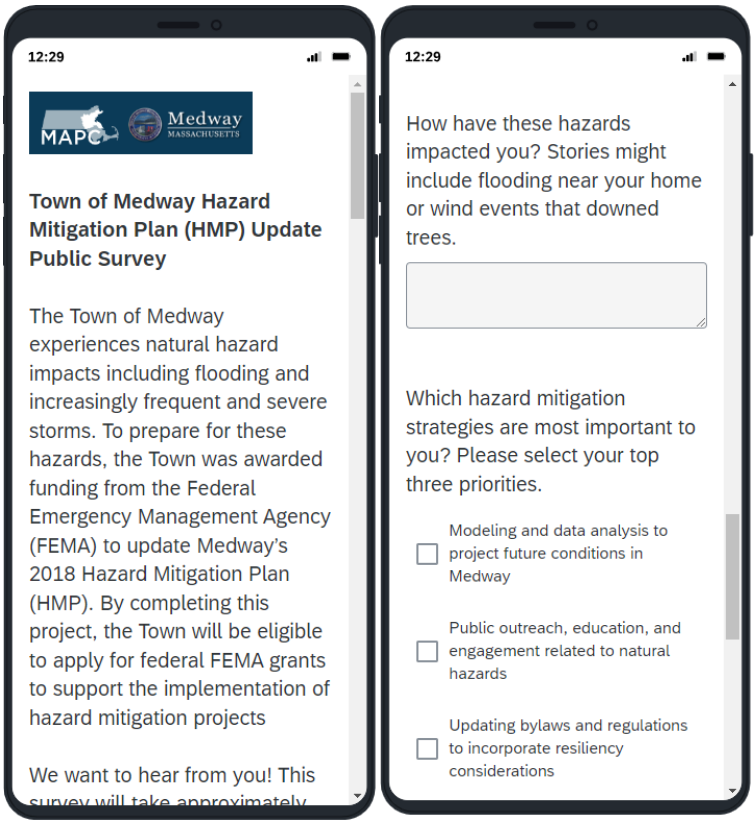
Another strategy for inclusive and accessible engagement is to develop a low-barrier way for residents to add their voice to the planning process. With the launch of an online survey, seen below in Figure 6, residents are able to engage in their own homes and on their own time. The project team launched a survey on August 2, 2023 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 5. Various screenshots of Posts that Advertised the Public Survey and First Public Meeting



The survey closed on November 3, 2023 and received 38 responses.

Figure 6. Screenshot of the Town of Medway Hazard Mitigation Plan Update Public Survey



Figures 7 and 8 show that survey respondents were most concerned about flooding and drought, including stream flooding, basement flooding, low water levels in the Charles River and damage to home gardens.

Figure 7: Hazards of Concern for Medway residents from Resident Survey

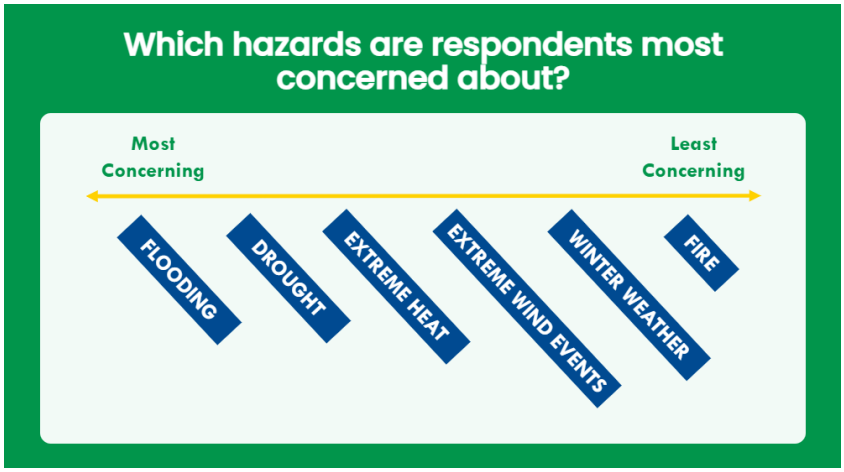
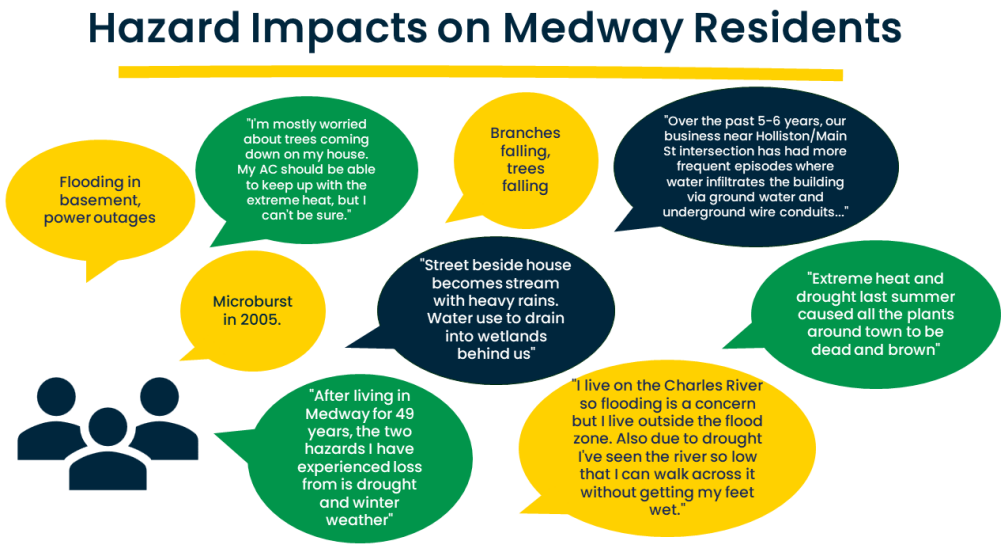


Figure 8: Stories about Hazard Impacts from Resident Survey



The survey also asked residents to rank the hazard mitigation strategies that were most important to them. The top ranked strategies are listed in Table 6 and include implementing green infrastructure and nature-based solutions, making roads, bridges and other infrastructure more resilient and updating regulations to include resiliency considerations. The survey results were shared with the Local Team members during the process of updating and adding to mitigation strategies for the HMP.

Table 6. Hazard Mitigation Strategy Priorities as ranked by Resident Survey Responses

Rank	Strategy	Total Votes
1	Designing resilient green infrastructure, nature-based solutions, and public open space	17
2	Designing resilient infrastructure such as roads, bridges, and buildings	15
3	Modeling and data analysis to project future conditions in Medway	9
4	Updating bylaws and regulations to incorporate resiliency considerations	8
5	Strategies that promote community resilience and support the Town's most vulnerable residents	8
6	Public outreach, education, and engagement related to natural hazards	7

The survey was publicized on Medway's website, Facebook page and through email, in addition to being announced at the first public meeting. The survey responses are not a representative sample of Medway residents, but do provide insight into resident concerns. Not all respondents filled out the demographic survey questions, but of those who did, 91% were white and 9% were Hispanic, about 40% were between 35-49 years old and another 50% were over 50 years old. Most respondents were homeowners in Medway and had an annual household income of over $100,000.

LOCAL STAKEHOLDER INVOLVEMENT

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

- Medway Public Library
- School Committee
- Council on Aging
- Open Space Committee
- Agricultural Commission
- Conservation Commission
- Planning and Economic Development Board
- Housing Authority/Affordable Housing
- Medway Energy and Sustainability Committee
- Economic Development Committee
- Medway Business Council
- Housing Authority
- Charles River Watershed Association
- Medway Community Farm
- Medway Historical Society/Commission

- Parks Commission
- Capital Improvement Planning Committee
- IDEA Committee
- Informational services Committees
- Board of Health
- Building Inspector
- Schools Facilities Manager

See Appendix D for public meeting notices. The draft Medway Hazard Mitigation Plan 2023 Update was posted the following URL after the second public meeting: https://www.townofmedway.org/sites/medwayma/files/uploads/draft.medway_hazardmitigationplan.6.22.18.pdf

Members of the public could access the draft document and submit comments or questions to the Town and MAPC. [include if there were any public comments at December 4 meeting].

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

Major milestones in the planning process to prepare this plan update included the following:

Table 7. Planning Timeline for the 2023 HMP Update

March 1, 2023	First Meeting of the Medway Local Hazard Mitigation Planning Team
April 24, 2023	Second Meeting of the Medway Local Hazard Mitigation Planning Team
July 20, 2023	Third Meeting of the Medway Local Hazard Mitigation Planning Team
September 14, 2023	Fourth Meeting of the Medway Local Hazard Mitigation Planning Team
August 14, 2023	First Public Meeting with Medway Select Board
December 4, 2023	Second Public Meeting with Medway 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 Medway
TBD	FEMA Formal Approval of the plan for 5 years

VII. RISK ASSESSMENT

The risk assessment analyzes the potential natural hazards that could occur within the Town as well as the relationship between those hazards and current land uses, potential future development, and critical infrastructure. This section also includes a vulnerability assessment that estimates the potential damages that could result from certain large-scale natural hazard events. In order to update Medway'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.

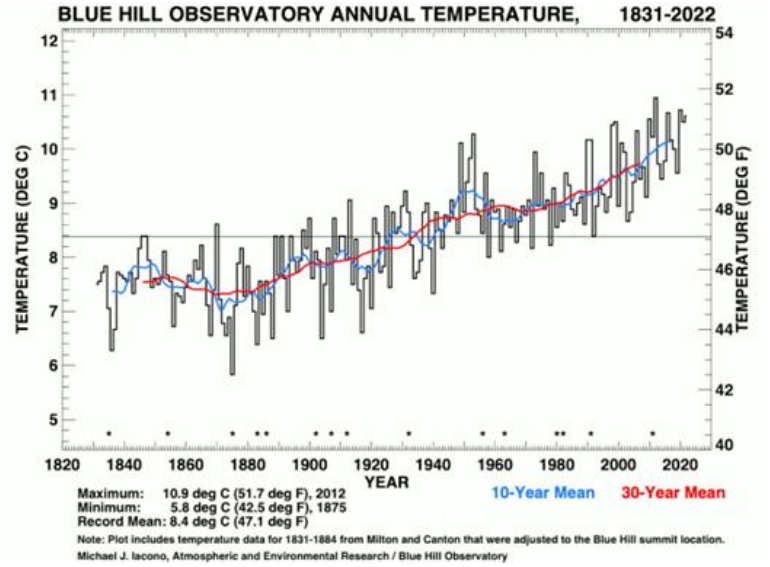
CLIMATE CHANGE OBSERVATIONS AND PROJECTIONS

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

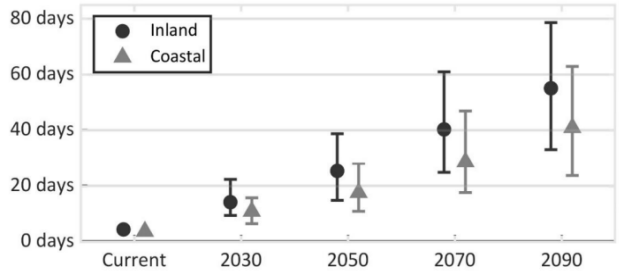
Our climate has always been regulated by gases, including carbon dioxide, methane, and nitrous oxide, which blanket the earth. These gases trap heat that would otherwise be reflected out to space; without them our planet would be too cold to support life. We refer to these gases as "greenhouse gases" (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 the almost 200 years since record keeping began in 1831. See Figure 9 below for more information.

Figure 9. 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) .

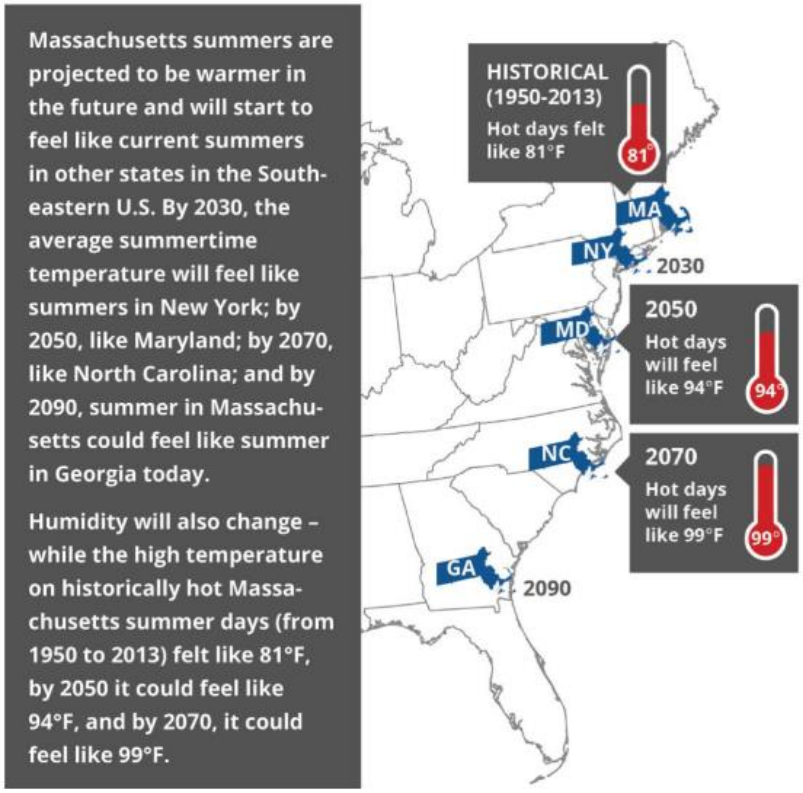
Figure 10. Change in the Annual Number of Days Over 90°F Compared to Today



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 11. Change in Average Summertime Temperatures for Massachusetts

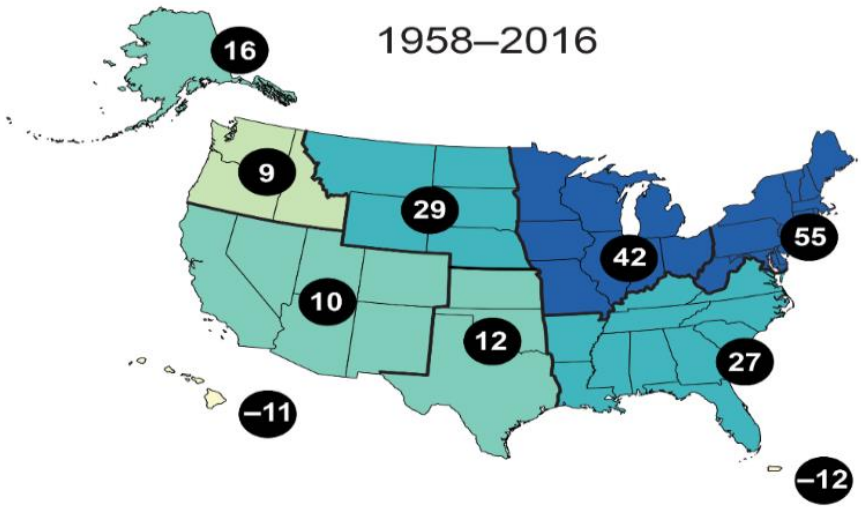


Source: 2022 MA Climate Change Assessment

PRECIPITATION PATTERNS

Annual precipitation in Massachusetts has increased by approximately 10% in the fifty-year period from 1960 to 2010 (MA EEA, 2011). Moreover, there has been a significant increase in the frequency and intensity of large rain events. For the Northeast US, according to the Fourth National Climate Assessment 2018, in the past sixty years there has been a 55% increase in the amount of annual precipitation that falls in the top 1% of storm events, as shown in Figure 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 12. Observed Change in Total Annual Precipitation in the Heaviest 1% Events

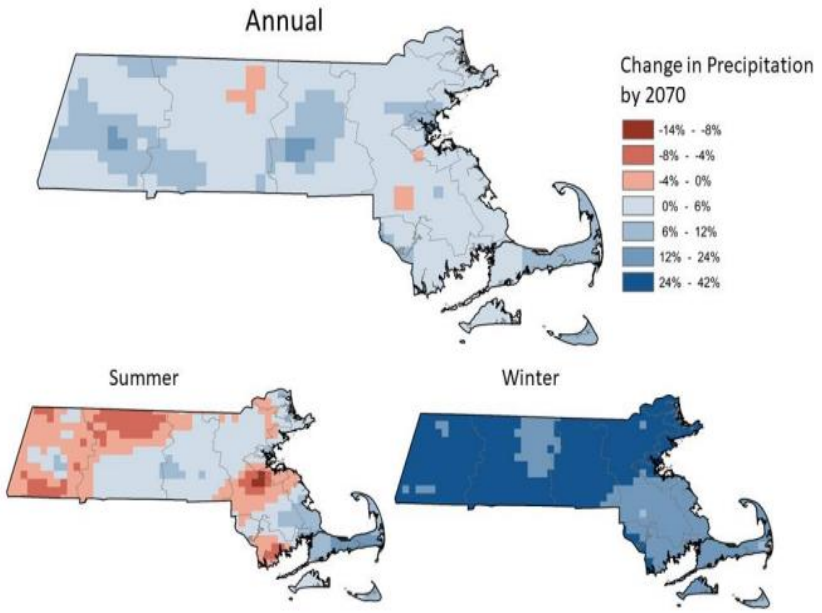


Source: Fourth National Climate Assessment, 2018
Numbers circled in black indicate % change.

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 13. 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 Eastern Inland region where Medway 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 14 below for more information.

Figure 14. Consecutive dry day events (number of multiple-dry-day events per year)

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

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

Source: Stochastic Weather Generator

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

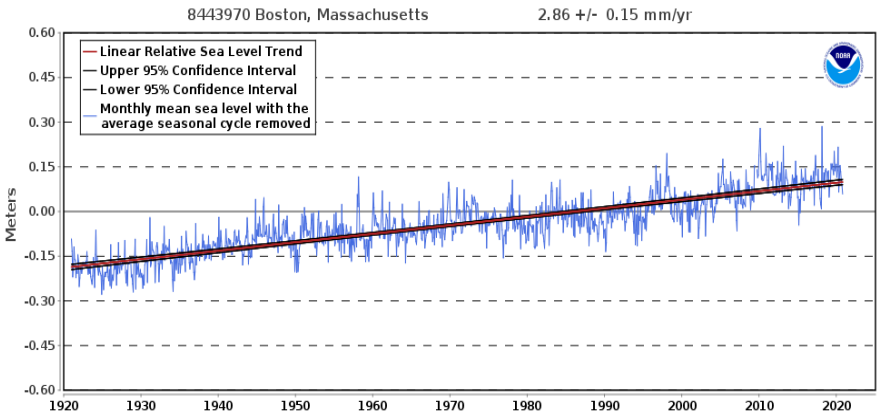
Region	Baseline	2030	2050	2070	2090
Berkshires & Hilltowns	159	161	165	167	170
Greater Connecticut River Valley	171	172	175	178	181
Central	180	182	185	188	192
Eastern Inland	186	181	185	188	193
Boston Harbor	192	185	192	194	198
North & South Shores	184	182	187	190	195
Cape, Islands, & South Coast	186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

Source: 2022 MA Climate Change Assessment. The Town of Medway is located in the Eastern Region, outlined by the blue box above.

SEA LEVEL RISE

While Medway 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 melt water. A third, quite minor, contributor to sea level rise in New England is not related to climate change. New England is still experiencing a small amount of land subsidence (drop in elevation) in response to the last glacial period. NOAA's records from the Boston Tide Station show nearly one foot of sea level rise over the past century. See Figure 15 below for more information.

Figure 15. Observed Increase in Sea Level Rise



Source: NOAA

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

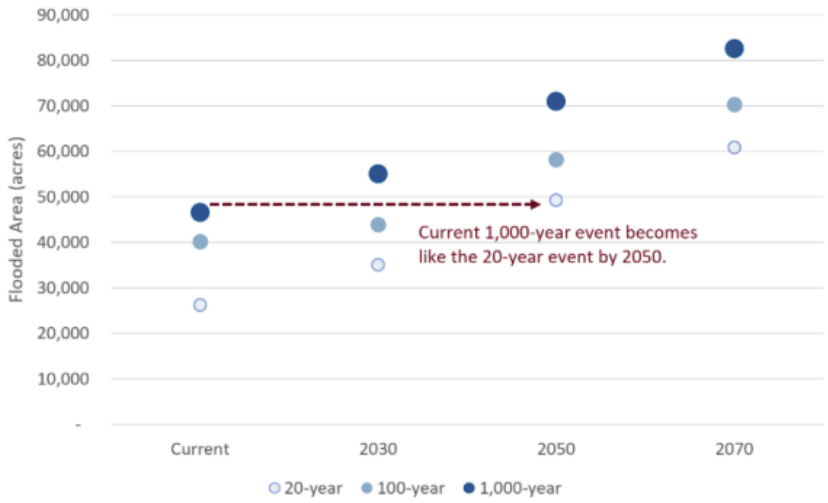
- **Northern Massachusetts:** 21 inches by 2050, and 43 inches by 2070
- **Southern Massachusetts:** 23 inches by 2050 and 45 inches by 2070

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

- 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 16 below for more information.

Figure 16. Total Flooded Area of the Commonwealth for Selected Events



Source: 2022 MA Climate Change Assessment

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 8 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
Changes In Precipitation	Inland Flooding	Extreme Weather	Flash flooding, urban flooding, drainage system impacts (natural and human-made), lack of groundwater recharge, impacts to drinking water supply, public health impacts from mold and worsened indoor air quality, vector-borne diseases from stagnant water, increased potential for loss of life, episodic drought, changes in snow-rain ratios, changes in extent and duration of snow cover, degradation of stream channels and wetland
	Drought	Rising Temperatures, Extreme Weather	
	Landslide	Rising Temperatures, Extreme Weather	
Sea Level Rise	Coastal Flooding	Extreme Weather	Increase in tidal and coastal floods, storm surge, coastal erosion, marsh migration, inundation of coastal and marine ecosystems, loss of wetlands
	Coastal Erosion	Extreme Precipitation	
	Tsunami	Rising Temperatures	

Rising Temperatures	Average/Extreme Temperatures	N/A	Shifting in seasons (longer summer, early spring, including earlier timing of spring peak flow), increase in length of growing season, increase of invasive species, increase in vector-borne illnesses (West Nile, Zika, EEE), ecosystem stress, energy brownouts from higher energy demands, more intense heat waves, public health impacts from high heat exposure and poor outdoor air quality, increased potential for loss of life, drying of streams and wetlands, eutrophication of lakes and ponds
	Wildfires	Changes in Precipitation	
	Invasive Species	Changes in Precipitation, Extreme Weather	
Extreme Weather	Hurricanes/Tropical Storms	Rising Temperatures, Changes in Precipitation	Increase in frequency and intensity of extreme weather events, resulting in greater damage to natural resources, property, and infrastructure, as well as increased potential for loss of life
	Severe Winter Storm / Nor'easter		
	Tornadoes		
	Other Severe Weather (Strong Wind & Thunderstorms)		

OVERVIEW OF HAZARDS AND IMPACTS

In order to update Medway's risk assessment, MAPC gathered the most recently available hazard and land use data and met with Town staff to identify changes in local hazard areas and development trends. MAPC also used FEMA's damage estimation software, HAZUS (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 Medway 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 Medway 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 9 below summarizes the frequency and severity of hazard risks for Massachusetts and Medway, 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 Norfolk County (where Medway 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 B.

Table 9. Hazard Risks Summary

Natural Hazard	Frequency		Severity	
	MA	Medway	MA	Medway
Inland Flooding	High	High	Serious to Catastrophic	Serious to extensive
Dam Failures	Low	Low	Extensive	Extensive
Drought	Medium	Low	Minor to Serious	Minor

Landslide	High	Low	Minor to Extensive	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	High	Medium	Minor to Serious	Minor
Wildfires/Brushfire	High	Medium	Minor to Extensive	Minor
Invasive Species	High	N/A	Minor	N/A
Hurricanes/Tropical Storms	Medium	Medium	Serious to Catastrophic	Extensive to Catastrophic
Severe Winter Storm / Nor'easter	High	High	Minor to Extensive	Minor
Tornadoes	High	Medium	Serious to Extensive	Minor
Other Severe Weather (Strong Wind & Thunderstorms)	High	High	Minor to Extensive	Minor
Earthquakes	Very Low	Very Low	Serious to Catastrophic	Serious

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 Norfolk 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 Medway's inland location, coastal hazards and tsunamis are unlikely to affect the Town and are therefore listed as Not Applicable ("N/A") in Table 9 above. Ice jams are also not a hazard in Medway. The US Army Corps Ice Jam Database shows no record of ice jams in Norfolk, and the Town did not identify ice jams as an issue of concern.

CHANGES IN PRECIPITATION

FLOODING

Flooding was the most prevalent serious natural hazard identified by local officials in Medway.

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.

Medway is located in the Charles River Watershed and flooding is one of the most prevalent natural hazards in Medway. Flooding can be associated with overflowing rivers and streams, as well as stormwater

associated with impervious surfaces which overwhelms 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 Norfolk County through the National Centers for Environmental Information (see Table 10). Norfolk County, which includes the Town of Medway, experienced 33 flood events from June 2013 to June 2023. No deaths or injuries were reported and the total reported property damage in the county was $68,200. See the table below for more information.

Table 10. Norfolk County Flood Events, 2012-2023

DATE	DEATHS	INJURIES	PROPERTY DAMAGE ($)
6/7/2013	0	0	0
7/29/2013	0	0	0
8/9/2013	0	0	15000
10/22/2014	0	0	0
10/23/2014	0	0	0
8/15/2015	0	0	0
8/18/2015	0	0	0
6/7/2016	0	0	5000
8/14/2016	0	0	5000
4/1/2017	0	0	5000
7/12/2017	0	0	0
7/18/2017	0	0	1000

8/2/2017	0	0	0
9/30/2017	0	0	10000
10/25/2017	0	0	0
10/29/2017	0	0	0
1/12/2018	0	0	0
1/13/2018	0	0	0
4/16/2018	0	0	0
7/6/2018	0	0	10000
10/29/2018	0	0	0
11/3/2018	0	0	500
4/15/2019	0	0	0
7/6/2019	0	0	0
7/17/2019	0	0	0
6/21/2020	0	0	0
6/28/2020	0	0	14700
8/23/2020	0	0	2000
12/25/2020	0	0	0
7/7/2021	0	0	0
7/18/2021	0	0	0
9/5/2022	0	0	0
10/14/2022	0	0	0
TOTAL	**0**	**0**	**68200**

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

Additionally, Norfolk 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.

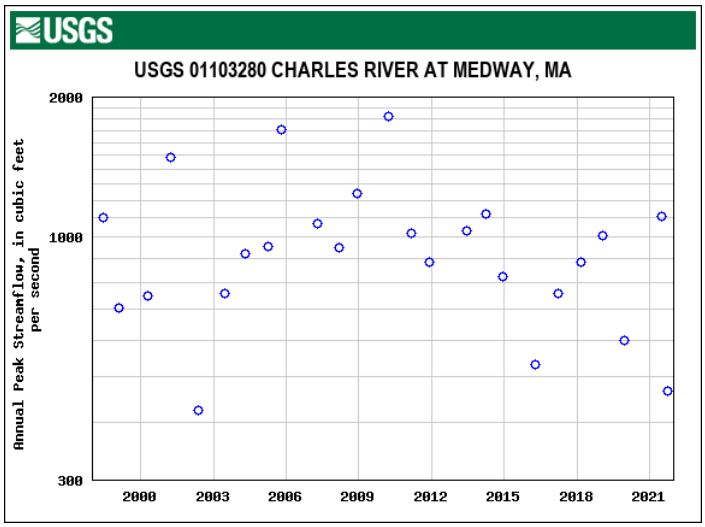
Table 11. Norfolk County Flash Flood Events, 2012-2022

DATE	DEATHS	INJURIES	PROPERTY DAMAGE ($)
9/1/2013	0	0	85000
9/18/2018	0	0	0
6/28/2020	0	0	30000000
TOTAL	**0**	**0**	**30085000**

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). $24.96 million of property damage was reported in Norfolk County and these storms were a federally declared disaster. 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 17. USGS Flood Gage Discharge Data for Charles River at Medway



Source: United States Geological Survey 2023

One indication of the extent of flooding is the gage discharge at the nearest USGS streamflow gauging station on Charles Street in Medway at the Walker Street Bridge. Figure 17 illustrates that 2010 had the highest streamflow at nearly 2,000 cubic feet per second for the years of 1998-2022. Potential damages from flooding in the Town of Medway were estimated using FEMA's Hazus program. The results, shown in Table 44, indicate potential damages from a 1% Annual Chance Flood (100-year) at $20,990,000 and from a 0.2% Annual Chance Flood (500-year) at $31,530,000.

Overview of Town-Wide Flooding

As with most of eastern Massachusetts the natural hazard threat that is most prevalent in the town of Medway, and therefore the focus of most of the town's hazard mitigation efforts is flooding. Medway is bordered by the town of Milford on the west, Holliston to the north, Millis to the east and Franklin and Bellingham to the south.

Medway has very little topographical relief and much of the flat, undeveloped land is wetland. The town is neighbored by several bodies of water, including but not limited to the Charles River (and surrounding wetlands), Chicken Brook, Hopping Brook, Choate Pond, Green Stream, and Winthrop St. Pond. However, the Charles River, the largest river in Massachusetts and Chicken Brook tend to have the largest impact on flooding, as does beaver activity, inadequate flood storage and under-sized drainage systems.

The Charles River is 80 miles in length - the longest river with its entire length in Massachusetts. The Charles River Watershed has a drainage area of approximately 308 square miles and encompasses all or part of 35 municipalities. The watershed drains northward and is divided into three distinct regions, which include the rural, forested upper watershed, the suburban lakes or middle watershed, and the urban lower watershed, which drains through the Boston metropolitan area. In general, the upper and middle watersheds are characterized by forest cover and residential land use, while the lower watershed is characterized by commercial land use and dense urban development. Since 1995, the water quality of the Charles River has improved dramatically, and is now clean enough for boating and swimming for the greater part of each year, according to the Environmental Protection Agency (EPA). The greatest source of pollution to the river is non-point source pollution, especially from stormwater runoff and Combined Sewer Overflows (CSOs). The quantity of water available for residential and commercial use is also threatened by overuse, which has lowered groundwater levels and decreased stream flow.

In the 1960's studies by the Corps of Engineers revealed that the communities above Newton had a history of only minimal flooding. Extensive marshes, swamps and wet meadows scattered around the upper watershed were holding floodwaters and then only slowly letting them go. In 1974 Congress authorized the "Charles River Natural Valley Storage Area," allowing for the acquisition and permanent protection of 17 scattered wetlands in the middle and upper watershed. Final acquisition totaled 8,103 acres, with 3,221 acres of land acquired in fee and 4,882 acres in flood easement, at total project cost of $8,300,000. Medway therefore, has the responsibility of preserving floodplains and other water storage areas in efforts reduce downstream flooding. It must be noted that within the Charles River Watershed, flooding within the lower watershed (Boston metro area) is controlled with dams and channelization, while the upper and middle watersheds, wetlands and other natural storage areas are relied upon to protect the area from flooding.

Flooding within Medway usually occurs within or near floodplains. The 1% Annual Chance Flood zones are found throughout Medway, mainly along the town's water ways. Within populated areas, flooding occurs in a handful of select areas; however the town has been able to avoid significant damages by passing aggressive zoning, wetland, watershed, and groundwater regulations.

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 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 and create flood hazards on streets and around residential and business areas in town. Combined with the watershed from its neighboring towns to the north and west, the Medway 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 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 B and their definitions are listed below.

It should also be noted that the Town will be impacted by the Charles Watershed RiskMAP mapping update for Norfolk, Plymouth and Suffolk Counties. This process is expected to result in a Letter of Final Determination (LFD) from FEMA by late December 2023 or January 2024. The Town will need to adopt an updated floodplain bylaw to reflect the new mapping before the updated Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) will become effective in June or July 2024. The State model floodplain ordinance is available to assist municipalities with making these updates. Municipalities can also go above and beyond the State's minimum requirements by including additional language. This additional language can be related to strengthening floodplain overlay district requirements, stormwater regulations, site plan review, and more.

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 12 and displayed on Map 8, with the corresponding map location numbers in parentheses.

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.

1) Hopping Brook (Flooding)
   Hopping Brook used to exceed its banks each spring but has been less of an issue recently. Infrequently, the brook floods Route 109, a major roadway and escape route for Medway residents. In larger rain storms, 4-5 five houses south of the brook sustain flood damages. Expanding the culvert under Route 109 could potentially mitigate this problem. Beaver deceivers were installed to prevent culverts from getting blocked. Re-designing the culvert area on Milford Street would also help to mitigate future problems.

2) Chicken Brook at Village Street (Flooding)
   During large rain storms and spring events, Chicken Brook exceeds its banks floods Village Street. The town also indicated that flooding occurs south of Chicken Brook in Bellingham causing the upstream portion in Medway to flood. There is also occasional flooding off of Cottage Street. The town has identified a hydro analytics study of the area and/or building a retaining wall on the northern banks of Chicken Brook as potential mitigation measures. A dam where Medway Police Department and Village Street are is also included in this hazard area.

3) Main Street by the Mill (Flooding)
   During large storms water levels at Chicken Brook raise and threaten to flood the old Medway Mill. The brook flows directly under the mill, a site for potential development. In attempts to restore the natural flow of Chicken Brook, the town is looking to conduct stream restoration. Massachusetts Department of Transportation updated the drainage in the area with the Route 109 project including bio-retention, additional catch basins, new piping to manage water going through. The bridge has not been improved.

4) Charles River at Village Street (Flooding)
   The Charles River rises every spring and causes or threatens flooding throughout its duration. The Charles River flows through the southern portion of Medway, which has low topography. During large storms, Village Street, a major roadway through Medway, sustains flooding resulting in partial to complete road closure. The town is currently working to mitigate flooding at this location.

5) Bresnahan's Landing (Flooding)
   This boat launch and fishing area completely floods, including the house next door. Annually, there is water all the way to the neighboring house and the parking lot.

6) Choate Dam (Dam/Flooding)
   The Choate Dam is currently out for bid for renovation. If the dam were to break it would cause extensive to catastrophic southward/downstream damages. The dam is high significance, impounding four or five acres of water. The Town owns the dam and is liable. They completed a hydrology study on the dam.

7) Sanford Dam (Dam/Flooding)
   The town is unsure of the condition of the Sanford Dam. It is a minor concern for the town since it does not own it. However, if the dam were to break it would cause extensive to catastrophic eastward/downstream damages.

8) Walker Street Bridge (Flooding)
There is scouring present on the Walker Street Bridge walls from damage related to flooding. This a priority to repair and have requested $150,000 for repairs from the Town.

9) High School Entrance Road (Flooding)
At the entrance road to the high school, beaver activity has raised the level of the water causing flooding. This could become more problematic in the future.

10) West Street near Bellingham Line(Flooding)
This is located in the floodplain and impervious surfaces were added in the area. This specific hazard area is southeast of West Street.

11) Main Street near Cottage Street (Flooding)
There is a stream that runs near Main Street which experienced recent flooding. It is possible that a recent project in the area was related to this new hazard area.

12) Shaw Street at the Bridge over Charles River (Flooding)
The river gets high here and surrounding houses can be impacts. Town staff have seen the water go up to the height of the houses multiple times.

13) West Street at Williamsburg Way (Flooding)
West street has minimal to no drainage infrastructure. An unnamed stream flows through this area and can be a problem with more frequent and intense storms. An area south of this location between Castle Road and Holbrook Street is also changing due to surrounding wetlands and the aforementioned unnamed stream.

14) Corner of West Street and Granite Street (Flooding)
There are flooding issues from wetland overflow at the west and south west ends of this corner.

15) Howe Street (Flooding)
There is a wetland north of Howe Street. At the field south of Howe street, the elevation is high and the level of ground water is also high. Road work in this area is postponed until a better drainage solution can be made.

16) Fisher Street (Flooding)
Fisher Street south of Route 109 floods because it is a low point in the road and abuts a wetland. There is poor grading and submerged outfall here.

17) Dogwood Lane (Flooding)
This area flood during high rains and when ground is saturated. It spills into the streets and can cause icy conditions in the winter. This area has high ground water, abuts a wetland, and an unnamed tributary.

18) Claybrook Dam off Summer Street (Flooding)
More information is needed

Commented [KK1]: More information is needed

Table 12. Locally Identified Areas of Flooding

Locally Identified Hazards Site ID	Name	Type	Comments
2	Hopping Brook	Flooding	Flooding
3	Chicken Brook at Village Street	Flooding	Flooding
4	Main Street by the Mill	Flooding	Flooding
5	Charles River	Flooding	Flooding
6	Choate Dam	Flooding	Dam
7	Sanford Dam	Flooding	Dam
17	Walker Street Bridge	Flooding	Flooding scours bridge walls
18	High School Entrance Road	Flooding	Beaver causing flooding
26	Bresnahan's Landing	Flooding	Frequent Flooding
27	West Street near Bellingham Line	Flooding	Located in floodplain
28	Main Street near Cottage Street	Flooding	Stream floods
29	Shaw Street at the Bridge over Charles River	Flooding	River gets high
30	West Street at Williamsburg Way	Flooding	Insufficient drainage infrastructure
31	Corner of West Street and Granite Street	Flooding	Wetland overflow
32	Howe Street	Flooding	Insufficient drainage
33	Fisher Street	Flooding	Low elevation
34	Dogwood Lane	Flooding	High water table and abuts wetland
44	Claybrook Dam off Summer Street	Flooding	Dam

Repetitive Loss Structures

FEMA defines a repetitive loss (RL) structure as "any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any 10-year rolling period since 1978". For more information on repetitive losses see here. Medway is not in the top 10 Massachusetts communities with repetitive or severe repetitive loss structures. There are no repetitive loss structures in the Town of Medway.

Flooding and Climate Change

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

Precipitation frequency estimates, which are used to derive stormwater design standards, were published in 1961 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, Medway could consider using NOAA Atlas 14 rainfall rates with an additional allowance to account for projected rainfall during the life of projects permitted today when sizing stormwater infrastructure. DEP takes a similar approach to describe current (not future) rainfall rates, called "NOAA14+". Mystic River Watershed Association (MyRWA) communities propose "NOAA14++", which they say reflects 2070 projections. The NOAA 14+ number is calculated by multiplying the NOAA 14 precipitation frequency estimate upper confidence interval by 0.9 (i.e., current but extreme precipitation events reflect 90% of upper confidence intervals). The NOAA 14++ number is the upper confidence interval. A comparison of these numbers for the Town of Norfolk 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++
5.27 inches	5.90 inches	6.56 inches

The 2022 MA Climate Change Assessment also highlights the following climate impacts for the Eastern Inland Region (where Medway 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)

Dams Hazards

Dam failure can occur as a result of structural failure, independent of a hazard event, or as the result of the impacts of a hazard event such as flooding associated with storms or an earthquake. In the event of a dam failure, the energy of the water stored behind even a small dam can cause loss of life and property damage if there are people or buildings downstream. The number of fatalities from a dam failure depends on the amount of warning provided to the population and the number of people in the area in the path of the dam's floodwaters.

Dam failure is a highly infrequent occurrence. 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 Medway.

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.

According to data provided by the Massachusetts Department of Conservation and Recreation (DCR) and the town, there are three dams located in Medway. Two of these are privately owned, one is owned by the Town of Medway. None of the dams in Medway were listed in the state auditor's report which identifies dams in unsafe or poor condition. Medway's dams are summarized in Table 14 according to ownership and hazard potential.

Table 14. DCR Inventory of Dams in Medway

Dam Name	River	Owner	Owner Type	Hazard Potential Classification
Stanford Mill Pond Dam	Charles River	Private	Private	Significant Hazard
Medway(Choate) Park Dam	Chicken Brook	Town of Medway	Municipality	Significant Hazard
West Medway Dam	Charles River	Private	Private	Low Hazard

Commented [KK2]: Confirm ownership

DCR defines dam hazard potential 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.

There have been no dam failures documented for the Town of Medway. Based on the record of previous occurrences, dam failure in Medway is a very low frequency event as defined by the 2013 Massachusetts State Hazard Mitigation 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.

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. Medway is located in the Southeast 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 15. 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.

Table 16 shows the range of values for each of the indices associated with the drought levels. Because drought tends to be a regional natural hazard, this plan references state data as the best available data for previous drought occurrences.

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 17. 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 Southeast region in Massachusetts, where Medway is located. That information is summarized in Table 18 and Figure 18 below.

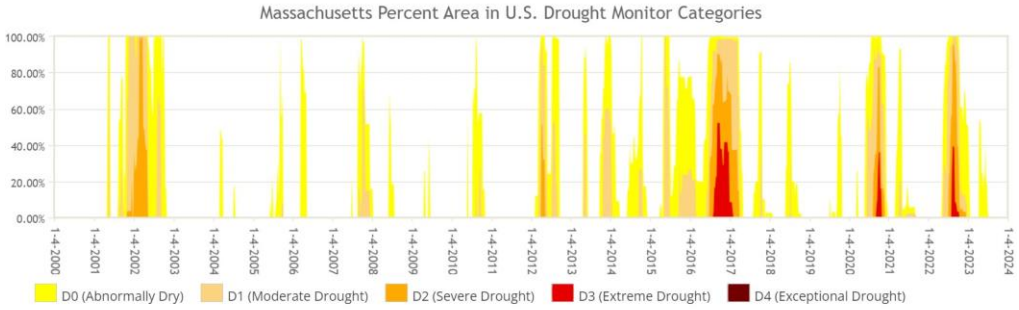
Table 18. Drought Status History for the Southeast Region, 2001-2023

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

Source: Drought Management Task Force, 2023

As shown in Figure 18, 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 18. Percent Area in Massachusetts with Drought Conditions 2000-2023

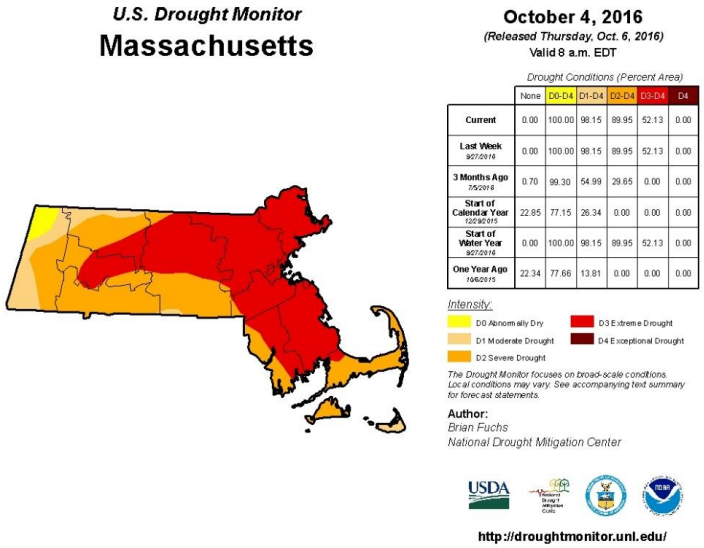


According to the US Drought Monitor, in 2016, nearly half of Massachusetts was in extreme drought conditions with 15 inches of deficit rainfall (Figure 18), the worst drought since 1965. The drought geographically affected 6.5 million people, forced communities to buy drinking water from the Massachusetts Water Resources Authority,[2] 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 19). 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.

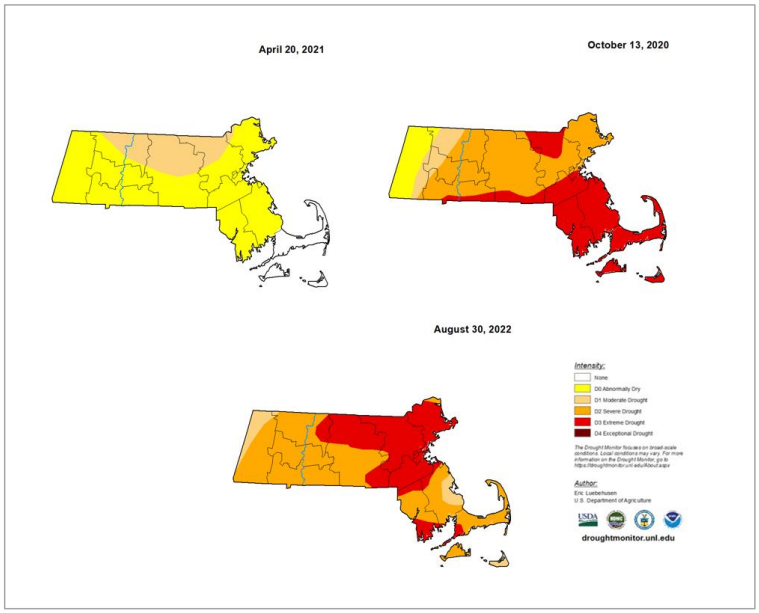
[2] https://www.boston.com/weather/local-news/2016/09/15/more-than-half-of-massachusetts-now-experiencing-an-extreme-drought

Figure 19 Extreme Drought Conditions in Massachusetts 2016



Source: US Drought Monitor, 2028-2023

Figure 20: Recent Massachusetts Drought Events (2018-2023)



Source: US Drought Monitor, 2028-2023

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. Medway shares major aquifers with Franklin, Norfolk, Millis and Wrentham. The Town's Water & Sewer Division serves Medway residents using its two water storage tanks that have a combined capacity of 2.8 million gallons. Many residents rely on individual private wells. 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, which are a dominant feature of Medway.

Under a severe long term drought the Town of Medway 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 Medway, 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.

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 Medway. December, 2016 marked the ninth consecutive month of below average rainfall (see Figure 12). In response to the drought, the Medway Water Department instituted restrictions on outdoor watering.

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. A 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 Eastern Inland region where Medway 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 Medway. Information on wind related hazards can be found on Map 5 in Appendix B.

Tree damage during high winds has the potential to be a significant hazard in Medway. Trees can knock out power lines and block major roadways, which hinders emergency response. While Medway does experience downed trees that have caused isolated power outages and roadway blockages, the town also takes pride in its tree-lined streets. Therefore, maintaining trees in a proactive fashion has been a trade-off for the tree amenities. Medway would benefit from an effective tree trimming and removal programs.

HURRICANES AND TROPICAL STORMS

A hurricane is a violent wind and rainstorm with wind speeds of 74 to 200 miles per hour. A hurricane is strongest as it travels over the ocean and is particularly destructive to coastal property as the storm hits land. Given its location not too distant from the coast, the Town of Medway's 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 20.

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 21 gives an overview of the wind speeds, surges, and range of damage caused by different hurricane categories:

Table 21. Saffir/Simpson Scale3

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

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 Medway 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.

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 Medway from a 100-year and 500-year hurricane have been estimated using HAZUS. Hurricanes and tropical storms are considered a town-wide hazard for Medway.

Hurricanes and Climate Change

Climate models suggest that hurricanes and tropical storms will become more intense as warmer ocean waters provide more fuel for the storms. In addition, rainfall amounts associated with hurricanes are predicted to increase because warmer air can hold more water vapor

TORNADOS

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.

[3] National Oceanic and Atmospheric Administration

- 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[4] 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). [5]

[4] Tornado Facts

[5] Morrison, Sara. 2014. Tornados of Massachusetts Past.https://www.boston.com/weather/untagged/2014/07/28/tornadoes-of-massachusetts-past

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."*

There has been one documented tornado within the limits of the Town of Medway, and since 1953 there have been 12 tornadoes in surrounding Norfolk County recorded by the Tornado History Project, as summarized in the table below. One of these was an F2 tornado, and three were FI.

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 Norfolk County, 1950-2023

Date	Mag.	Fatalities	Injuries	Width (yd)	Length (mi)	Damage
6/9/1953	3	0	15	667	13.1	$2.5M
11/21/1956	2	0	0	17	0.1	$2.5K
8/9/1972	1	1	6	30	4.9	$25K
9/6/1973	1	0	0	10	1.1	$25K
7/10/1989	0	0	0	23	0.1	$2.5K
5/18/1990	0	0	0	10	0.2	$2.5K
5/18/1990	0	0	0	10	0.2	$2.5K
6/30/2001	0	0	0	80	0.1	$0.0K
8/21/2004	1	0	0	40	6	$1.5M
5/9/2013	EF0	0	0	50	0.38	$20K
6/23/2015	EF0	0	0	200	0.48	$20K
10/7/2020	EF0	0	0	50	.053	$6K
7/29/2023	EF0	0	0	25	0.16	$5K
Total		**1**	**21**			**4.111M**

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

Although tornadoes are a potential town-wide hazard in Medway, tornado impacts are relatively localized compared to severe storms and hurricanes. Damages from any tornado in Medway 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. While there are no existing estimates for potential damages from tornadoes in Medway, the best available date for Norfolk County, Table 23, shows that 13 recorded tornadoes since 1953 resulted in a range of damages from $2,500 to $2.5 million. One fatality and twenty-one injuries were reported.

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.

SEVERE THUNDERSTORMS

While less severe than the other types of storms discussed, thunderstorms can lead to localized damage and represent a hazard risk for communities. A thunderstorm typically features lightning, strong winds, 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 best available data on previous occurrences of thunderstorms in Medway is for Norfolk County through the NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. From December 2012 to October 2023, records show 47 thunderstorm events in Norfolk County. These storms resulted in a total of $651,200 in property damage. There were no injuries or deaths reported. See the table below for more information..

Table 24. Norfolk County Thunderstorm Events, 2012-2023

Date	Magnitude	Deaths	Injuries	Property Damage ($)
6/17/2013	50	0	0	11,000
7/29/2013	50	0	0	20,500
7/3/2014	50	0	0	20,000
7/28/2014	60	0	0	50,000
6/23/2015	50	0	0	5,000

8/4/2015	50	0	0	30,000
8/15/2015	50	0	0	35,000
2/25/2016	50	0	0	94,000
6/7/2016	50	0	0	10,000
7/18/2016	50	0	0	90,000
7/22/2016	50	0	0	65,000
7/23/2016	40	0	0	35,000
8/14/2016	50	0	0	5,000
6/9/2017	45	0	0	1,000
6/13/2017	48	0	0	1,000
6/23/2017	50	0	0	1,000
8/2/2017	50	0	0	2,500
9/6/2017	50	0	0	1,000
7/17/2018	45	0	0	3,000
9/6/2018	50	0	0	6,000
11/3/2018	50	0	0	500
7/17/2019	50	0	0	5,000
7/31/2019	50	0	0	9,000
6/6/2020	50	0	0	10,000
6/28/2020	50	0	0	8,900
7/2/2020	50	0	0	31,000
7/5/2020	50	0	0	500
7/23/20	50	0	0	11,200
8/22/2020	50	0	0	2,000
8/23/2020	50	0	0	5,600
10/7/2020	55	0	0	35,800
11/15/20	50	0	0	500
6/8/2021	50	0	0	12,200
6/29/2021	50	0	0	1,100
6/30/21	55	0	0	1,500
7/7/2021	550	0	0	4,700
7/8/2021	50	0	0	1,000
7/16/2021	50	0	0	500
7/21/2021	50	0	0	600
7/27/2021	52	0	0	7,300
11/13/2021	50	0	0	1000
5/22/2022	50	0	0	8600
8/5/2022	50	0	0	800
8/26/2022	50	0	0	0
6/02/2023	43	0	0	2,100
7/27/2023	50	0	0	500
7/29/2023	50	0	0	500
TOTAL		**0**	**0**	**651,200**

Source: NOAA, National Climatic Data Center
*Magnitude refers to maximum wind speed

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

Based on the record of previous occurrences, severe thunderstorms in Medway are high frequency events. 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.

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 25. 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 Norfolk County through NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. There were 10 hail events recorded from January 2013 through October 2023, as shown in the table below. There was no property damage, injuries, or deaths reported for any of these hail events.

Table 26. Norfolk County Hail Events, 2013-2023

Date	Hail Size	Deaths	Injuries	Property Damage ($)
5/21/2013	0.75	0	0	0
9/1/2013	0.75	0	0	0
8/7/2014	0.75	0	0	0
5/12/2015	0.75	0	0	0
6/23/2015	1	0	0	0
8/4/2015	1	0	0	0
6/30/2019	0.75	0	0	0
6/28/2020	1.5	0	0	0
7/7/2021	1	0	0	0
6/2/2023	0.75	0	0	0
TOTAL		**0**	**0**	**0**

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

Hail events are a potential town-wide hazard in Norfolk.

WINTER HAZARDS

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).

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, January 2015, and in March 2018 were large nor'easters that caused significant snowfall amounts.

Table 27. Nor'easter Events for Massachusetts, 1978 - 2021

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

Medway is vulnerable to both the wind and precipitation that accompany nor'easters. High winds can cause damage to structures, fallen trees, and downed power lines leading to power outages. Intense rainfall can overwhelm drainage systems causing localized flooding of rivers and streams as well as 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.

The entire Town of Medway 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.

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 28. 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 in Norfolk County related to winter weather since 1978.

Table 29: Norfolk County 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 Norfolk County by NOAA's National Centers for Environmental Information (NCEI) Storm Events Database. From December 2012 through October 2023, Norfolk County experienced 8 days with recorded blizzards and 27 days with heavy snow, as shown in the tables below.

Table 30. Blizzards in Norfolk County, 2012-2023

Date	Deaths	Injuries	Damages ($)
2/8/2013	0	0	353000
1/2/2014	0	0	5000
1/26/2015	0	0	0
2/14/2015	0	0	10000
1/23/2016	0	0	50000
2/8/2016	0	0	10000
3/13/2018	0	0	60000
1/28/2022	0	0	2500
TOTAL	**0**	**0**	**490500**

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

Table 31. Heavy Snow in Norfolk County, 2012-2023

Date	Deaths	Injuries	Damages ($)
2/8/2013	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
1/21/2014	0	0	0
2/5/2014	0	0	0
2/15/2014	0	0	5000
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
3/5/2015	0	0	0
1/23/2016	0	0	0
2/5/2016	2	0	210000
2/8/2016	0	0	0
4/4/2016	0	0	0
3/14/2017	0	0	0
11/15/2018	0	0	0
10/30/2020	0	0	1800

12/16/2020	0	0	0
2/7/2021	0	0	0
1/7/2022	0	0	0
2/13/2022	0	0	0
2/25/2022	0	0	0
TOTAL	**2**	**0**	**216800**

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

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

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.

A number of public safety issues can arise during snowstorms. Impassible streets are a challenge for emergency vehicles and affect residents and employers. Large piles of snow can also block sight lines for drivers, particularly at intersections. Refreezing of melting snow can cause dangerous roadway conditions. In addition, transit operations may be impacted, as they were in the 2015 blizzards which caused the closure of the MBTA system for one day and limited services on the commuter rail for several weeks.

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 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, farther inland and at a higher elevation than Medway. 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.

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 Norfolk and the local team did not identify this hazard as an issue for the Town.

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.[6]

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[7].

Table 32. 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

[6]The Northeast States Emergency Consortium. http://nesec.org/earthquakes-hazards/
[7] Nevada Seismological Library (NSL), 2005

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.[8] 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 33.

Table 33. Historical Earthquakes in Massachusetts or Surrounding Area9

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

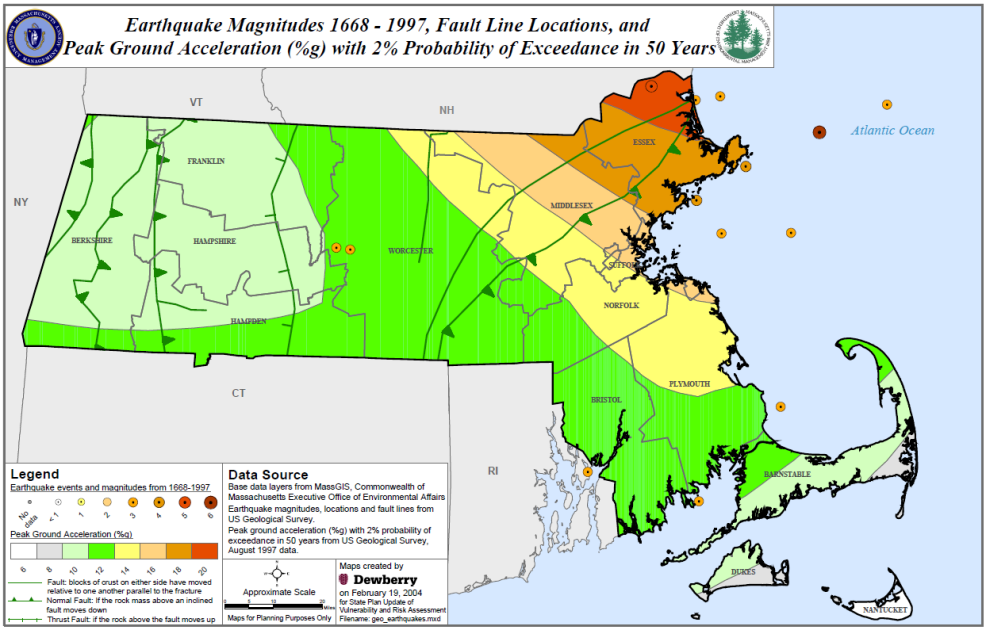
[8] The Northeast States Emergency Consortium. http://nesec.org/earthquakes-hazards/
[9] United States Geological Society. https://earthquake.usgs.gov/earthquakes/

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

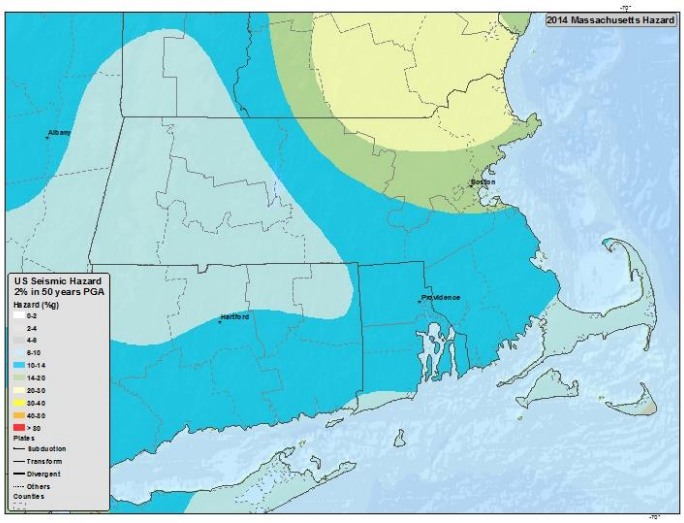
One measure of earthquake risk is ground motion, which is measured as maximum peak horizontal acceleration, expressed as a percentage of gravity (%g). The range of peak ground acceleration in Massachusetts is from 10 % to 20 %, with a 2% probability of exceedance in 50 years, as shown in Figure 21. Medway is in the middle part of the range for Massachusetts, at 12-14g, 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 Medway.

Figure 21. State of Massachusetts Earthquake Probability Map[10]



[10] Massachusetts Emergency Management Agency

Figure 22. 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 Medway. 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 Medway have been estimated using Hazus. Total building damages are estimated at $665,580,000 for a 5.0 magnitude earthquake and $3,430,630,000 for a 7.0 magnitude earthquake. Other potential impacts are detailed in Table 43. Estimated Damages from Earthquakes,

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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 the 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 34. 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 Medway has been classified as having a low risk for landslides (see Map 4, Appendix B). There are not many steep slopes in the town and the Local Team concurs that landslides are not a major threat or occurrence in Medway. 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. Given the assessed value of property in Medway, damages affecting a single residence could exceed $440,000, and damages affecting several homes or business properties could theoretically extend from $1 million to several million. However, there are no data available on landslide damages in Medway, 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 Medway.

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.

Medway 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.[11] Extreme temperatures are a town-wide hazard.

EXTREME COLD

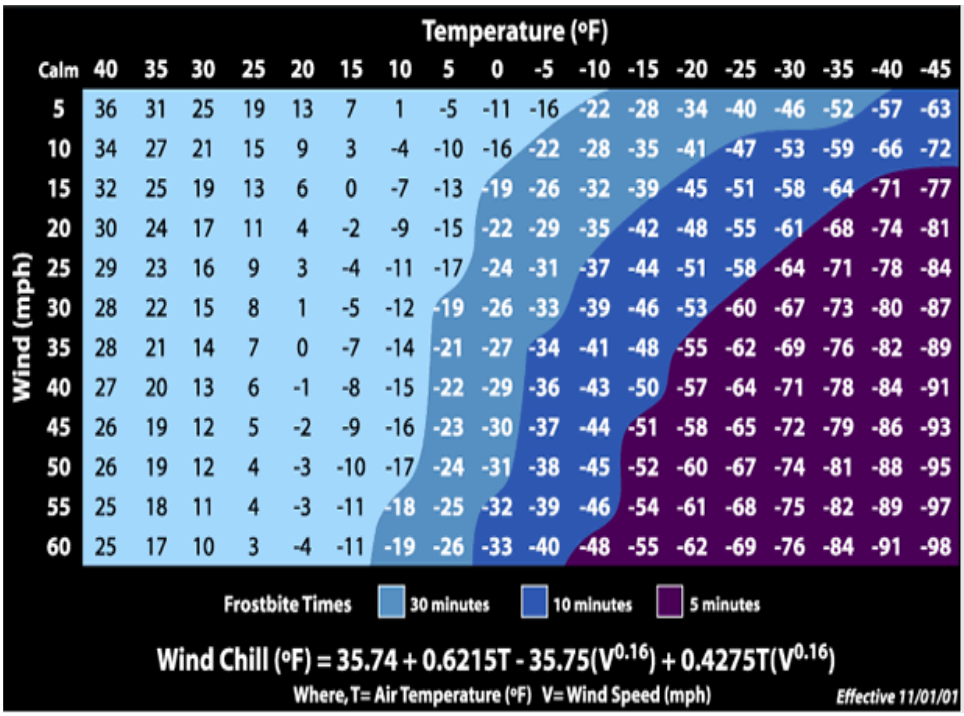
For extreme cold, temperature is typically measured using Wind Chill Temperature Index, which is provided by the National Weather Service (NWS). The latest version of the index was implemented in 2001 and it meant to show how cold conditions feel on unexposed skin. The index is provided in Figure 23 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.[12]

[11] National Weather Service NOAA Online Weather Data, https://www.weather.gov/wrh/Climate?wfo=box
[12] National Weather Service. https://www.weather.gov/lwx/WarningsDefined#Wind%20Chill%20Advisory

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. In Medway, 12.7% of the population people are over 65 years old, and 5.7% of the population have a disability and are under 65 years.

Figure 23. Wind Chill Temperature Index and Frostbite Risk



Source: National Weather Service.

The Town of Medway does not collect data for previous occurrences of extreme cold. The best available local data are for Norfolk 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 Norfolk.

Table 35. Norfolk County Extreme Cold and Wind Chill Occurrences, 2013 - 2023

Date	Deaths	Injuries	Property Damage
02/03/2007	1	0	0
2/16/2015	0	0	0
2/13/2016	0	0	0
2/14/2016	0	0	0

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

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 2) 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.

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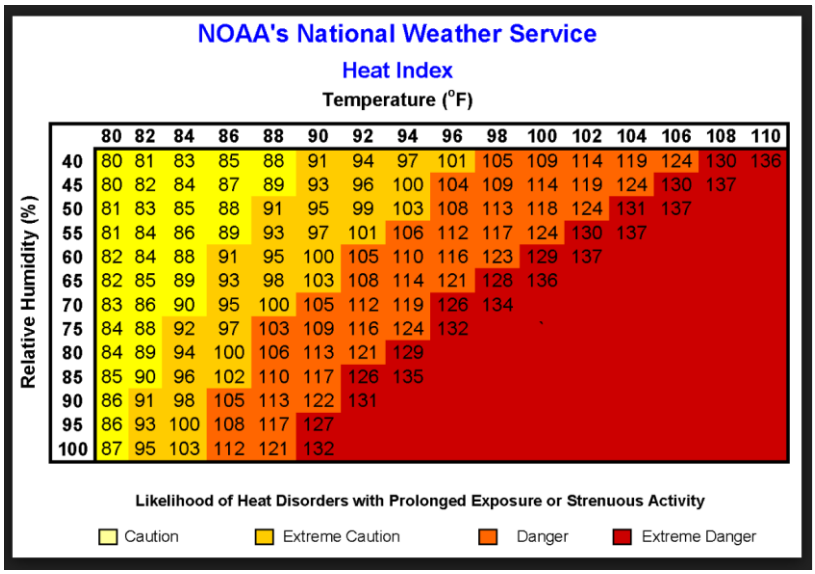
Figure 24. Heat Index Chart



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 at 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.[13,14] In Medway children under 5 years old make up 6.3 percent of the population, and 12.7 percent are over 65 years old.

Power failures can occur during heat waves, where intense heat spikes electricity demand and 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.[15] 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 Medway does not collect data on excessive heat occurrences. The best available local data are for Norfolk 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 Medway.

Table 36. Norfolk County Extreme Heat Occurrences16

Date	Deaths	Injuries	Damage
7/1/2018	**0**	**0**	**0**
7/3/2018	**0**	**0**	**0**
8/28/2018	**0**	**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 Eastern Inland Region (where Medway 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.

[13] Gamble, J. L., Hurley, B. J., Schultz, P. A., Jaglom, W. S., Krishnan, N., & Harris, M. (2013). Climate Change and Older Americans: State of the Science. Environmental Health Perspectives, 121(1), 15–22. http://doi.org/10.1289/ehp.1205223

[14] Center for Disease Control and Prevention. Natural Disasters and Severe Weather. https://www.cdc.gov/disasters/extremeheat/older-adults-heat.html

[15] Wicked Local Belmont "Power Outage in Belmont Affects 2,000 Customers" June 14, 2017. http://belmont.wickedlocal.com/news/20170612/power-outage-in-belmont-affects-2000-customers.

[16] NOAA, National Centers for Environmental Information

- Damage to electric transmission and utility distribution infrastructure associated with heat stress
- Damage to rails and loss of rail/ transit service, including flooding and track buckling during high heat events.
- 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).

WILDFIRE HAZARDS

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:

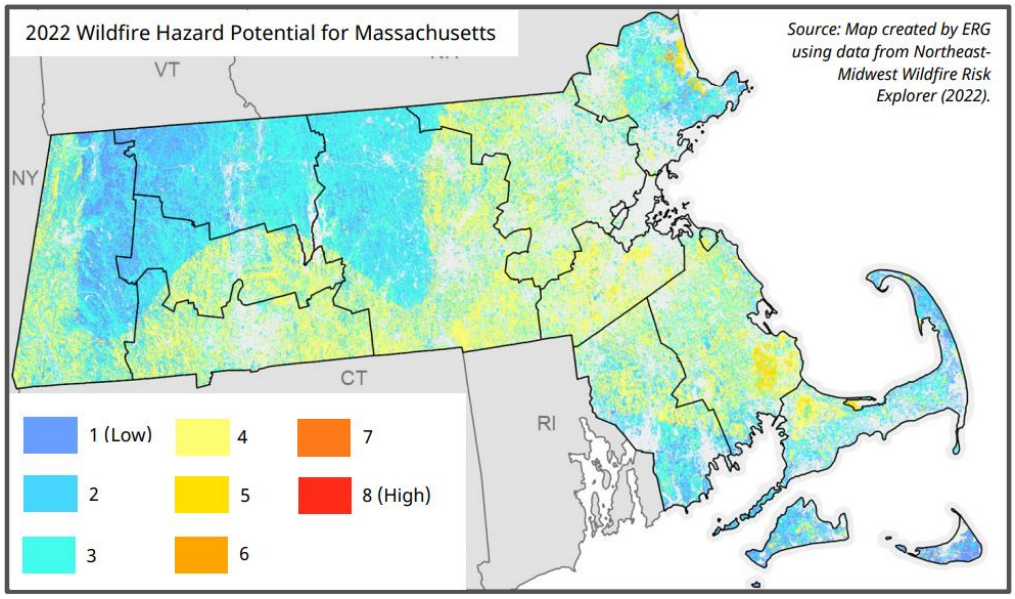
- Class A - one-fourth acre or less;
- Class B - more than one-fourth acre, but less than 10 acres;
- Class C - 10 acres or more, but less than 100 acres;
- Class D - 100 acres or more, but less than 300 acres;
- Class E - 300 acres or more, but less than 1,000 acres;
- Class F - 1,000 acres or more, 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 25 below for more information. Norfolk County is designated as 1 of the 6 counties most at risk, according to ResilientMass.

Figure 25. 2022 Wildfire Hazard Potential for Massachusetts

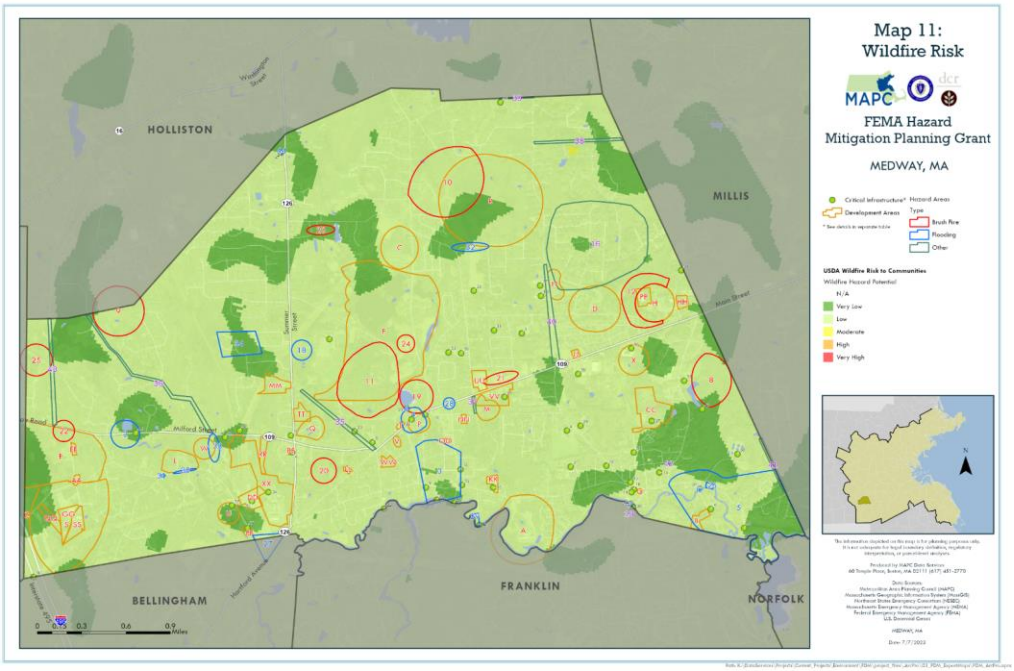


Source: ResilientMass Plan, Map created by ERG using data from Northeast-Midwest Wildfire Risk Explorer (2022)

The Medway Fire Department responds to approximately 35 brush fires annually. There have been no reports of significant property damage or deaths related to brush fires. In most areas of town, fires are inadvertently caused by pedestrian recreational use, careless disposal of cigarettes, and by weather conditions such as lack of rainfall, winds and lightning. Most of these fires are small, but some are larger. There is a potential for severe fires, especially during dry summers and fall months. The Fire Chief, indicated that the town has all-terrain vehicles capable of fighting remote brush fires located off existing roadways.

The Local Team identified the following fire hazard areas.

Figure 26. Wildfire Risk



Data Source: USDA. Mapping by MAPC.

There are no recorded wildfire events for Norfolk County in NOAA's Storm Events Database (NOAA, 2022) and the Local Team considers the entire Town to be equally at risk to fires.

Potential vulnerabilities to wildfires in Medway include damage to structures and other improvements and impacts on natural resources such as wildlife habitat. Should a wildfire occur in Norfolk 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. The Massachusetts Department of Public Health Bureau of Environmental Health states that Norfolk has a lower pediatric asthma prevalence in K-8 students, and a lower rate of asthma emergency department visits, than the state average (MA Dept of Public Health, 2022).

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 Assessment cites anticipated forest health degradation from increasing wildfire frequency for the Eastern Inland Region, where Medway 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 B.

Table 37.5 Medway Locally Identified Hazards

Locally Identified Hazards Site ID	Name	Type	Comments
2	Hopping Brook	Flooding	Flooding
3	Chicken Brook at Village Street	Flooding	Flooding
4	Main Street by the Mill	Flooding	Flooding
5	Charles River	Flooding	Flooding
6	Choate Dam	Flooding	Dam
7	Sanford Dam	Flooding	Dam
8	Oakland Park	Brush Fire	Brush Fire
9	Fisher Street	Brush Fire	Brush Fire
10	High Tension Lines	Brush Fire	Brush Fire
11	High School	Brush Fire	Brush Fire
12	Industrial Park	Brush Fire	Brush Fire
17	Walker Street Bridge	Flooding	Flooding scours bridge walls
18	High School Entrance Road	Flooding	Beaver causing flooding
19	Winthrop/Temple/Main	Brush Fire	Flooding scours bridge walls
20	240-250 Main Street	Brush Fire	Beaver causing flooding
21	108/114 Main Street	Brush Fire	Brush Fires in this vicinity
22	119/124 Milford Street	Brush Fire	Brush Fire report
23	153-157 Lovering	Brush Fire	Brush Fires reported
24	27-38 Winthrop Street	Brush Fire	Brush Fires reported
25	23 Clark Street	Brush Fire	Brush Fires Reported
26	Bresnahan's Landing	Flooding	Frequent Flooding
27	West Street near Bellingham Line	Flooding	Located in floodplain
28	Main Street near Cottage Street	Flooding	Stream floods
29	Shaw Street at the Bridge over Charles River	Flooding	River gets high
30	West Street at Williamsburg Way	Flooding	Insufficient drainage infrastructure
31	Corner of West Street and Granite Street	Flooding	Wetland overflow
32	Howe Street	Flooding	Insufficient drainage
33	Fisher Street	Flooding	Low elevation
34	Dogwood Lane	Flooding	High water table and abuts wetland
44	Claybrook Dam off Summer Street	Flooding	Dam

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 37 shows the acreage and percentage of land in 26 categories. The majority of the Town is comprised of low density residential at 48.39%. The next largest land use category is Open Land at 18.06%. These land use categories have changes over time, with the largest land use category in 2005 being Forest.

The most recent land use statistics available for Massachusetts communities are from aerial imagery completed in 2016. Some change has certainly occurred in Medway 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 B. Table 38 shows the acreage and percentage of land uses in 26 categories. If the three residential categories are aggregated, residential uses make up 53.05% of the area of the city (3,962 acres). Agriculture land makes up 4.5%, or 336 acres and 6.23% of the Town is land used for Industrial purposes.

Table 38. Town of Medway, MA 2016 Land Use

Land Use	Acres	Percentage
Agriculture	336	4.50
Bare Land	2	0.03
Commercial	146	1.95
Cultivated	6	0.08
Deciduous Forest	121	1.62
Developed Open Space	86	1.15
Evergreen Forest	66	0.88
Forest	15	0.21
Grassland	20	0.27
Impervious	70	0.93
Industrial	465	6.23
Mixed use, other	16	0.21
Mixed use, primarily residential	173	2.32
Open land	1348	18.06
Palustrine Aquatic Bed	2	0.03
Palustrine Emergent Wetland	18	0.24
Palustrine Forested Wetland	96	1.28
Palustrine Scrub/Shrub Wetland	9	0.13
Pasture/Hay	0	0.00
Recreation	39	0.52
Residential - multi-family	175	2.34
Residential - single family	3614	48.39
Right-of-way	567	7.59
Scrub/Shrub	3	0.04
Unknown	53	0.71

Water	21	0.29
Total	**7,467**	**100%**

Source: MassGIS Land Use Database

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 Medway's natural, cultural, and historic resources.

Natural, Cultural, and Historic Resource Areas

Medway has experienced significant growth since the 1990s but still maintains a desirable mix of a rural and suburban feel. Medway residents place high value on open space, outdoor recreation areas, and expanded pedestrian and bicycle networks, according to public engagement conducted for Medway's Open Space and Recreation Plan.[17] Medway is home to various cultural, historic, and natural resources, which the town aims to support and strengthen through its Master Plan goals.[18]

Medway contains 25 designated scenic roads and important open space and recreation areas such as Choate Park, Idylbrook Park, Medway Community Farm and trails and forest around Medway High School. According to the Medway Open Space & Recreation Plan 2020, the Town has protected 379 acres of land for open space and recreation, constituting 12.4% of the town's total land area.[19] Of its total area, 462 acres are considered BioMap Core Habitat and 679 acres of BioMap Critical Natural Landscape[20]. BioMap is a program created by MassWildlife and The Nature Conservancy to identify exemplary and important natural ecosystems that support the biodiversity and protect the nature of Massachusetts. Of Medway's total Core Habitat and Critical Natural Landscape, 23.5% of that land is protected. Medway's forests and natural areas support three State-listed Species of Critical Concern, including the Spotted Turtle and Four-toed Salamander.[21] Further, 55.8% of Medway is covered by tree canopy. The tree canopy serves as a great resource for community health, beauty and livability. The Tree canopy mitigates 318,000 pounds of air pollutants per year, intercepts 62.5 million gallons of stormwater a year and sequesters 3,402 tons of carbon a year.[22]

The Charles River is also a prominent natural and recreational amenity which in part has shaped Medway's community character. Combined with Chicken and Hopping Brooks which flow into the Charles, Medway was an ideal location for mills during the Industrial Revolution.[23] Beginning as an agrarian society, it evolved with home-based industries and mills. The Town currently has two historic districts the Rabbit Hill Historic district, and the Medway Village Historic district, recognized by both the Massachusetts Historical Commission and National Parks Service in 1988 and 2008 respectively. Overall, the town has 336 historic structures

[17] Town of Medway Open Space and Recreation Plan 2018-2025, 2020 Revision
[18] Town of Medway Master Plan, 2022
[19] Medway Open Space & Recreation Plan 2020
https://www.townofmedway.org/sites/g/files/vyhlif8006/f/uploads/medway_osrp_final_with_all_appendices_ac_6.22.2020_with_updated_appendix_a_0.pdf
[20] MassGIS BioMap
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[21] MADFW and TNC. 2012. Preserving the Biodiversity of Massachusetts in a Changing World. Medway.
http://maps.massgis.state.ma.us/dfg/biomap/pdf/town_core/Medway.pdf
[22] iTreeLandscape.v.3.1.Modeled April 6, 2018
[23] PGC Associates. 2010. Town of Medway Open Space and Recreation Plan

registered with the Massachusetts Historic Commission. One notable is the Torrent Engine House, one of the few remaining unaltered examples of later 19th century firehouse architecture in the state.
Medway has a Demolition Delay Bylaw and the Historical Commission has been active in the review of Demolition Permit to preserve historic resources. This is in addition to 19 historic preservation projects completed in Medway using Community Preservation Act funds.

Of the 336 historic structures, seven lie within a 1% Annual Chance Flood and 15 lie within the 0.2% Annual Chance Flood. Most of these are historic homes with the exception of the Stanford Mill Dam and Bridge.

DEVELOPMENT TRENDS

According to the town's 2023 Housing Production Plan, in the past 100 years, the town experienced two major periods of significant growth: between 1950 and 1970, when the population more than doubled from about 3,700 to almost 8,000 people; and in the 20 years between 1980 and 2000, when the population grew almost 50 percent from about 8,500 to almost 12,500. The Town of Medway has experienced some additional population growth over the last several decades and is presently home to 13,115 residents. While the population is growing somewhat, it is also aging. The Metropolitan Area Planning Council (MAPC) projects that the older population will continue to increase in size and the younger population will continue to shrink through 2030.

Medway has continued to develop in response to these population growth trends. There are 37 new developments listed in Medway including 15 that have been completed, 12 under construction, and 10 that are permitted or planned/potential. The adaptation in development is summarized in the table below.

Table 39. Summary of Medway Developments 2018-2023

ID	Development Name	Development Type	Status
A	The Willows/ Salmon Retirement	259 Village Street	Under construction
C	Millstone Village	Residential	Completed
R	Timber Crest Estates	136 single-family homes on 170-acre property	Under Construction
D	Applegate Farm	Residential	Completed
H	CommCan., Inc./ Industrial Park	An addition and parking are under construction	Partially Completed
E	Oak Grove	82-acre area	Potential
L	Williamsburg Condominiums/ West Street Meadow	Residential	Completed
P	Medway Mill Redevelopment	Mixed Use	Under construction
T	Medway Greens	176 & 178 Main Street	Completed
U	Glen Brook Way	Residential	Under construction

W	The Haven	Residential	Completed
X	Hathon Apartments	33-39 Main Street. 190-unit apartment building	Under Construction
Z	Milway Auto	50 Alder Street	Completed
AA	17 Trotter Drive	Corner lot	Completed
BB	Country Cottage	35 Summer Street	Completed
CC	DPW Facility	46 Broad Street	Completed
DD	Eversource Energy	34 West Street	Completed
EE	CTS Property Management LLC	9 Trotter Drive. 6,00 square foot commercial building	Completed
FF	Verizon Wireless new Wireless Communications Facility	15 West Street	Completed
GG	L&W Building Supply Expansion	Commercial	Completed
HH	Phytotherapy Marijuana Facility	6 Industrial Park Road	Permitted
II	Town Line Estates	13 Walker Street	Permitted
JJ	Milford Regional Medical Center	68A Main Street	Under construction
KK	William Wallace Village	274 Village Street	Under construction
LL	Harmony Village	Multi family housing development. 218 Main Street	Completed
MM	Boundary Lane Subdivision	67R and 69 Summer Street	Under Construction
NN	Evergreen Village	22 Evergreen Street	Under construction
OO	Cutler Place	6 Cutler Street	Under construction
PP	Neo Organics	4 Marc Road	Under construction
QQ	39 Alder St	Construction equipment rental	Potential
RR	BESS (Battery Energy Storage System)	49 Milford Street. Potential. Lithium battery storage facility	Potential
SS	R.P. Marzilli	Commercial, addition to existing building	Pending compliance.
TT	56 Summer Street	Condominium buildings	Potential
UU	Medway Block	Commercial	Potential
VV	Main Street Commercial Development	Commercial	Potential
WW	21 High Street	Multi-family residential building	Potential
XX	Exelon	9 Summer Street, 65 Milford Street, 0 Milford Street, 61R	Completed

		Milford Street, and 53R Milford Street	

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 B and in Table 40.

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 5 of the 22 planned developments are one the edge of 0.2% flood zones. With respect to average annual snowfall, all of the development sites are within the zone of 36 to 48 inches average annual snowfall. With respect to wind, there is no variation across the town of Medway; the entire town is in the same category, which has a 100-year wind maximum speed of 110 miles per hour. Overall, Medway's new development does not significantly increase the town's vulnerability to natural hazards.

Table 40. Future Development Sites in Hazard Areas

ID	Development Name	Status	FEMA Flood Zone
A	The Willows/ Salmon Retirement	Under construction	2.88% in X: 0.2% Annual Chance of Flooding
R	Timber Crest Estates	Under Construction	6.67% in X: 0.2% Annual Chance of Flooding
H	CommCan., Inc./ Industrial Park	Partially Completed	No
E	Oak Grove	Potential	No
P	Medway Mill Redevelopment	Under construction	22.2% in X: 0.2% Annual Chance of Flooding
U	Glen Brook Way	Under construction	12.48% in X: 0.2% Annual Chance of Flooding
X	Hathon Apartments	Under Construction	2.93% in X: 0.2% Annual Chance of Flooding
HH	Phytotherapy Marijuana Facility	Permitted	No
II	Town Line Estates	Permitted	No
JJ	Milford Regional Medical Center	Under construction	No

KK	William Wallace Village	Under construction	No
MM	Boundary Lane Subdivision	Under construction	No
NN	Evergreen Village	Under construction	No
OO	Cutler Place	Under construction	No
PP	Neo Organics	Under construction	No
QQ	39 Alder St	Potential	No
RR	BESS (Battery Energy Storage System)	Potential	No
SS	R.P. Marzilli	Pending compliance.	No
TT	56 Summer Street	Potential	No
UU	Medway Block	Potential	No
VV	Main Street Commercial Development	Potential	No
WW	21 High Street	Potential	No

Critical Facilities & Infrastructure in Hazard Areas

Critical facilities and infrastructure includes facilities that are important for disaster response and evacuation (such as emergency operations centers, fire stations, water pump stations, 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 55 facilities identified in Medway. These are listed in Table 41 and are shown on the maps in Appendix B.

Explanation of Columns in Table 41

- ***Column 1: ID #:*** The first column in Table 21 is an ID number which appears on the maps that are part of this plan. See Appendix B.
- ***Column 2: Name****:* The second column is the name of the site. 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 B.
- ***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 41. Critical Facilities and Relationship to Hazard Areas

Map ID	Name	Type	Landslides	FEMA Flood Zone	Locally Identified Hazard	Average Annual Snowfall	Located in Hot Spot
1	Medway High School	School	Low	No	No	36"-48"	No
2	Burke Memorial Elementary School	School	Low	No	No	36"-48"	No
2	Medway Middle School	School	Low	No	No	36"-48"	Yes
4	John D McGovern Elementary School	School	Low	No	No	36"-48"	No
5	Meeting House School Inc	Daycare	Low	No	No	36"-48"	No
6	Little Lamb Nursery School	Daycare	Low	No	No	36"-48"	No
7	Medway Police Station	Police station	Low	No	Flooding	36"-48"	No
8	Medway Fire Station I	Fire station	Low	No	No	36"-48"	No
9	Town Hall	Townhall/EOC backup	Low	No	No	36"-48"	No
10	Medway Country Manor	Nursing home	Low	No	No	36"-48"	No
11	Good Shepard Nursery School	Daycare	Low	No	No	36"-48"	No
12	Medway Fire Station II	Fire Station	Low	No	No	36"-48"	No
13	Medway Episcopal Church Nursery School	Daycare	Low	No	Flooding	36"-48"	No
14	Shining Stars Nursery School	Daycare	Low	No	No	36"-48"	No
15	VFW Hall	Proposed Municipal Property	Low	No	No	36"-48"	No
16	Medway House (SMOC)	Family Shelter	Low	No	No	36"-48"	No
17	Sanford Street Bridge	Bridge	Low	AE: 1% Annual Chance of Flooding; with BFE	No	36"-48"	No
18	Walker Street Bridge	Bridge	Low	AE: 1% Annual Chance of Flooding; with BFE	Flooding	36"-48"	No
19	Franklin Street Bridge	Bridge	Low	AE: 1% Annual Chance of Flooding; with BFE	No	36"-48"	No
20	Choate Dam	Dam	Low	AE: 1% Annual Chance of Flooding; with BFE	Flooding & Brushfire	36"-48"	No
21	Milford Street Culvert	Bridge	Low	AE: Regulatory Floodway	Flooding	36"-48"	No
22	Sanford Dam	Dam	Low	AE: 1% Annual Chance of Flooding; with BFE	No	36"-48"	No
23	Village Street Dam	Dam	Low	AE: 1% Annual Chance of Flooding; with BFE	Flooding	36"-48"	No
24	DPW Garage	DPW Garage	Low	No	No	36"-48"	No
25	Main Street Culvert	Bridge	Low	AE: 1% Annual Chance of Flooding; with BFE	Flooding	36"-48"	No
26	Kenney Drive Senior Housing	Elderly Housing	Low	No	No	36"-48"	No

27	Mahan Circle Senior Housing	Elderly Housing	Low	No	No	36"-48"	No
28	Stand Pipe 2	Water stand pipe/ Communication Repeater	Low	No	No	36"-48"	No
29	Lovering Heights Senior Housing	Elderly Housing	Low	No	No	36"-48"	No
30	Stand Pipe 1	Water stand pipe/ Communication Repeater	Low	No	No	36"-48"	No
31	Exelon Energy	Power generating plant	Low	No	No	36"-48"	No
32	Eversource	Power substation	Low	No	No	36"-48"	No
33	Osterman Propane	Gas and Propane distribution	Low	No	No	36"-48"	No
34	Algonquin Gas	Gas transmission	Low	No	No	36"-48"	No
35	Charles River Pollution Control District	Sewer treatment plant	Low	No	No	36"-48"	No
36	Medway Senior Center	Senior center	Low	No	No	36"-48"	No
37	Village Street Well	Well	Low	No	Flooding	36"-48"	No
38	Water Treatment Plant	Well	Low	No	Flooding	36"-48"	No
39	Oakland Street Well	Well	Low	No	No	36"-48"	No
40	Main Street Communication Tower	Communication Tower/ Town Repeater	Low	No	No	36"-48"	No
41	Sprint Communication Tower	Communication Tower	Low	No	No	36"-48"	No
42	Country Cottage Children's Center	Daycare	Low	No	No	36"-48"	No
43	The Willows	Assisted Living/Senior Housing	Low	No	No	36"-48"	No
44	Claybrook Dam	Dam	Low	No	Flooding	36"-48"	No
45	Shaw Street Bridge	Bridge	Low	AE: 1% Annual Chance of Flooding; with BFE	Flooding	36"-48"	No
46	Electric Utility Right of Way	Electricity Lines	Low	No	No	36"-48"	No
47	Medway Oil & Propane	Fuel Storage	Low	No	No	36"-48"	No
48	Verizon	Utility	Low	No	No	36"-48"	No
50	Kadin Lane Bridge	Bridge	Low	AE: 1% Annual Chance of Flooding; with BFE	No	36"-48"	No
51	Maple Lane Senior and Family Housing	Family and disabled housing	Low	No	No	36"-48"	No
52	Industrial Well	Well	Low	No	No	36"-48"	No
53	Cell Tower	Cell Tower	Low	X: 0.2% Annual Chance of Flooding	No	36"-48"	No
54	Affordable Housing	Affordable Housing	Low	No	No	36"-48"	No
55	Glen Brook Way Apartments	Affordable Housing	Low	No	No	36"-48"	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-MH software: hurricane wind, flooding, and earthquakes. There are also three levels at which HAZUS-MH can be run. Level 1 uses national baseline data and is the quickest way to begin the risk assessment process. The analysis that follows was completed using Level 1 data. Level 1 relies upon default data on building types, utilities, transportation, etc. from national databases as well as census data. While the databases include a wealth of information on the Town of Medway, 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."

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 Medway, it does not capture all relevant information. In fact, the HAZUS training manual notes that the default data is "subject to a great deal of uncertainty."

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

ESTIMATED DAMAGES FROM HURRICANES

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

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

Table 42. Estimated Damages from Hurricanes

	100 Year	500 Year
Building Characteristics		
Estimated total number of buildings	4,693	
Estimated total building replacement value (2023 $)	$2,788,911,000	
Building Damages		
# of buildings sustaining no damage	4,370	3,552
# of buildings sustaining minor damage	299	956
# of buildings sustaining moderate	23	167
# of buildings sustaining severe damage	1	13
# of buildings sustaining destruction damage	0	5
Population Needs		
# of households displaced	0	4
# of people seeking public shelter	0	0
Debris		
Building debris generated (tons)	969	3,430
Tree debris generated (tons)	1,557	3,251
# of truckloads to clear building debris (25 ton trucks)	39	137
Value of Damages		
Total property damage (buildings and content)	$25,406,280	$74,480,380
Total losses due to business interruption	$ 699,970	$5,136,040

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. Refer to the Hazus exports in Appendix C for more information.

Table 43. Estimated Damages from Earthquakes

	Magnitude 5.0	Magnitude 7.0
Building Characteristics		
Estimated total number of buildings	4,693	
Estimated total building replacement value	$2,788,911,000	
Building Damages		
# of buildings sustaining no damage	2,307	6
# of buildings sustaining minor damage	1,376	107
# of buildings sustaining moderate	748	845
# of buildings sustaining severe damage	208	1,310
# of buildings sustaining destruction damage	53	2,425
Population Needs		
# of households displaced	174	1,761
# of people seeking public shelter	80	1,267
Debris		
Building debris generated (tons)	52,000	442,000
Tree debris generated (tons)	2,080	17,680
# of truckloads to clear building debris (25 ton trucks)		
Value of Damages		
Total property damage (buildings and content)	$665,580,000	$3,430,630,000
Total losses due to business interruption	2,307	6

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. Refer to the Hazus exports in Appendix C for more information.

Table 44. Estimated Damages from Flooding

	100 Year Flood	500 Year Flood
Building Characteristics		
Estimated total number of buildings	4,693	
Estimated total building replacement value	$2,788,911,000	
Building Damages		
# of buildings sustaining Damage Level 1-10	9	10
# of buildings sustaining Damage Level 11-20	26	28
# of buildings sustaining Damage Level 21-30	3	9
# of buildings sustaining Damage Level 31-40	1	0
# of buildings sustaining Damage Level 41-50	0	0
# of buildings sustaining Damage Level >50	0	0
Population Needs		
# of households displaced	309	379
# of people seeking public shelter	45	49
Debris		
Building debris generated (tons)	413	777
# of truckloads to clear building debris (25 ton trucks)	17	32
Value of Damages		
Total property damage (buildings and content)	$20,990,000	$31,530,000
Total losses due to business interruption	$38,300,000	$49,410,000

VIII. HAZARD MITIGATION GOALS

HAZARD MITIGATION GOALS

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

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

2. Identify and seek funding for measures to mitigate, remediate, and work to eliminate as many or eliminate each known significant flood hazard area as possible.

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

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

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

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

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

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

9. Consider the impacts of climate change. Incorporate climate resilience and clean energy in hazard mitigation planning.

10. Partnering and working with traditionally underrepresented communities and climate vulnerable populations to reduce disproportionately experienced hazards.

IX. EXISTING MITIGATION MEASURES

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

The Town's existing mitigation measures are listed by hazard type here and are summarized in Table 44 below.

FLOOD-RELATED EXISTING MITIGATION

Medway 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:

- *Participation in the National Flood Insurance Program (NFIP)* – Medway participates in the National Flood Insurance Program. NFIP provides access to funds in the case of flood related damages. Table 45 provides an overview of NFIP information for the Town of Medway (reporting period covers through June 2023). FEMA maintains a database on flood insurance policies and claims FEMA maintains a database on flood insurance policies and claims. This database can be found on the FEMA website at http://www.fema.gov/business/nfip/statistics/pcstat.shtm.

Table 45. National Flood Insurance Program Statistics for Medway

Flood insurance policies in force	99
Coverage amount of flood insurance policies	$25,778,000.00
Total losses (all losses submitted regardless of the status)	7
Substantial Damage Claims Since 1978	1
Total payments (Total amount paid on losses)	$ 112,880.96

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.

- *Street Sweeping* – The Medway Department of Public Services conducts year-round street sweeping. All streets are swept two times per year or as needed in select areas of town. The town is planning to increase the street sweeping program to monthly, or twelve times per year.

- *Catch Basin Cleaning* – There are 2,100 catch basins in the town and are currently cleaned out once a year. The town plans to increase the frequency of these cleanings to two times per year. Included in the town's Stormwater Management program is a provision to keep catch basins free and clear of snow, ice and debris.

- *Roadway Treatments* – The town uses salt for roadway treatments in the winter and are looking into a brine, or salt and water mixture. Roads are treated when needed for winter storms.

- *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.
- *The Massachusetts Stormwater Policy* – This policy is applied to developments within the jurisdiction of the Conservation Commission.
- *Community Preservation Act (CPA)* – The town adopted the CPA (permitted by Massachusetts General Law Chapter 44B, Sections 3 through 7), in 2001. CPA establishes a dedicated funding source, derived from a 3% surcharge on the annual property tax and state matching funds, for the purpose of preserving open space, historical preservation, community housing and recreation.
- *Infrastructure Improvements* – Within the past 5-10 years, the town upgraded much of the town's infrastructure such as culverts, bridges, roads, and drainage systems. These upgrades have a focus on green infrastructure and include locations such as West Street Bridge, Lee Lane, Walker Street Bridge, and more.
- *Regulations, By-Laws, and Plans* – The town has adopted many regulations and bylaws that serve to reduce flooding, preserve open space, and protect the community from natural hazards. These include Land Disturbance Permit, MS4 CD Permit, updated regulations to include stormwater design improvements, NOAA Atlas 14 (with consideration of NOAA Atlas 14+).

Commented [KK3]: We had noted to update this with data and dollars used

DAM FAILURE EXISTING MITIGATION

- *DCR dam safety regulations* – All dams are subject to the Division of Conservation and Recreation's dam safety regulations. The dams must be inspected regularly and reports filed with the DCR Office of Dam Safety.
- *Permits required for construction* – State law requires a permit for the construction of any dam.

WIND-RELATED HAZARDS EXISTING MITIGATION

- *Massachusetts State Building Code* – The town enforces the Massachusetts State Building Code whose provisions are generally adequate enough to mitigate most wind damage. The code's provisions are the most cost-effective mitigation measure against tornados given the extremely low probability of occurrence. If a tornado were to occur, the potential for severe damages would be extremely high.
- *Tree-Trimming* – The Park Division and electric company, Eversource, conduct regular tree trimming. The town responds to downed tree limbs caused by winds, lightning strike reports and other weather related incidents. The town utilizes a bucket truck for tree removal efforts.

WINTER-RELATED HAZARDS EXISTING MITIGATION

- *Snow Disposal* – The town moves snow to snow storage at Winter Street.
- *Roadway Treatments* – The DPW conducts salting and plowing services throughout the town during winter storms.

FIRE-RELATED HAZARDS EXISTING MITIGATION

- *Permits Required for Outdoor Burning* – The Fire Department requires a written permit for outdoor burning. The property-owner must come into the Fire Station and fill out a form.
- *Fire Hydrant Regulations* – The Medway Water Department regulates that fire hydrants be installed at all new developments at the expense of the developer.
- *Subdivision Review* – The Fire Department is involved in reviewing subdivision plans from conceptual design through occupancy to ensure that there is adequate access for fire trucks and an adequate water supply.
- *Dry Hydrants* – Installing dry hydrants in event of large brush fires. These could be placed in areas such as Park (Choate) Pond, swamp area on Milford Street near West Street, and the stream that runs under Lovering Street.
- *All-Terrain Vehicles* – The town maintains all-terrain vehicles for fighting forest fires. These vehicles provide access to remote areas that otherwise would not be reachable.

EARTHQUAKE HAZARDS EXISTING MITIGATION

- *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.

LANDSLIDE HAZARD EXISTING MITIGATION

- The subdivision regulations have maximum slope requirements for new roads to minimize landslide risk.

MULTI-HAZARD EXISTING MITIGATION

- *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.

The CEMP addresses dam safety issues.

- *Multi-Department Review of Developments* – Multiple departments, such as the Town Administrator, Planning, Zoning, Health, Highway, Fire, Police, and Conservation, review all subdivision and site plans prior to approval. The town is building a stronger departmental review process and incorporating the use of CitizenServe.
- *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. The CEMP is available online through secure access for town personnel.
- *FEMA Tankers* – FEMA has 8-12 tankers that can be deployed anywhere in the US withing 72 hours.

COMPILATION OF EXISTING MITIGATION

Table 46 summarizes the many existing natural hazard mitigation measures already in place in Medway. Because of the number of entities, public and private, involved in natural hazard mitigation, it is likely that this list is a starting point for a more comprehensive inventory of all measures.

Table 46. Existing Hazard Mitigation Measures in Medway

Type of Existing Protection	Description	Effectiveness /Enforcement	Changes Needed
MULTIPLE HAZARD MITIGATION			
Comprehensive Emergency Management Plan (CEMP)	Addresses mitigation, preparedness, response and recovery from a variety of natural and man-made emergencies. The CEMP addresses dam safety issues.	Emphasis is on emergency response.	Needs to be updated.
Massachusetts State Building Code	Regulates wind loads, earthquake resistant design, flood-proofing and snow loads.	Most effective for new construction.	None.
Multi-Department Review of Developments	Multiple department within town review site plans before development.	Most effective for new construction.	Building a stronger interdepartmental review. Use of CitizenServe.

FEMA Tankers	FEMA has 8-12 tankers that can be deployed anywhere in the US within 72 hours.	Effective for most situations.	None.
FLOOD RELATED HAZARDS			
Participation in the National Flood Insurance Program (NFIP)	Homeowners in the floodplain can purchase flood insurance.	There are 99 policies in force.	Annual review of maps. Updated FEMA maps to be considered.
Street Sweeping	Every street gets swept twice per year or as needed. High traffic areas are swept more regularly.	Effective.	Plan on increasing this to monthly sweeping.
Catch Basin Cleaning	All 2,100 catch basins are cleaned out once a year.	Effective.	Planning on cleaning 2xs/year.
Roadway Treatments	The town uses salt on the roads.	Effective.	Looking into adding a brine.
Enforcement of the State Building Code	Regulates for wind loads, earthquake resistant design, flood-proofing and snow loads.	Most effective for new construction.	None.
Community Preservation Act	The town adopted CPA in 2001.	Most effective for new construction.	None.
Infrastructure Improvements	Infrastructure improvements include culverts, bridges, roads, and drainage systems.	Partially Effective	Focus on green infrastructure.
Regulations, By-Laws, and Plans	Includes: Stormwater Management, Floodplain Protection District, Open Space Residential Development, NPDES, Land Disturbance Permit, MS4 CD Permit, Updated regulations to include stormwater design improvements, NOAA Atlas 14 and considering +	Effective.	None.
State permits required for dam construction	State law requires a permit for the construction of any dam.	Most effective for new construction.	Improvements needed to the statewide system for dam inspections.

DCR Dam Safety Regulations	The state has enacted dam safety regulations mandating inspections and emergency action plans.	Enforcement is an issue.	Ownership of the Sanford Mill Dam and West Medway Dam (near police station)
BRUSH FIRE RELATED HAZARDS			
Permits required for outdoor burning.	The Fire Department requires a written permit for outdoor burning. The permit must be obtained from the Fire Dept.	Effective.	None.
Fire Hydrant Regulations	Town-wide hydrant regulations.	Effective.	None.
Subdivision Review	The Fire Department is involved in reviewing all subdivision plans.	Effective.	None.
Dry Hydrants	Installing dry hydrants in event of large brush fires. These could be placed in areas such as Park (Choate) Pond, swamp area on Milford Street near West Street, and the stream that runs under Lovering Street.	Most effective during Emergency Response.	None.
All-Terrain Vehicles	The town maintains all-terrain vehicles for fighting forest fires	Effective.	None.
GEOLOGIC HAZARDS			
The Massachusetts State Building Code	The Town enforces the Massachusetts State Building Code.	Effective for most situations.	None.
WIND HAZARDS			
Massachusetts State Building Code	The town enforces the Massachusetts State Building Code.	Most effective for new construction.	None.
Tree-Trimming	The Parks Division and electric company, Eversource, conducts regular tree trimming. The Town responds to local calls.	Effective for most situations.	None.
WINTER-RELATED HAZARDS			
Roadway Operations & Treatments	The DPW conducts salting and plowing services throughout the town during winter storms.	Effective for most situations.	None.

Snow Disposal	Snow storage location at Winter Street.	Effective for most situations.	None.

Local Capacity for Implementation

Under the Massachusetts system of "Home Rule," the Town of Medway 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, MS4 Permit, and local enforcement of the State Building Code. Local Bylaws may be amended each year at the annual Town Meeting to improve the town's capabilities, and changes to most regulations simply require a public hearing and a vote of the authorized board or commission, such as the Planning Board or Conservation Commission. The Town of Medway has recognized several existing mitigation measures that require implementation or improvements, and has the capacity within its local boards and departments to address these.

X. MITIGATION MEASURES FROM THE 2018 PLAN

IMPLEMENTATION PROGRESS ON THE PREVIOUS PLAN

At a meeting of the Local Team, the team reviewed the mitigation measures identified in the 2018 Medway 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 2023 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. Table 45 summarizes the status of mitigation measures from the 2018 plan and identification of measures that are being continued as part of the 2023 update.

Table 47. Status of Mitigation Measures from the 2018 Plan

Mitigation Measure	2018 Priority	Current Status	Include in the 2023 HMP?
Brush Fire Regulation-Back yard setback requirements for fire protection	Low	Not complete and no longer relevant.	No
Brush Fire Education-Public Education on Brush Fire Prevention (Senior, Student, and civic orgs)	Low	This is ongoing and partially complete. The town plans to extend reach to existing civic organizations to target outreach and communications to different populations throughout the community.	Yes
Impose water restrictions for town facilities, residents, businesses, and institutions with exceptions for emergency response training.	High	This is complete. This was done with a previous MassDEP water ban.	No
Public Education around drinking water supply, where drinking water comes from.	High	This is partially completed. An annual Water Quality Report is produced but the town desires to extend reach and add additional educational messages.	Yes
Promote drought tolerant landscaping and site design measures	High	Partially complete. The town plans to update sub-division regulations with site design and drought considerations.	Yes
Audit water use with existing household meters, particularly during times with use restrictions.	Medium	This is complete. The town used Aqua Hawk Tool and Neptune meters.	No
Provide Rain barrels to residents, commercial/industrial/institutions, and municipal facilities.	High	This is complete.	No
Assessment /feasibility study of town buildings earthquake vulnerability, especially public safety facility. Police and Fire.	Low	This has not been completed and the town plans to continue to pursue this.	Yes
Assessment/ feasibility study of roadways and stormwater infrastructure vulnerable to earthquakes and landslides.	High	This is not complete and the priority level will be changed to 'low' and will remain in the 2023 update.	Yes
Encourage Site Design to increase tree plantings, increase the percentage of trees used in parking areas, and along public ways.	Low	This is partially complete. Progress has been made but the town also plans to encourage retention and to update subdivision regulations. This has already been updated in the site plan.	Yes
Public education campaign on extreme heat and cold to prevent health challenges or property damages (extreme cold).	Medium	This is partially complete. The town plans to improve operations by continuing broad and inclusive outreach for educational campaigns.	Yes
Create a tree inventory and risk assessment. Tree trimming.	High	This is partially complete. The town plans to complete a tree inventory after having done tree trimming/removal of dead trees in the right of way.	Yes
Evaluate public buildings for ability to withstand snow loads; retrofit if needed to greatest degree feasible.	High	This is partially complete. The evaluation of schools is complete and other buildings remain.	Yes
Salt roads during winter storms	High	The town is continuing to improve operations so this is considered partially complete. The town plans to add protection areas and/or increase education. The town is also investigating the use of a brine system.	Yes
Open Space Protection-ensure future development does not increase flooding. Implement Open Space and Recreation Plan 2018.	Medium	This is partially complete as the town has already implemented this measure into stormwater bylaw updates and updated site plan regulations.	Yes
Require the use of the new Low Impact Development guidance manual for all developments in Town, not just those within the Aquifer Protection District.	Medium	All new subdivisions are encouraging the use of the new LID guidance manual and this is planned to expand. This is considered partially complete.	Yes
Flood-related Public Education on water resources such as flood prevention and stormwater management.	Medium	This is partially complete. The town plans to continue outreach and education. The town is shifting the main responsibility of this measure to the DPW and increased the priority level	Yes

		from 'medium' to 'high'. Finally, the town is utilizing the new Charles River Flood Model as a tool to assist this measure.	
Brentwood Subdivision-Comprehensive Drainage Improvements	High	This is complete.	No
Hopping Brook (on Milford St) Culvert Enlargement	High	This is not complete and has been incorporated into a larger scale plan to update.	Yes
Chicken Brook & Village Street Mitigation-Hydro Analysis/Drainage Study	Medium	This is not complete. Culvert assessments for stream connectivity have been completed and the town has changed this priority level to 'high'.	Yes
Choate Dam Restoration & Repairs	Medium	This is complete.	No
Sanford Dam Restoration & Repairs	Medium	This is not complete. A removal feasibility study is planned as well as the clear definition of dam ownership. This priority has been changed to 'high' in this 2023 plan.	Yes
Chicken Brook Stream Restoration-better bank stabilization, development management, buy land around Chicken Brook. More plantings, wildlife buffer. Medway Block leaks into Chicken Brook. Establish vegetated cover. To prevent washouts.	Medium	This is partially complete. The Medway Block has been closed and the town has acquired ownership of it. The town plans to apply for Brownfields Grant funding to fund this measure and therefore has changed the priority to 'high' in the 2023 plan.	Yes
Charles River Drainage Improvements	Low	This is partially complete and the town changed the priority to 'high'. This improvement area is referring to the Charles River and Village Street area, but is likely to be extended when improvements are pursued.	Yes
Clark Street roadway and drainage improvements and resource protection. Install a bridge at Clark street over the wetland which is in the 1% Annual Chance Flood zone.	Medium	This is not yet complete but the town plans to pursue funding in the near future.	Yes
Inter-municipal Collaboration to improve communications between municipalities.	Medium	This is complete. The town consistently participated in the Charles River Climate Compact project and the Emergency Management for Norfolk County initiative.	No
First Net-nationwide communication system. Participate First Net.	High	This is complete.	Yes
Promote Net Zero in new buildings/new development in town. DPW is Net Zero building.	Low	This is complete.	Yes
Investigate performing greenhouse gas inventory.	Low	This is not complete and no longer a priority or relevant to the town.	No

Transitioning to the 2023 Updated Plan

As indicated in the table above, the Town has made progress implementing mitigation measures identified in the 2018 HMP. Below is a summary of the progress:

- 7 projects were completed, including Choate Dam restoration and repairs, water management upgrades, drainage improvements, and updated communication and education systems.
- 20 of the mitigation measures from the 2018 plan were carried over to this 2023 plan update, most of which are partially complete. These partially completed measures are being improved or progressed by the town.
- 2 mitigation measures from the 2018 plan were not completed and not carried over to the current plan as they are no longer relevant to the town.

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.

XI. HAZARD MITIGATION STRATEGY

WHAT IS HAZARD MITIGATION?

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

- https://www.fema.gov/hazard-mitigation-grant-program
- https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities
- https://www.fema.gov/flood-mitigation-assistance-grant-program

According to FEMA Local Multi-Hazard Mitigation Planning Guidance, identified 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.

REGIONAL AND INTER-COMMUNITY CONSIDERATIONS

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

REGIONAL PARTNERS

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

OVERVIEW OF REGIONAL FACILITIES WITHIN MEDWAY

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

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

- Interstate I-495 (Mass Highways)
- State roads Routes 109 and 126 (Mass Highways)
- Charles River
- Sanford Dam at the Charles River on the boundary of Medway and Franklin
- Major power utility lines, power plants, and substations
- Charles River Pollution Control District, a regional wastewater treatment facility servicing Medway, Millis, Franklin, and Bellingham

INTER-COMMUNITY CONSIDERATIONS

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

A) Coordinate on New Development on a Regional Basis

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

B) Long-Term Regional Management Plan To Control Beaver Activity

One regional issue of significance is the widespread effects of beaver dams in the area. Most streams, wetland areas, and ponds in the region have had some degree of beaver activity in the past several years. Much of the localized flooding that occurs is due to beaver activity. The towns will mitigate the problem temporarily by hiring trappers, removing dams, or installing pipes, but a long-term comprehensive approach should be considered.

C) Stormwater Management within and along the Charles River Watershed

Medway lies along the Charles River and is one of the municipalities serviced by the Charles River Pollution Control District. Collaboration and cooperation on stormwater with the Towns of Millis, Bellingham, and Franklin, will minimize potential infrastructure capacity challenges during extreme precipitation events, minimize localized flooding, and enhance the water quality of the Charles River.

The Town of Medway is aware that most communities within the region share common concerns including the following:

- The regional impacts of drought, as many other towns also rely on local groundwater sources for public drinking water.
- The regional risks of flooding in the Charles River watershed, as documented in the Charles River Water Shed Association's Flood Model.
- Maintenance and drainage from state highways
- Inspection and maintenance of state and privately owned dams
- Coordinated response to wildfires on state and privately owned properties
- Emergency Planning through Local Emergency Planning Committees (LEPC) and Regional Emergency Planning Committees (REPC)

NEW DEVELOPMENT AND INFRASTRUCTURE

As part of the process of developing recommendations for new mitigation measures for this plan update, the Town considered the issues related to new development, redevelopment, and infrastructure needs in order limit future risks. Taking into consideration the Town's stormwater requirements town-wide, the Wetlands Bylaw enforced by the Conservation Commission, the Comprehensive Plan, and the Open Space Plan, the town determined that existing regulatory measures are taking good advantage of local Home Rule land use regulatory authority to minimize natural hazard impacts of development. Priorities for the future include further regulatory changes and public education efforts toward ensuring that future development occurs in a sustainable manner. Open Space purchases and drainage upgrades are also priorities in this plan.

PROCESS FOR SETTING PRIORITIES FOR MITIGATION MEASURES

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

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

The table below summarizes the factors considered for prioritizing the recommended hazard mitigation measures. For each mitigation measure, the geographic extent of the potential benefiting area is identified as well as an estimate of the overall benefit and estimated cost of the mitigation measures. The overall priority of each measure was evaluated in terms of these factors.

Table 48. Factors for Prioritizing Mitigation Measures

Estimated Benefits	
High	Action will result in a significant reduction of hazard risk to people and/or property from a hazard event
Medium	Action will likely result in a moderate reduction of hazard risk to people and/or property from a hazard event
Low	Action will result in a low reduction of hazard risk to people and/or property from a hazard event
High	Estimated costs greater than $100,000
Medium	Estimated costs between $10,000 to $100,000
Low	Estimated costs less than $10,000 and/or staff time
High	Action very likely to have political and public support and necessary maintenance can occur following the project, and the costs seem reasonable considering likely benefits from the measure
Medium	Action may have political and public support and necessary maintenance has potential to occur following the project

Low	Not clear if action has political and public support and not certain that necessary maintenance can occur following the project

IDENTIFICATION OF POTENTIAL MITIGATION MEASURES

During the Local Team meetings, officials in Medway 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 Table 47 below.

Table 49 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.

RECOMMENDED MITIGATION MEASURES FOR 2023 PLAN UPDATE

INTRODUCTION TO POTENTIAL MITIGATION MEASURES TABLE

Mitigation Measure – name, location, or category of the action item.

Description– Each mitigation measure is provided with a brief description.

Lead Implementation– based on a general knowledge of what each municipal department is responsible for; coordination with state agencies should also be considered. Most mitigation measures may require coordination of multiple departments, and assigning staff is the sole responsibility of the governing body of each community.

Time Frame – The timeframe was based on a combination of the priority for that measure, the complexity of the measure and whether the measure is conceptual, in design, or already designed and awaiting funding. The timing for all mitigation measures has also been kept within the typical five-year HMP framework. The identification of a likely timeframe is not meant to constrain a community from taking advantage of funding opportunities as they arise. In some cases, target dates are listed. In other cases, the estimated time ranges are used.

Estimated Cost – The Local Hazard Mitigation Team assigned a cost category as follows:

Low:	<$10,000 and/or staff time
Medium:	$10,000 to $100,000
High:	>$100,000

Potential Funding Sources – This column attempts to identify the most likely sources of funding for each recommended mitigation 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. 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. The best way to determine eligibility for a particular funding source is to review the project with a staff person at the funding agency. Upon adoption of this plan, the local committee responsible for its implementation should begin to explore the funding sources in more detail.

Priority – As described above, the designation of high, medium, or low priority was done considering potential benefits and estimated project costs.

Abbreviations used in the Table below include:

- DCR: MA Department of Conservation and Recreation
- BRIC: Building Resilient Infrastructure and Communities
- EEA: Massachusetts Executive Office of Energy and Environmental Affairs
- MassDOT: Massachusetts Department of Transportation
- TOM: Town of Medway
- DEP: Department of Environmental Protection
- MAPC: Metropolitan Area Planning Council
- TAP: Technical Assistance Program (an MAPC Grant)
- ACR: Accelerating Climate Resilience (An MAPC Grant)
- PPA: Power Purchase Agreement
- EMPG: MEMA Emergency Management Performance Grant
- CCP: MEMA Citizen Corps Program
- MET: Massachusetts Environmental Trust
- "General fund" refers to funding from the Town

RECOMMENDED MITIGATION MEASURES

Below is a comprehensive summary of recommended mitigation measures for the 2023 plan, as confirmed and reviewed by the Local Team. This list includes measures from the 2018 plan that are carried over, as well as 9 new recommendations for mitigation strategies. The new strategies are indicated by an asterisk (*) in the first column.

Table 49. Potential Mitigation Measures for the 2023 Hazard Mitigation Strategy

Mitigation Measures	Geographic Coverage	Priority	Lead Implementation	Time Frame	Estimated Cost	Estimated Benefit	Potential Funding
BRUSH FIRE HAZARDS							
Brush Fire Education-Public Education on Brush Fire Prevention (Senior, Student, civic orgs existing)	Town-wide	Low	Fire Department	2024 -2029	<$10,000	Low	Town General Fund
DROUGHT HAZARDS							
Public Education about drinking water supply including where drinking water comes from, and other educational messages to extend reach and awareness.	Town-wide	High	DPW	2024 -2029	<$10,000	Medium	Town General Fund, MAPC, MVP Action Grant
Promote drought tolerant landscaping and site design measures with new focus on updating sub-division regulations.	Town-wide	Medium	Planning Department	Begin 2024	<$10,000	Medium	Town General Fund, MAPC
*Develop outreach plan to residents about water use in the case of extreme drought.	Town-wide	Medium	DPW & Board of Health	2024-2029	<$10,000	Medium	Town General Fund
*Investigate interconnections, waste chemistry capability, and water pressures with neighboring towns in times of drought.	Town-wide	Medium	DPW	2025	$100,000	Medium	Town General Fund, MVP Action Grant
GEOLOGIC HAZARDS (EARTHQUAKES/LANDSLIDES)							
Assessment /feasibility study of town buildings earthquake vulnerability, especially public safety facility. Police and Fire.	Town-wide	Low	DPW/ Selectboard's Office	2026	$50,000-$100,000	Low	Town General Fund
Assessment/ feasibility study of roadways and stormwater infrastructure vulnerable to earthquakes and landslides.	Town-wide	Low	DPW/ Selectboard's Office	2026	$50,000-$100,000	Low	Town General Fund
EXTREME TEMPERATURES							

Encourage Site Design to increase tree plantings, increase the percentage of trees used in parking areas, and along public ways. Site plan has been updated to also encourage retention and subdivision regulations have been updated.	Town-wide	High	Planning Department	2024	<$10,000	Medium	Town General Fund, MVP Action Grant, Charles River Tree Protection Grant, MAPC's ACR
Public education campaigns on extreme heat and cold to prevent health challenges or property damages (extreme cold) continues with extended outreach and broader education.	Town-wide	Medium	Health Department	2024	<$10,000	Medium	Town General Fund, MVP Action Grant
*Tree bylaw to promote tree protection.	Town-wide	High	Conservation	2024	<$10,000	Medium	Town General Fund
*Add backup generator to Medway High School.	High School	Medium	DPW	2024-2029	$50,000	Medium	Town General Fund
WIND-RELATED HAZARDS (TORNADOS, HURRICANES, THUNDERSTORMS)							
Create a tree inventory and risk assessment. Tree trimming, removal of dead trees in right-of-way, and replacement.	Town-wide	High	Tree Warden (DPW)	2025	$35,000	Medium	Town General Fund
*Develop outreach materials to educate residents how to spot tree damage and report it.	Town-wide	Medium	DPW	2024-2029	<$10,000	Medium	Town General Fund
WINTER STORMS							
Improved operations of salting roads during winter storms continues, with a new focus on researching a brine system to replace/supplement salt. Increased education and areas of heightened protection are planned.	Town-wide	High	DPW	2024 -2029	>$100,000	High	Town General Fund
Evaluate public buildings for ability to withstand snow loads; retrofit if needed to greatest degree feasible. (still need to check which buildings are remaining (schools are complete).	Town-wide	Low	Building Commissioner	2024	$50,000	Low	Town General Fund
FLOODING AND DAM RELATED HAZARDS							

Implement Open Space and Recreation Plan 2018 to acquire and preserve open space.	Town-wide	High	Conservation Department, Planning Department	2024 -2029	>$100,000	High	Town General Fund
All new subdivisions, commercial, and industrial development encourage the use of the Low Impact Development guidance manual.	Town-wide	High	Planning	2024 -2029	Staff Time	High	Town General Fund
Outreach and education on water resources such as flood prevention and stormwater management. Use of the Charles River Flood Model increases awareness and communication.	Town-wide	High	Planning Department, Conservation Commission, Building Department, DPW	2024 -2029	<$10,000	Medium	Town General Fund, MAPC, MVP Action Grant
Hopping Brook (on Milford St) Culvert Enlargement.	Northwest Medway	High	DPW, Conservation Commission	2025	$250,000-$300,000	High	BRIC, TOM, MVP Action Grant
Chicken Brook & Village Street Mitigation-Hydro Analysis/Drainage Study to build on completed culvert assessments for stream connectivity.	Central Medway	High	DPW, Conservation Commission	2025	$25,000-$100,000	High	BRIC, ACOE, DCR, DEP, Town General Fund
Sanford Dam and West Medway Dam restoration, repairs, and removal feasibility study. (Add description of impact of breakdown/failure of Sanford Dam).	Charles River at Medway and Franklin	Medium	Select Board, DPW, Conservation Commission, DCR	2024 -2029	N/A	High	Town of Franklin, DER
Chicken Brook Stream Restoration- better bank stabilization and development management. More plantings, wildlife buffer. Establish vegetated cover to prevent washouts.	Chicken Brook Corridor	High	Conservation Department	2025	$75,000- $200,000	High	MVP Action Grant
*Investigate the feasibility of establishing a Stormwater Enterprise Fund.	Town-wide	High	DPW	2024-2029	$50,000	High	Town General Fund, MVP Action Grant, DEP
*Complete a hydrological study of the following drainage areas: Broad Street drainage, Route 109 corridor drainage.	Town-wide	High	DPW	2024-2029	$200,000-$500,000	Medium	BRIC
Charles River Drainage Improvements (this is referring to the Charles River and Village Street	Charles River Corridor	High	DPW	2024 -2029	$500,000-$1million	High	BRIC, ACOE, CMRP, DCR, DEP, NCMCP, Town General Fund, Stormwater Enterprise Fund

area, but could be extended in new update).							
Pursuing funding for Clark Street roadway and drainage improvements and resource protection. Install a bridge at Clark street over the wetland which is in the 1% Annual Chance Flood zone.	Northwest Medway	Medium	DPW	2027	$500,000-$1 million	High	BRIC, ACOE, CMRP, DCR, DEP, NCMCP, TOM
MULTIPLE HAZARDS							
*Diversify public outreach channels to reach all demographic groups.	Town-wide	Medium	Communications	2024-2029	<$10,000	Medium	MVP Action Grant
CLIMATE CHANGE HAZARDS							
Promote Net Zero in new buildings/new development in town. DPW is Net Zero building.	Town-wide	Medium	Planning Department, Sustainability Coordinator, Building Department	2025	<$10,000	Medium	Town General Fund
*Build relationships with and ask utility companies to have a climate assessment vulnerability discussion with town.	Town-wide	Medium	DPW	2024-2029	<$10,000	Medium	Town General Fund

XII. PLAN ADOPTION & MAINTENANCE

PLAN ADOPTION

The Medway Hazard Mitigation Plan 2023 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 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 Medway Hazard Mitigation 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 Commissioner of Public Works 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 by the Hazard Mitigation Implementation Team, these will be placed on the Town's web site, and any meetings of the Hazard Mitigation Implementation Team will be publicly noticed in accordance with town and state open meeting laws.

IMPLEMENTATION AND EVALUATION SCHEDULE

Mid-Term Survey on Progress– The coordinator of the Hazard Mitigation 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 Health Director, 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 Medway 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 Medway Hazard Mitigation Plan 2023 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. The plan will be reviewed and discussed with the following departments. During updates of any Town department's plans or policies, the relevant portions of this mitigation strategy will be incorporated.

- Fire Department
- Emergency Management
- Police Department
- Public Works Department
- Planning and Community Development
- Conservation Commission
- Public Health
- Building
- Land Use

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

The Hazard Mitigation Plan will be integrated into other town plans and policies as they are updated and renewed, including the Medway Comprehensive Plan, Open Space Plan, Comprehensive Emergency Management Plan, and Capital Investment Program.

XIII. LIST OF REFERENCES

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XIV. APPENDIX A: LOCAL TEAM MEETINGS

Agenda

Medway Hazard Mitigation Plan (HMP) Update
Kickoff Meeting
January 26, 2023

1. **Project Overview**
   - Tasks & Timeline
   - Communication with stakeholders and distribution channels
   - Information request (GIS, reports, images)
2. **Local Team Discussion** (typically 6-9 members)

2018 Local Team	Recommendations	2023 Updates
Allison Potter, Assistant Town Administrator		
Jeff Lynch, Fire Chief	Emergency Management	
Susy Affleck-Childs, Planning and Economic Development Coordinator	Economic Development, Land Use and development, Housing	
Dave D'Amico, Director of Department of Public Works	Infrastructure (incl. transportation and other community lifelines[1])	
Beth Hallal, Health Agent	Health & Social Services	
Bridget Graziano, Conservation Agent	Natural Resources	
	Cultural resources	
	Representatives who can help us reach climate vulnerable populations	

The process must provide opportunities for stakeholders to be involved (i.e., through the Local Team, public meetings), including:

- Local and regional agencies involved in hazard mitigation activities
- Agencies that have the authority to regulate development
- Neighboring communities
- Representatives of businesses, academia, and other private organizations (i.e., private utilities or major employers)
- Representatives of nonprofit organizations, including community-based organizations, that work directly with and/or provide support to underserved communities and socially vulnerable populations.

3. **Next Steps**
   - Finalize Local Team List
   - Identify date for Local Team Meeting #1
   - Information request

Agenda

Medway Hazard Mitigation Plan (HMP) Update
Local Team Meeting #1
March 1, 2023

1. Welcome & Introductions

2. Project Overview
   - FEMA Hazard Mitigation Planning
   - Project tasks and schedule

3. Getting Started: Updates from the 2018 Plan
   - We will use two worksheets to update local data from the 2018 plan:
     - Worksheet #1: Local Hazard Areas of Concern
     - Worksheet #2: Critical Facilities
   - *MAPC's GIS Planner will join to map new or revised sites using the online platform Google MyMaps*

4. Next steps:
   - Share additional feedback by March 8th
   - Follow-up discussion on development
   - Stay tuned for an invitation to Local Team Meeting #2

5. Wrap Up & Action Items

Agenda

Medway Hazard Mitigation Plan (HMP) Update
Local Team Meeting #2
April 24, 2023
10:00 AM

1. Welcome
2. Update on HMP Project Progress
3. Discuss & Update Hazard Mitigation Goals
4. Discuss & Update Existing Mitigation Measures
5. Prepare for Public Meeting #1
6. Wrap Up & Action Items

Agenda

Medway Hazard Mitigation Plan (HMP) Update
Local Team Meeting #3
July 20, 2023

1. Welcome

2. Update on HMP Project Progress
    a. Secure spot on August 14th Select Board meeting slot for a short presentation and Q&A about the plan

3. Discuss & Update Recommended Mitigation Measures from 2018 plan

4. Prepare for Public Meeting #1

5. Wrap Up & Action Items

Action Items	MAPC	Town

Agenda

Medway Hazard Mitigation Plan (HMP) Update
Local Team Meeting #3
September 14, 2023

1. Welcome
2. Discuss Survey Results
3. Discuss & Update New Mitigation Measures for the Plan
4. Prepare for Public Meeting #2 and Plan Drafting
5. Wrap Up & Action Items

Action Items	MAPC	Town

XV. APPENDIX B: 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.	FloodZones 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 10.	Coastal Flooding
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 1b: Environmental Justice – This map shows Environmental Justice (EJ) populations using 2020 data. EJ designations from the State include English isolation, income, and minority residents.

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

Map 3: Flood Zones – The map of flood zones used the FEMA NFIP Flood Zones for Norfolk 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.

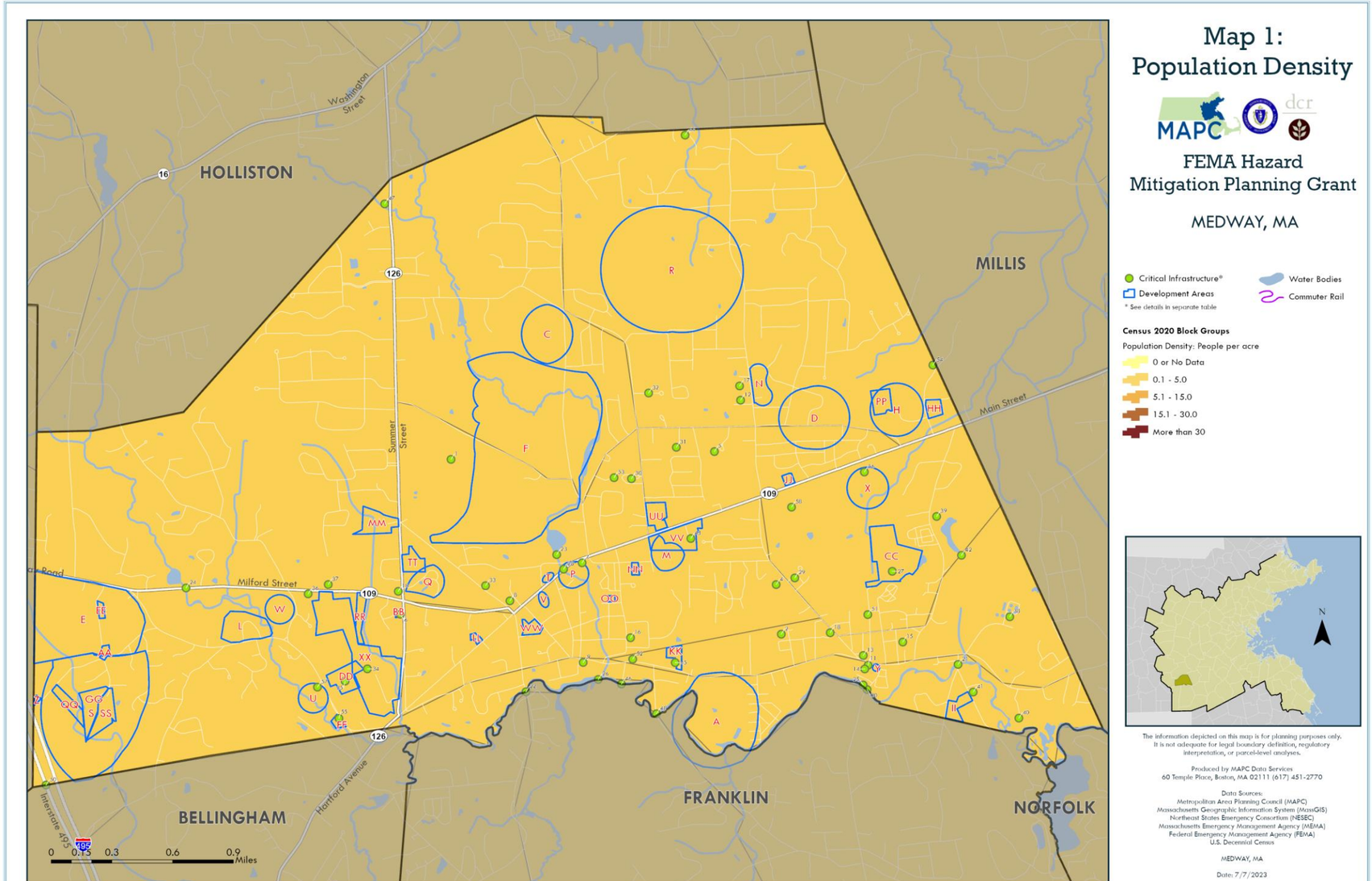
Map 7: Composite Natural Hazards (Regional) - This map shows four categories of composite natural hazards for areas of existing development. The hazards included in this map are 100-year wind speeds of 110 mph or higher, low and moderate landslide risk, FEMA Q3 flood zones (100 year and 500 year) and 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 10: Extreme Heat – MAPC's Statewide Land Surface Temperature (LST) Index was created by combining estimates of surface temperature from days in 2018, 2019, and 2020 where the daily air temperature maximum exceeded 70 degrees Fahrenheit. The Statewide LST Index "Hot Spots" data depicts the 5% highest LST index areas in each Regional Planning Agency (RPA) region. The data was generated by identifying pixels whose LST index values are equal to or greater than 95% of LST index values in the region, and then delineating cohesive regions where pixels meet this criterion as polygons. Map 9 represents the "Hot Spots" relative to the MAPC region, mapped on top of the National Land Cover Database's 2016 30-m tree canopy data.

Map 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 map set described above is included on the subsequent pages.



Map 1: Population Density

MAPC dcr

FEMA Hazard Mitigation Planning Grant

MEDWAY, MA

- Critical Infrastructure*
- Development Areas
  * See details in separate table
- Water Bodies
- Commuter Rail

Census 2020 Block Groups

Population Density: People per acre

- 0 or No Data
- 0.1 - 5.0
- 5.1 - 15.0
- 15.1 - 30.0
- More than 30

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Data Sources:
Metropolitan Area Planning Council (MAPC)
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Northeast States Emergency Consortium (NESEC)
Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)
U.S. Decennial Census

MEDWAY, MA

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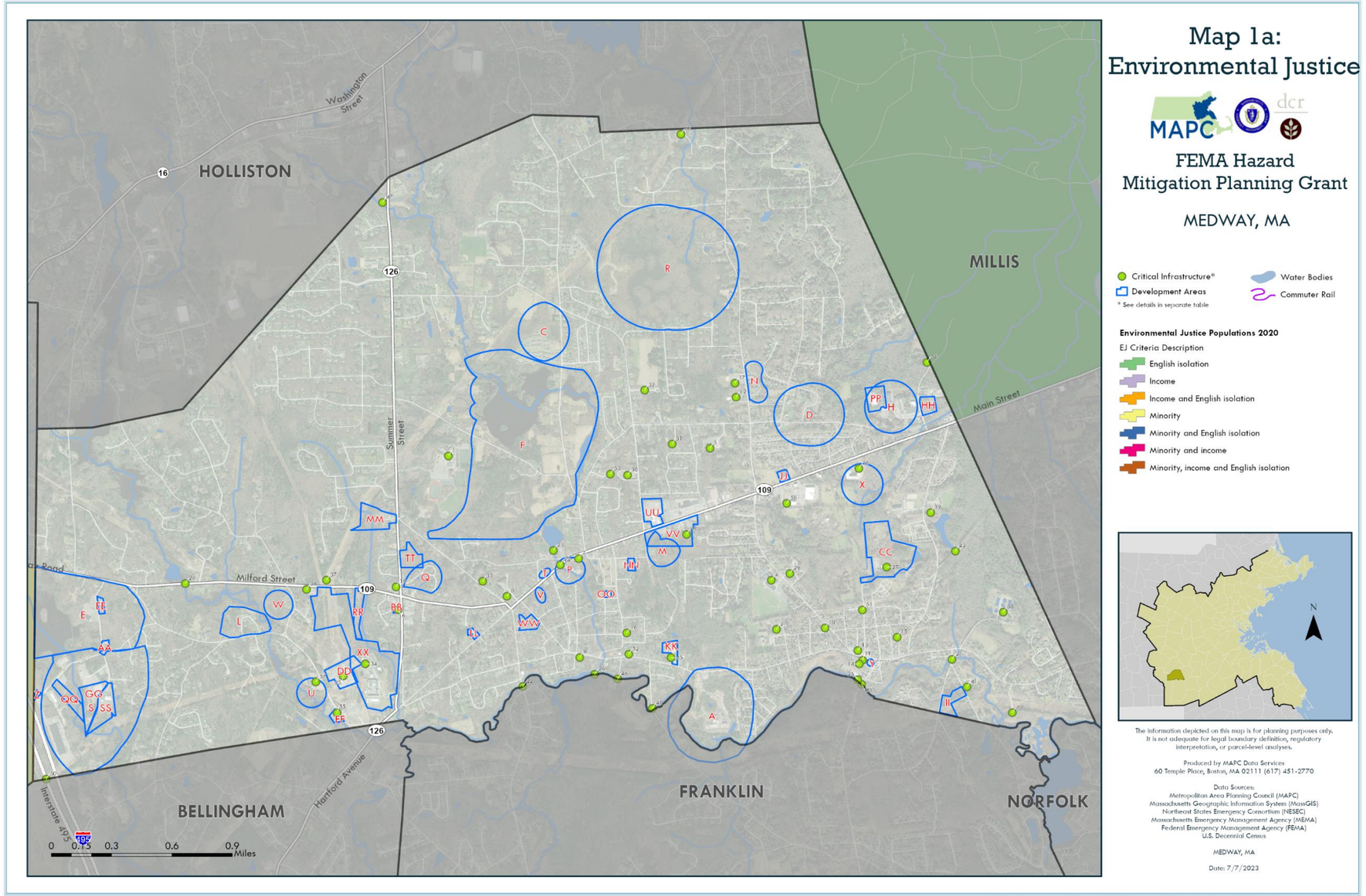

Map 1a: Environmental Justice

MAPC

FEMA Hazard Mitigation Planning Grant

MEDWAY, MA

- Critical Infrastructure*
- Development Areas

* See details in separate table

- Water Bodies
- Commuter Rail

Environmental Justice Populations 2020

EJ Criteria Description

- English isolation
- Income
- Income and English isolation
- Minority
- Minority and English isolation
- Minority and income
- Minority, income and English isolation

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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

MEDWAY, MA

Date: 7/7/2023

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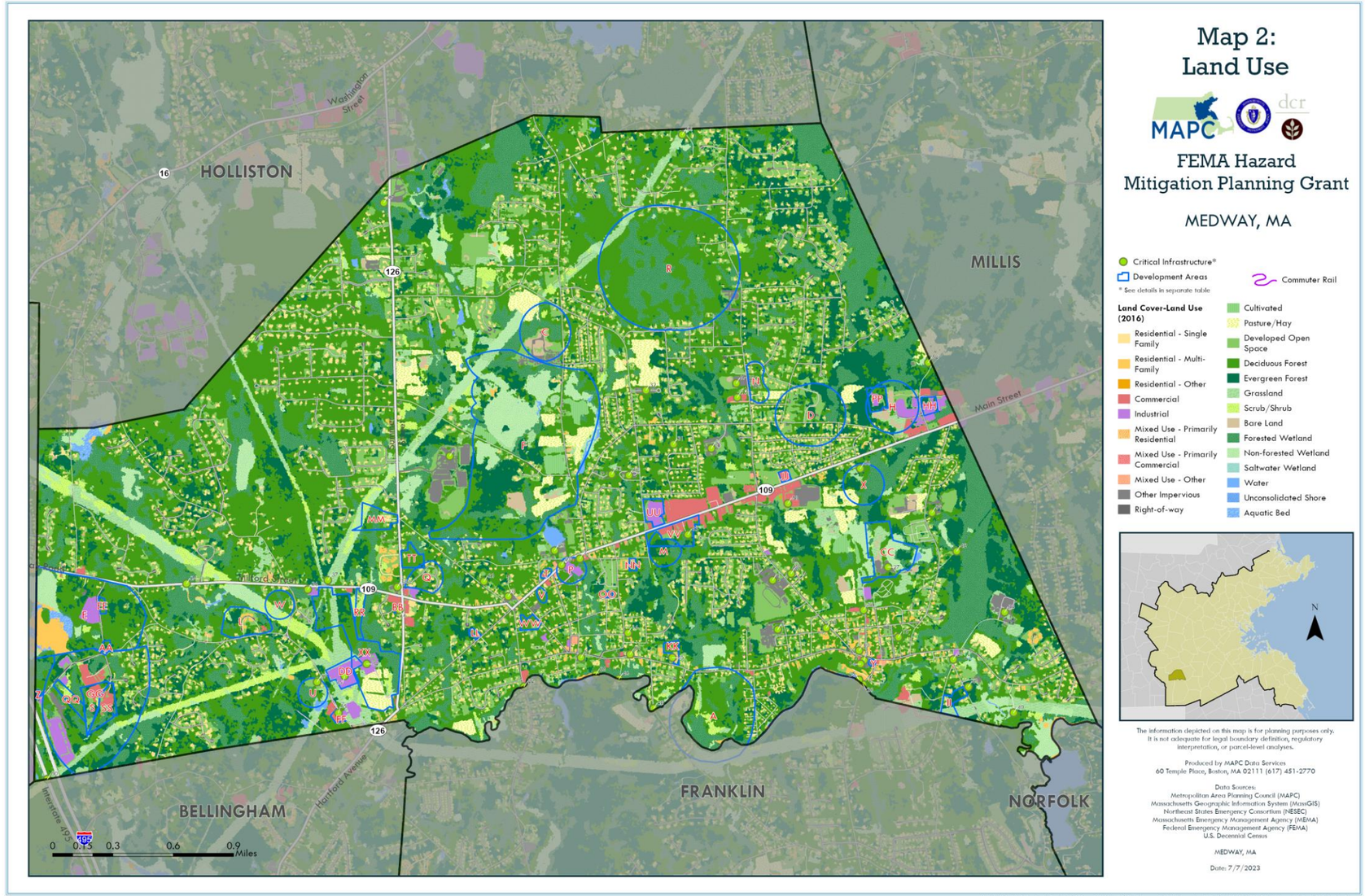

Map 2: Land Use

MAPC dcr

FEMA Hazard Mitigation Planning Grant

MEDWAY, MA

- Critical Infrastructure*
- Development Areas
  * See details in separate table
- Commuter Rail

Land Cover-Land Use (2016)

- Residential - Single Family
- Residential - Multi-Family
- Residential - Other
- Commercial
- Industrial
- Mixed Use - Primarily Residential
- Mixed Use - Primarily Commercial
- Mixed Use - Other
- Other Impervious
- Right-of-way
- Cultivated
- Pasture/Hay
- Developed Open Space
- Deciduous Forest
- Evergreen Forest
- Grassland
- Scrub/Shrub
- Bare Land
- Forested Wetland
- Non-forested Wetland
- Saltwater Wetland
- Water
- Unconsolidated Shore
- Aquatic Bed

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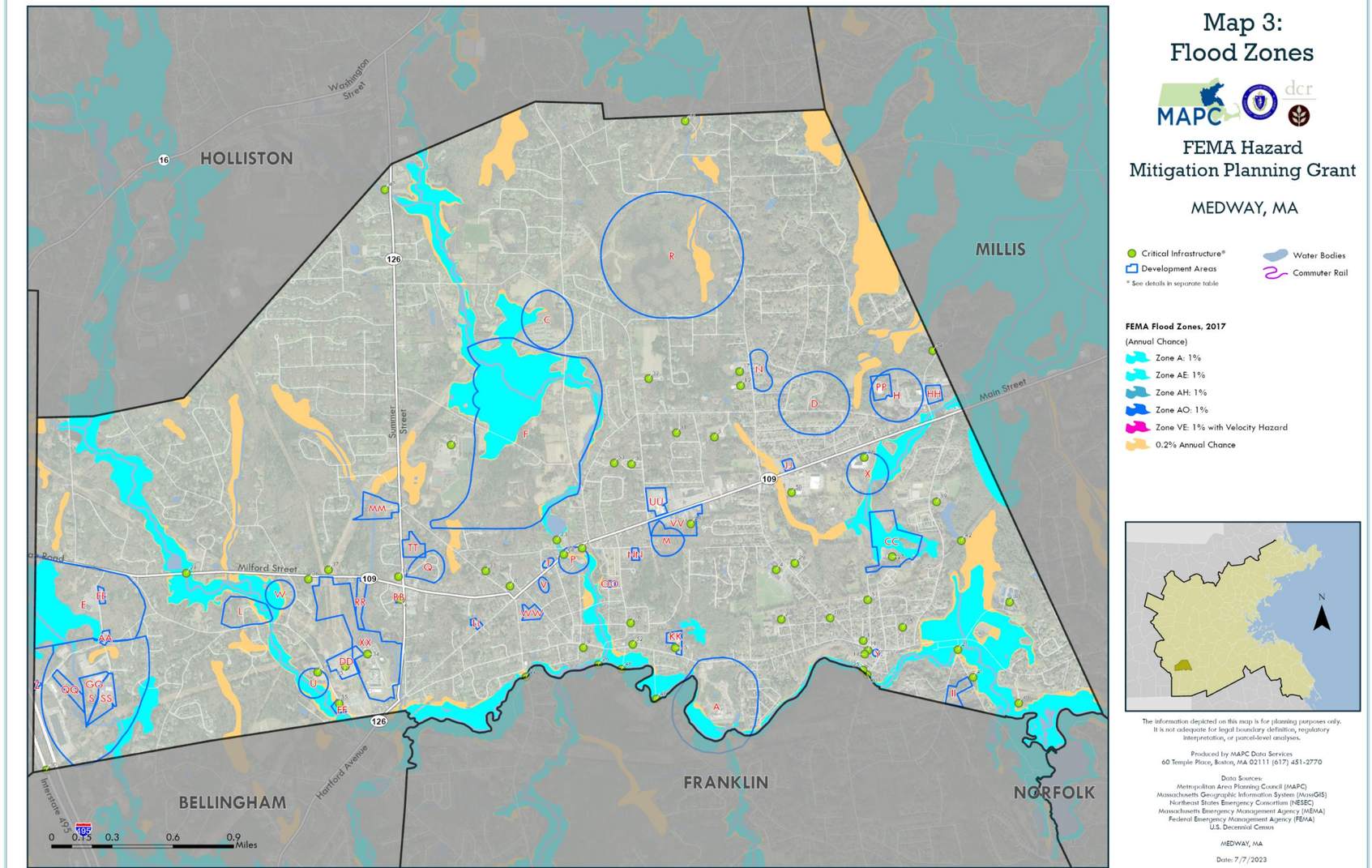

Map 3: Flood Zones

MAPC dcr

FEMA Hazard Mitigation Planning Grant

MEDWAY, MA

- Critical Infrastructure*
- Development Areas

* 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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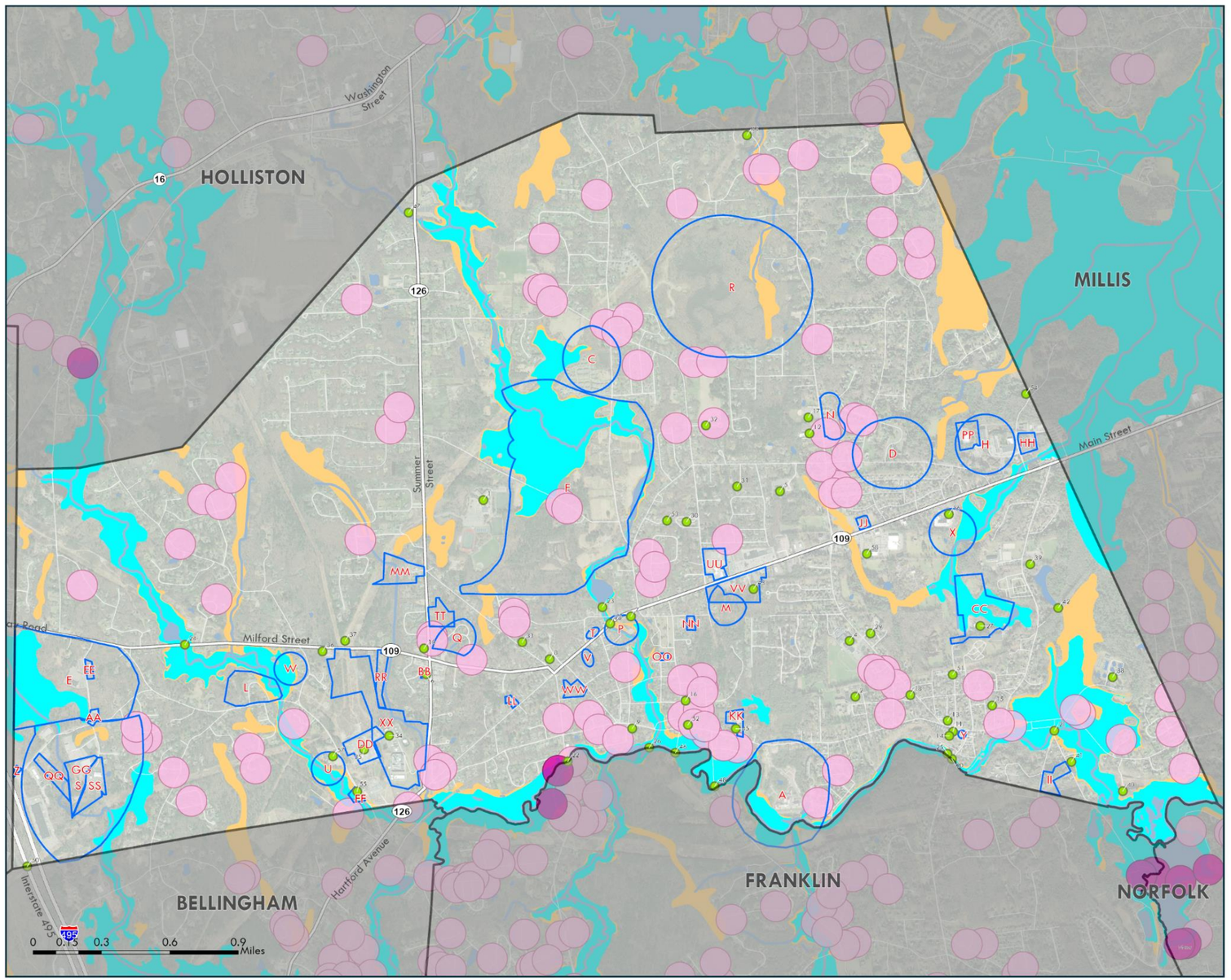


Map 3b: Flood Zones and 2010 Flood Claims

MAPC dcr

FEMA Hazard Mitigation Planning Grant

MEDWAY, MA

- Critical Infrastructure*
- Development Areas

* See details in separate table

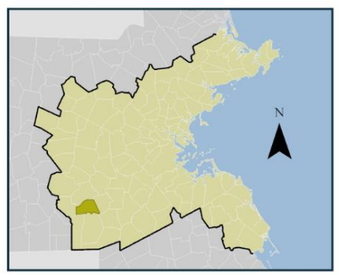
- Water Bodies
- Commuter Rail

FEMA Flood Zones, 2017
(Annual Chance)

- Zone A: 1%
- Zone AE: 1%
- Zone AH: 1%
- Zone AO: 1%
- Zone VE: 1% with Velocity Hazard
- 0.2% Annual Chance

2010 Flood Claims

- Disaster Assistance
- Flood Insurance



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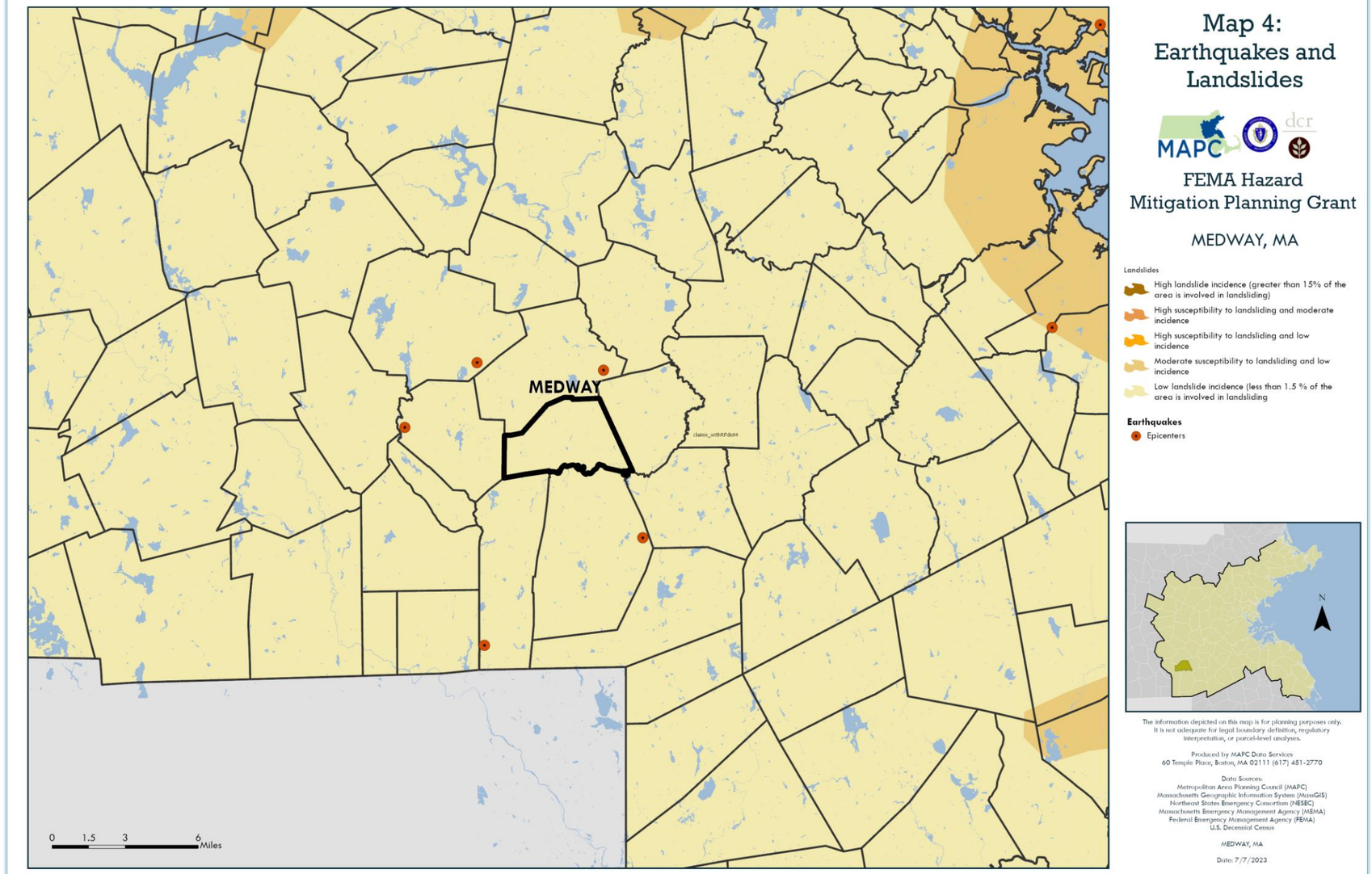

Map 4: Earthquakes and Landslides

MAPC dcr

FEMA Hazard Mitigation Planning Grant

MEDWAY, MA

Landslides

- High landslide incidence (greater than 1.5% of the area is involved in landsliding)
- High susceptibility to landsliding and moderate incidence
- High susceptibility to landsliding and low incidence
- Moderate susceptibility to landsliding and low incidence
- Low landslide incidence (less than 1.5 % of the area is involved in landsliding

Earthquakes

- Epicenters

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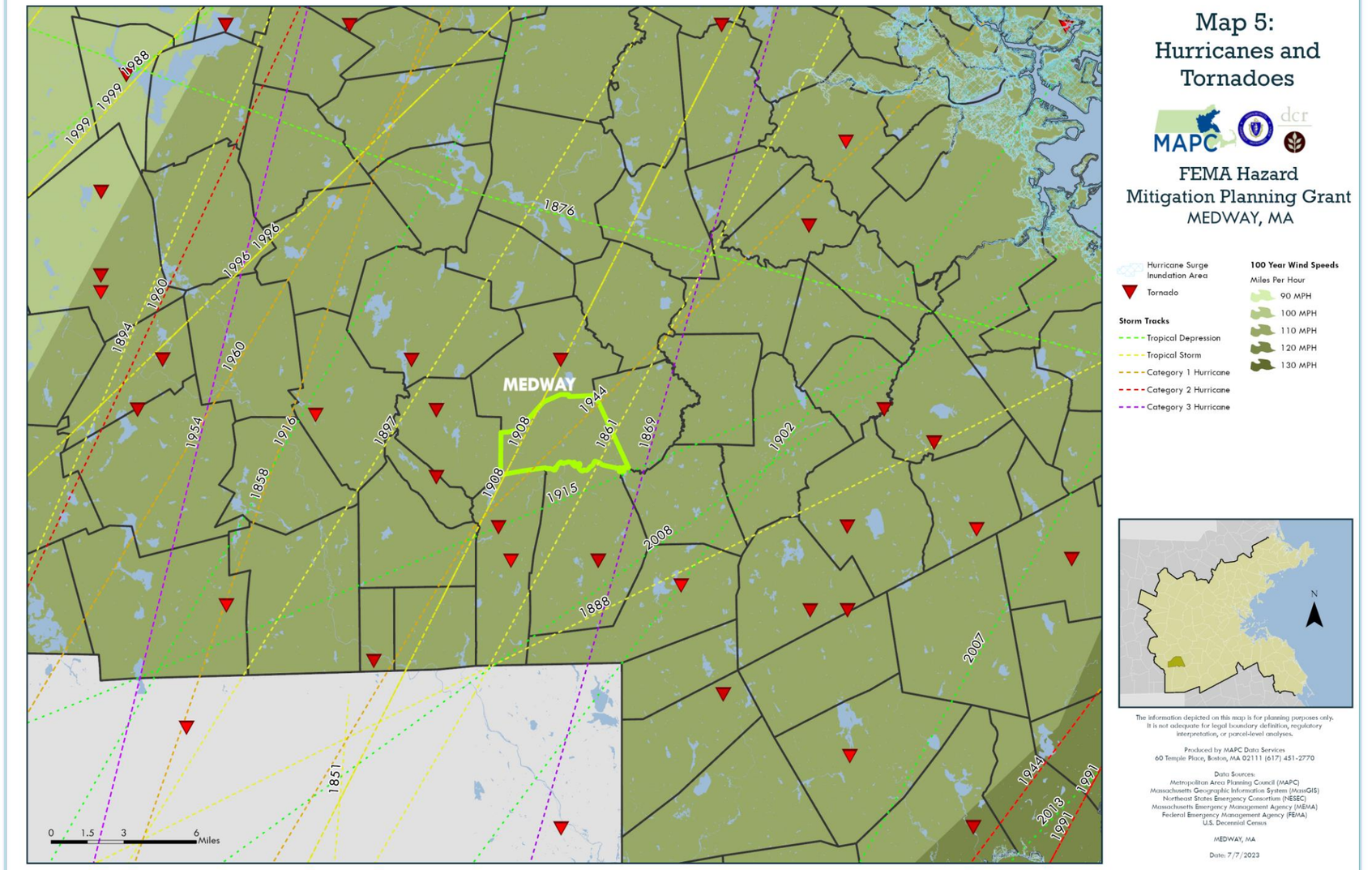

Map 5: Hurricanes and Tornadoes

MAPC dcr

FEMA Hazard Mitigation Planning Grant
MEDWAY, MA

Hurricane Surge Inundation Area
Tornado

Storm Tracks
- Tropical Depression
- Tropical Storm
- Category 1 Hurricane
- Category 2 Hurricane
- Category 3 Hurricane

100 Year Wind Speeds
Miles Per Hour
- 90 MPH
- 100 MPH
- 110 MPH
- 120 MPH
- 130 MPH

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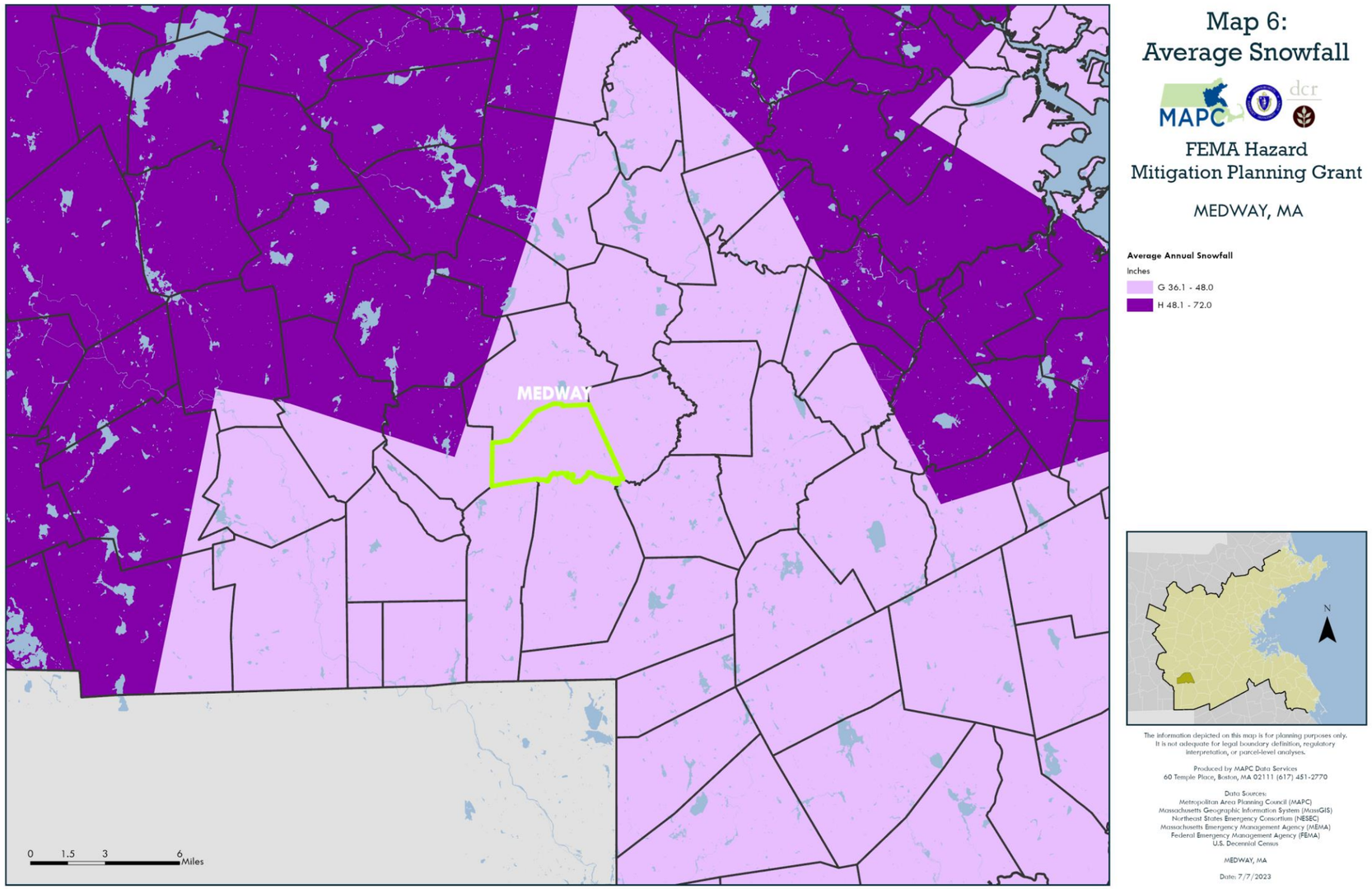

Map 6: Average Snowfall

MAPC dcr

FEMA Hazard Mitigation Planning Grant

MEDWAY, MA

Average Annual Snowfall
Inches
G 36.1 - 48.0
H 48.1 - 72.0

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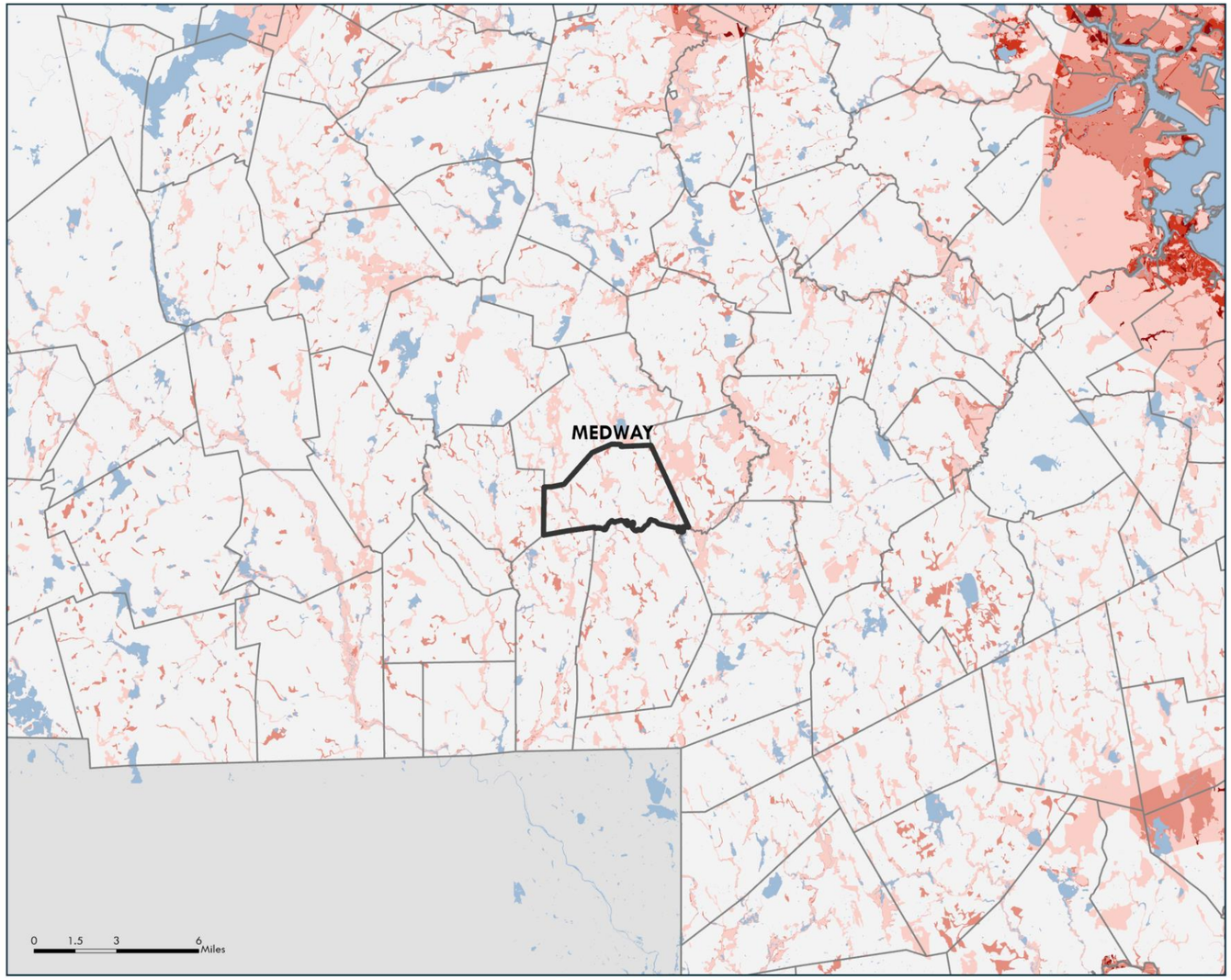


Map 7: Composite Natural Hazards

MAPC dcr

FEMA Hazard Mitigation Planning Grant

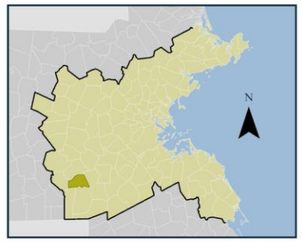
MEDWAY, MA

Composite Natural Hazards

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

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

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



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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

MEDWAY, MA

Date: 7/7/2023

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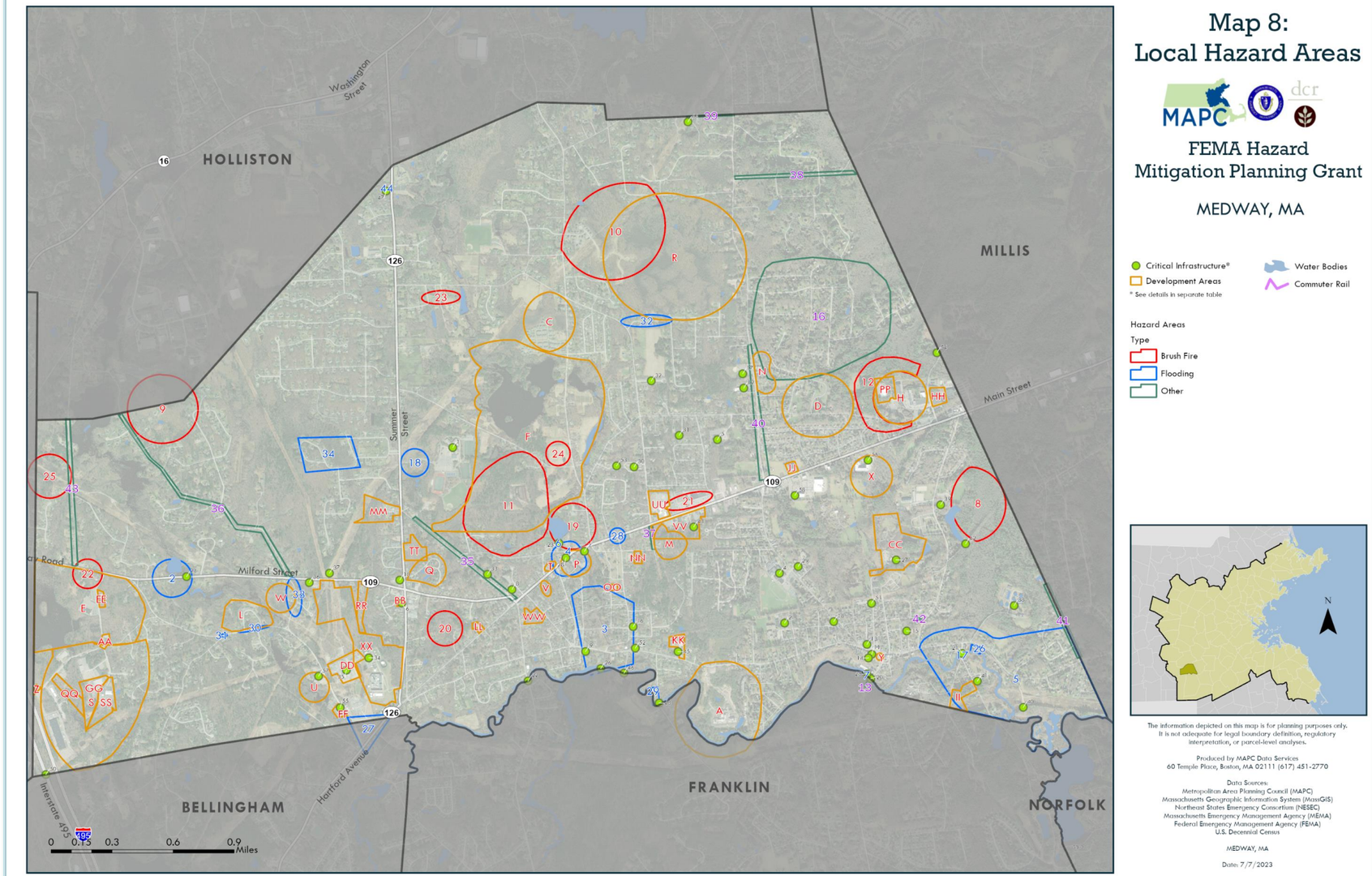

Map 8: Local Hazard Areas

MAPC dcr

FEMA Hazard Mitigation Planning Grant

MEDWAY, MA

- Critical Infrastructure*
- Development Areas
  * See details in separate table
- Water Bodies
- Commuter Rail

Hazard Areas
Type
- Brush Fire
- Flooding
- Other

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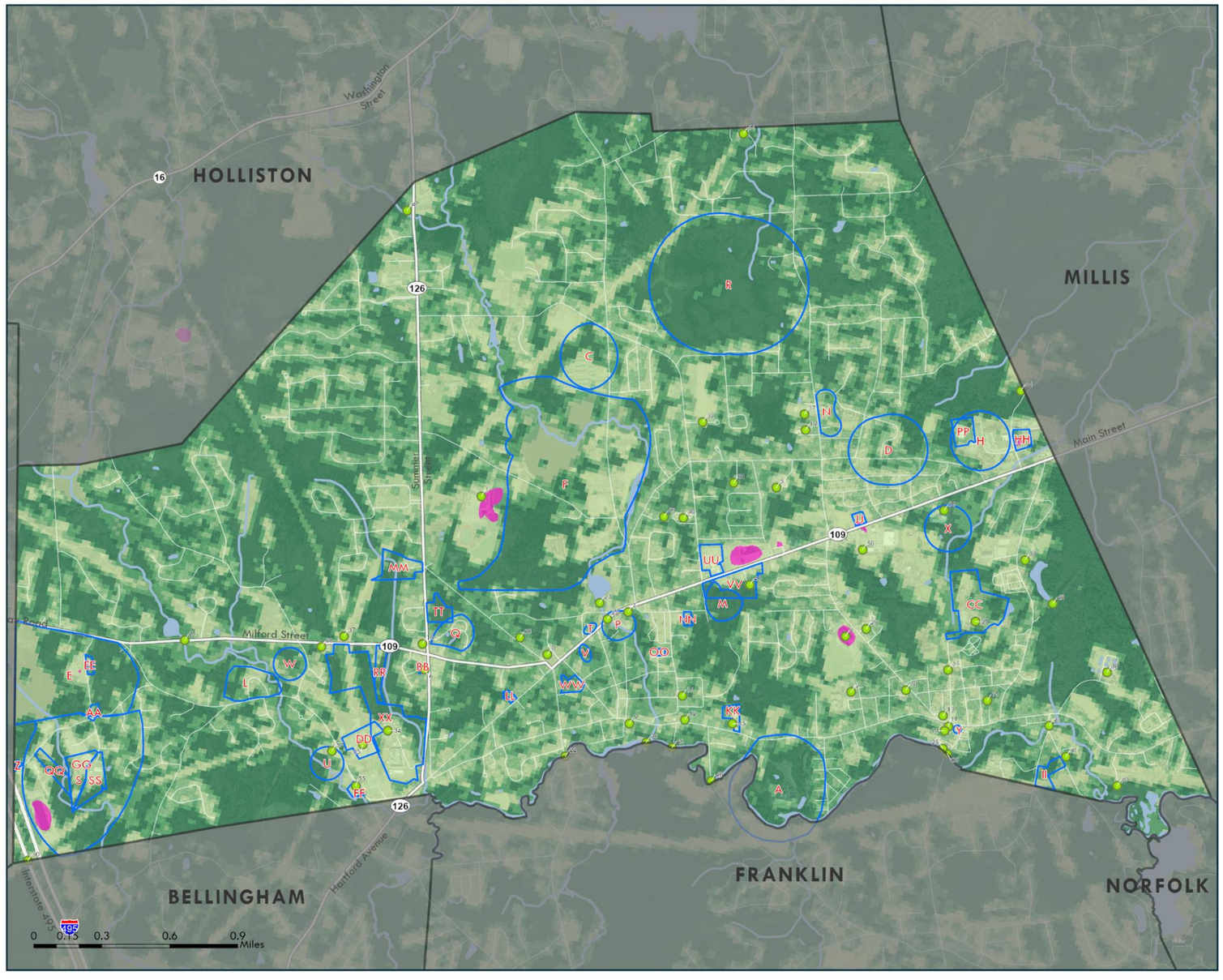


Map 9: Land Surface Temperature

MAPC dcr

FEMA Hazard Mitigation Planning Grant

MEDWAY, MA

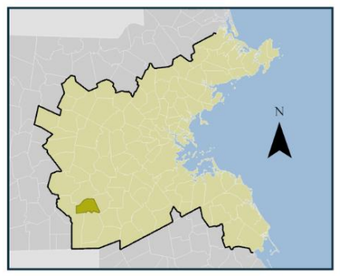
Critical Infrastructure*
Development Areas
* See details in separate table

Water Bodies
Commuter Rail

Tree Canopy Coverage (2016 - 30m)

Hottest 5% of region's land area

% Canopy Coverage
0 - 25%
25 - 50%
50 - 75%
75 - 100%



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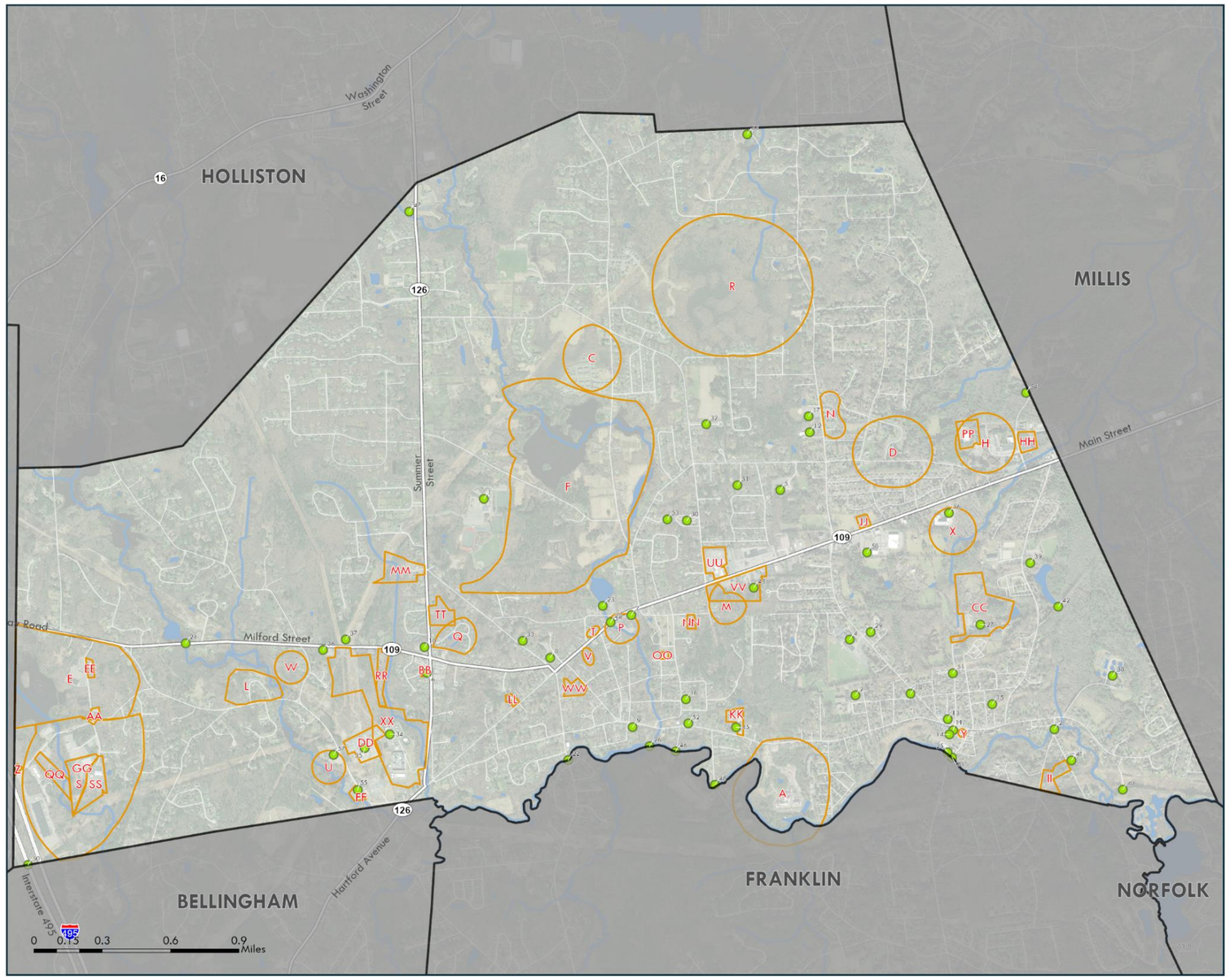


Map 10: Coastal Flooding

MAPC dcr

FEMA Hazard Mitigation Planning Grant

MEDWAY, MA

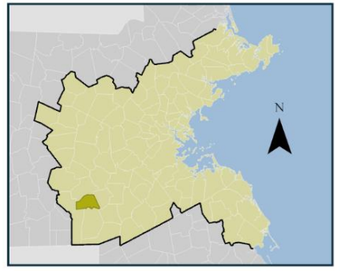
- Critical Infrastructure*
- Development Areas

* See details in separate table

- Water Bodies
- Commuter Rail

Extent of flood inundation for a 1% chance storm for the following sea level rise scenarios:

- 1.2ft sea level rise scenario (approx. 2030)
- 2.4ft sea level rise scenario (approx. 2050)
- 4.2ft sea level rise scenario (approx. 2070)



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MEDWAY, MA

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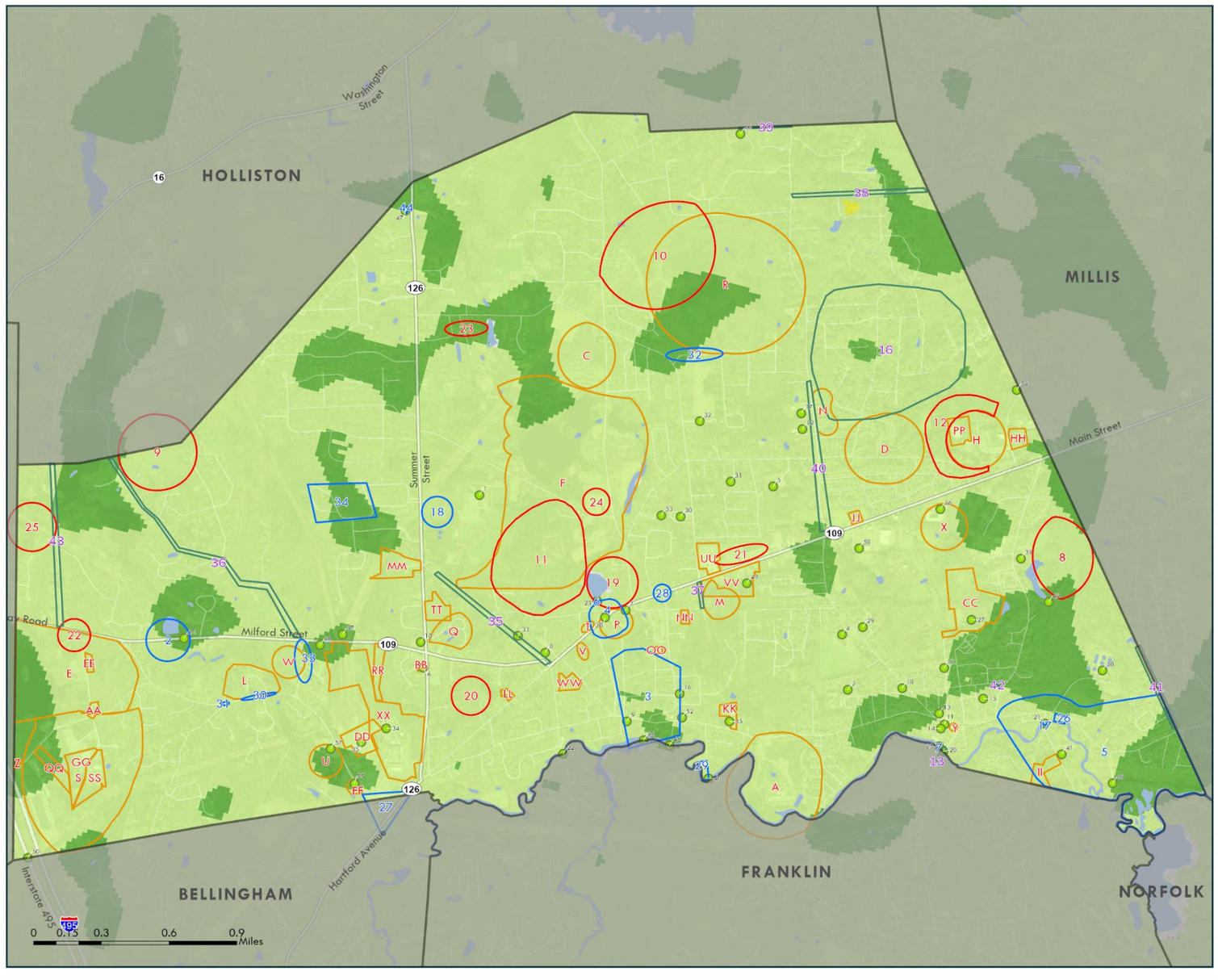


Map 11: Wildfire Risk

MAPC dcr

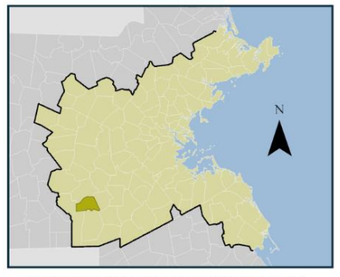
FEMA Hazard Mitigation Planning Grant

MEDWAY, 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



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MEDWAY, MA

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XVI. APPENDIX C: HAZUS REPORTS

[TO INCLUDE A LINK TO REPORTS]

XVII. APPENDIX D: PUBLIC PARTICIPATOIN

Invitation to Medway Hazard Mitigation Plan Update – Select Board Meeting Aug 14

Delete | Archive | Report | Reply | Reply all | Forward | Read / Unread | Categorize | Flag / Unflag | Print | ...

Invitation to Medway Hazard Mitigation Plan Update – Select Board Meeting Aug 14

SC Stephanie Carlisle <scarlisle@townofmedway.org>

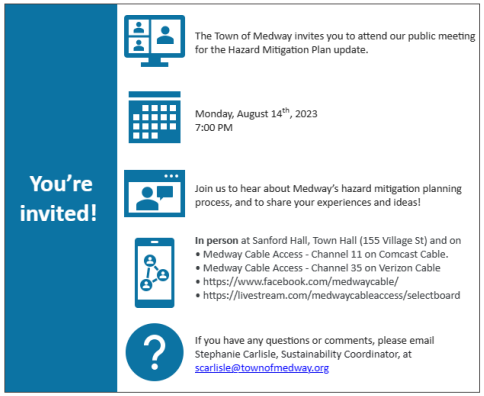
To: William Kingsbury <wkingsbury@medwaypolice.com>; Jonathan Ackley <jackley@townofmedway.org>; MargretPerkins <mperkins@minlib.net>; Cindy Sullivan <csullivan@medwayschools.org>; mgrennon@medwayschools.org; asherry@charlesriverbank.com; **+13 others**

Cc: Allison Potter <apotter@townofmedway.org>; Barbara Saint Andre <bsaintandre@townofmedway.org>; Bridget Graziano; Courtney Riley <CRiley@townofmedway.org>; Derek Kwok <dkwok@townofmedway.org>; Jeff Lynch <ChiefLynch@townofmedway.org>; **+3 others**

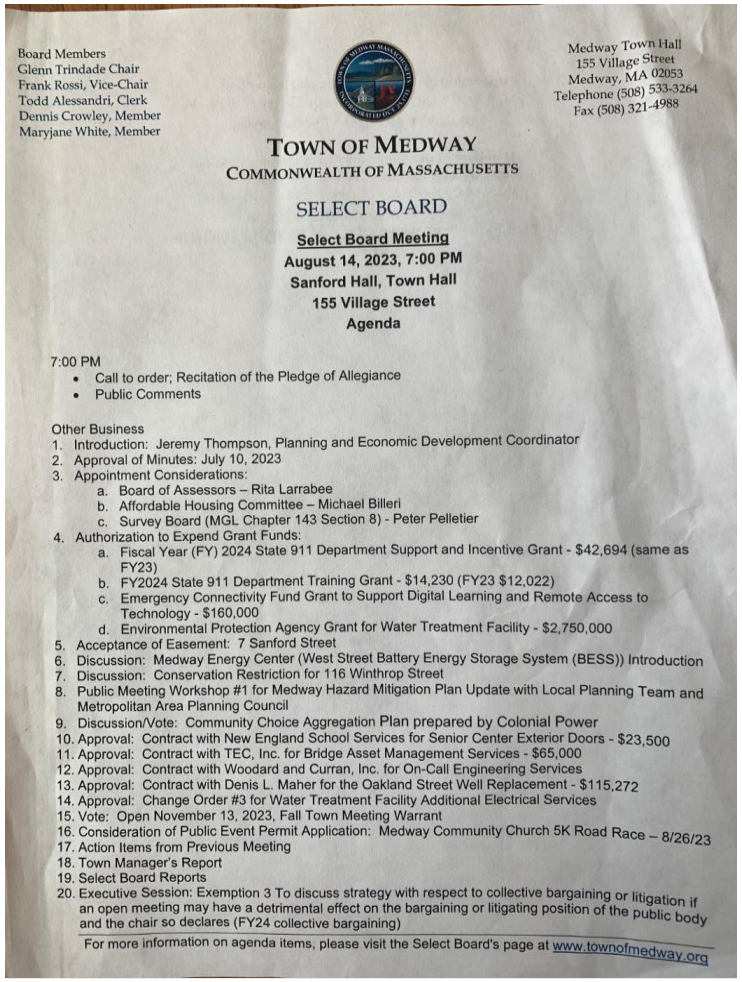
Tue 8/1/2023 12:57 PM

Good afternoon everyone,
I am reaching out on behalf of the Hazard Mitigation Planning Team (cc'd here).
During the August 14th Select Board meeting, we will be joined by the Metropolitan Area Planning Council (MAPC), who will facilitate the first of two public meetings to gather comments from the public on ways we can improve our hazard response and preparedness measures. As department heads or board/committee chairs, we are reaching out to you for your added expertise and thoughts. See the meeting information below, and if you are able to join, you are more than welcome! If not, please feel free to send me any comments or questions about the hazard mitigation plan update.

Thank you and hope to see you there!




Medway Hazard Mitigation Plan Update
Public Meeting
When: Monday, August 14th, 2023
7:00 PM
Where: This meeting will be held in person at Sanford Hall, Town Hall (155 Village St) and on
• Medway Cable Access - Channel 11 on Comcast Cable
• Medway Cable Access - Channel 35 on Verizon Cable
• https://www.facebook.com/medwaycable/
• https://livestream.com/medwaycableaccess/selectboard
Medway experiences natural hazard impacts including flooding and increasingly frequent and severe storms.
The Town is updating its Hazard Mitigation Plan to help assess vulnerability to natural hazards and identify strategies to increase the resilience of our community, infrastructure, and natural resources.
We want to hear from you! Join us to share your experiences and recommendations.
If you have any questions or comments, please email Stephanie Carlisle, Sustainability Coordinator, at scarlisle@townofmedway.org
MAPC
Medway
MASSACHUSETTS



Board Members
Glenn Trindade Chair
Frank Rossi, Vice-Chair
Todd Alessandri, Clerk
Dennis Crowley, Member
Maryjane White, Member

Medway Town Hall
155 Village Street
Medway, MA 02053
Telephone (508) 533-3264
Fax (508) 321-4988

TOWN OF MEDWAY
COMMONWEALTH OF MASSACHUSETTS

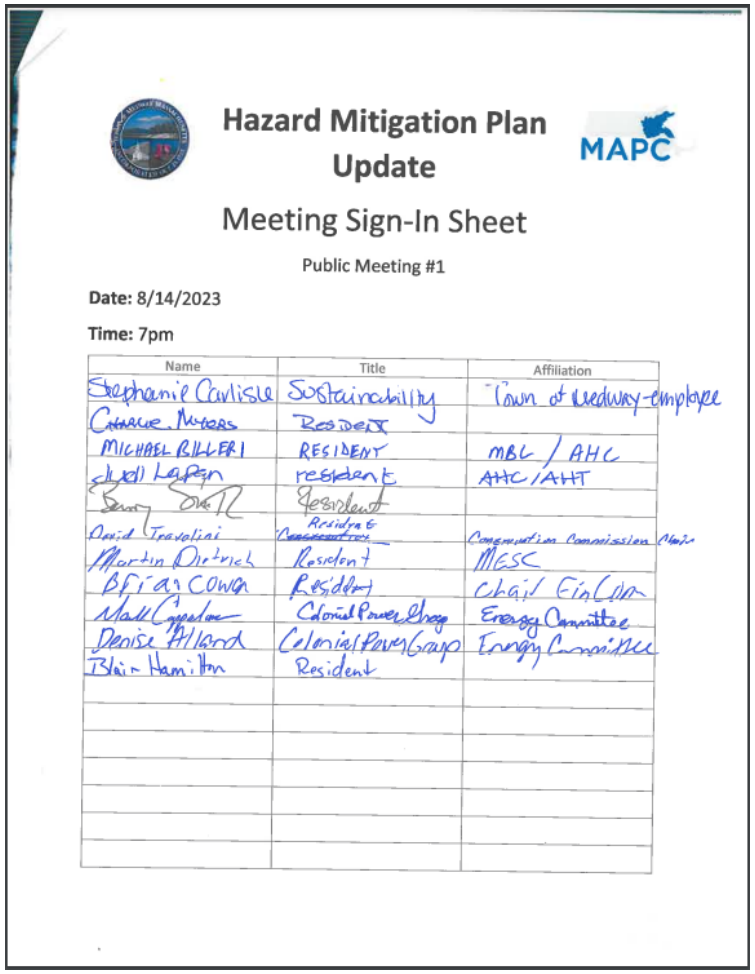
SELECT BOARD

Select Board Meeting
August 14, 2023, 7:00 PM
Sanford Hall, Town Hall
155 Village Street
Agenda

7:00 PM
- Call to order; Recitation of the Pledge of Allegiance
- Public Comments

Other Business
1. Introduction: Jeremy Thompson, Planning and Economic Development Coordinator
2. Approval of Minutes: July 10, 2023
3. Appointment Considerations:
   a. Board of Assessors – Rita Larrabee
   b. Affordable Housing Committee – Michael Billeri
   c. Survey Board (MGL Chapter 143 Section 8) - Peter Pelletier
4. Authorization to Expend Grant Funds:
   a. Fiscal Year (FY) 2024 State 911 Department Support and Incentive Grant - $42,694 (same as FY23)
   b. FY2024 State 911 Department Training Grant - $14,230 (FY23 $12,022)
   c. Emergency Connectivity Fund Grant to Support Digital Learning and Remote Access to Technology - $160,000
   d. Environmental Protection Agency Grant for Water Treatment Facility - $2,750,000
5. Acceptance of Easement: 7 Sanford Street
6. Discussion: Medway Energy Center (West Street Battery Energy Storage System (BESS)) Introduction
7. Discussion: Conservation Restriction for 116 Winthrop Street
8. Public Meeting Workshop #1 for Medway Hazard Mitigation Plan Update with Local Planning Team and Metropolitan Area Planning Council
9. Discussion/Vote: Community Choice Aggregation Plan prepared by Colonial Power
10. Approval: Contract with New England School Services for Senior Center Exterior Doors - $23,500
11. Approval: Contract with TEC, Inc. for Bridge Asset Management Services - $65,000
12. Approval: Contract with Woodard and Curran, Inc. for On-Call Engineering Services
13. Approval: Contract with Denis L. Maher for the Oakland Street Well Replacement - $115,272
14. Approval: Change Order #3 for Water Treatment Facility Additional Electrical Services
15. Vote: Open November 13, 2023, Fall Town Meeting Warrant
16. Consideration of Public Event Permit Application: Medway Community Church 5K Road Race – 8/26/23
17. Action Items from Previous Meeting
18. Town Manager's Report
19. Select Board Reports
20. Executive Session: Exemption 3 To discuss strategy with respect to collective bargaining or litigation if an open meeting may have a detrimental effect on the bargaining or litigating position of the public body and the chair so declares (FY24 collective bargaining)

For more information on agenda items, please visit the Select Board's page at www.townofmedway.org



Hazard Mitigation Plan Update

MAPC

Meeting Sign-In Sheet

Public Meeting #1

Date: 8/14/2023

Time: 7pm

Name	Title	Affiliation
Stephanie Carlisle	Sustainability	Town of Medway-employee
Chance Myers	Resident	
MICHAEL BILLERI	RESIDENT	MBL / AHC
Heidi Lapan	resident	AHC / AHT
[illegible]	Resident	
David Travalini	Resident & Conservation Agent	Conservation Commission Chair
Martin Dietrich	Resident	MESC
Brian COWA	Resident	Chair EnCom
Matt Coppedge	Colonial Power Group	Energy Committee
Denise Allard	Colonial Power Group	Energy Committee
Blair Hamilton	Resident	

I'm responding to the Friends of Medway post about updates to the Hazard Mitigation Plan, requesting resident comments about natural hazard experiences related to extreme weather events.

Here's a little history of our experiences that may be of significance for the Hazard Mitigation Plan for Medway's future weather challenges.

We have lived in Medway since 1991 with property that abuts the wetlands parallel to Winthrop Street.

After the first 7 years of living here, one late March we experienced clear ground water entering our basement. As a result, we had a small sump pump installed. It was adequate, although several times we had issues with the pump and water entered again at least twice.
All cleanup was at our expense, of course. The pump often began operating in early spring when snow melt and rain added to the groundwater before leaves began sprouting to absorb some of the groundwater.

About 5+ years ago Eversource notified residents that the utility planned to turn off electricity in order to perform some type of service in our area, this at a time when we were experiencing heavy spring rains.

I contacted Eversource and told them that many residents rely on sump pumps during periods of excess precipitation in spring and that it was poor timing to turn off electricity since doing so could cause basement flooding for some residents if their sump pumps couldn't operate. I was informed that the Eversource schedule couldn't be changed.

Given that scenario my husband and I, both retirees, had to rent a portable generator, rig up electrical cords to reach from the sump pump's motor, across the basement to the bulkhead, and out to the yard where the generator was located.

We rehearsed how we would unplug the sump pump when power was cut and attach the pump's cord to the extension cord leading to the portable generator in the yard. Then we waited during the 2-3 hour window when power was to be off. However, power was never turned off and later we received a robo call that the planned work was canceled.

Imagine our reaction. So much effort and expense for nothing. I will add that we were able to appeal our generator rental expense to Eversource and we got a refund.
Nevertheless, we were in our 60s and it was no easy task lifting and transporting a heavy portable generator, setting it up in the yard under a tarp supported by two ladders to protect the generator from the rain, then taking it back to 495 Rentals. Add to that the gasoline needed to prep and to power it.
And the generator, ironically, had a sign warning that it shouldn't be used in wet conditions.
(See photos)

Because our electricity here goes off randomly, as it did yesterday for a short time in the rain storm, and because we were seeing our sump pump go on more often, not just in springtime, we have made several large and costly preventative investments.

We installed a 20K Koehler Whole House Generator outside and a TripleSafe Sump Pump System with back-up battery in the basement. This provides peace of mind as we age knowing that we no longer have to worry about what would happen if we lost electricity when the pump was engaged causing

basement flooding to recur. And cleaning up a flooded basement is also costly, time-consuming, and requires a lot of effort.

Since getting the new sump pump system we've seen it operate for a long stretch in June during heavy rains and also in the fall. This didn't used to be the case until the past 10 years or so.

Another issue on my radar relates to monitoring the condition of older trees near homes. Massachusetts has had several weak tornados this year. As these events and high winds unfold we see a lot of damage from snapped pines and uprooted trees in our state. Many very close to dwellings.

In 2018 my husband by chance noticed that a huge split-trunk oak tree on our property had cracked to the ground, likely due to rot caused by water seeping into the crack over many years; one of the trunks within reach of the house. Since this was a dangerous situation, a tree company came to us immediately to remove the tree. (See photos)

I narrate my observations because, though anecdotal, our experiences over our three decades in Medway seem to validate that our climate is edging away from stability.

What are the best strategies to increase resilience to natural hazards?

I would advocate for an education awareness campaign so residents know more about preparing for and confronting future threats.

Informational Facebook posts are not enough. Too many residents aren't on Facebook's Friends of Medway feed. Many residents don't know what's going on in town. Not all residents share knowledge from a community newspaper, either.

I propose an informational mailing to all Medway addresses.
Topics might include:

- Tips on how to examine one's property to assess threats posed by extreme weather.
- Advice on trees, especially large pines and split-trunk oaks, to monitor them and determine if they are healthy or too close to homes during threats posed by wind.
- Suggestions on whether woodland foliage should be cut back a certain distance from houses to create buffers and reduce wild fire threats during droughts like that of the summer of 2022.
- Information on which types of insurance policies better protect home owners from weather-related damage and how certain types of insurance cover losses.
- Grants or funding to assist low income residents who may lack resources when weather events affect their homes.
- Important town contacts and telephone numbers on whom to call for help.

Thanks very much for requesting comments from residents.

[TO INSERT OUTREACH FOR PUBLIC MEETING #2]

XVIII. APPENDIX E: PLAN ADOPTION

Certificate to Document Adoption of the
Hazard Mitigation Plan Update
By the SelectBoard

[INSERT SELECTBOARD ADOPTION LETTER]

XIX. APPENDIX F: FEMA PLAN REVIEW TOOL

The FEMA Plan Review Tool itemizes the features of the plan that meet each of FEMA's requirements for Hazard Mitigation Plans contained in the federal regulations at 44 CFR §201.6

The Plan Review Tool also includes comments and suggestions from FEMA on how the plan could be improved and strengthened in the future. The Town should consider these comments when it reviews and updates the plan. Also included are lists of available resources and funding for hazard mitigation.

The Plan Review Tool is included in this Appendix to incorporate it this plan for future reference.

LOCAL MITIGATION PLAN REVIEW TOOL