NORTHBOROUGH HAZARD MITIGATION PLAN

Wachusett Aqueduct Bridge, Northborough, Massachusetts

Adopted by the Select Board on August 4th, 2025

Prepared by

Local Hazard Mitigation Team

Town of Northborough, Massachusetts

&

Central Massachusetts Regional Planning Commission

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CERTIFICATE ADOPTION
SELECT BOARD
TOWN OF NORTHBOROGH, MASSACHUSETTS

A RESOLUTION ADOPTING THE *NORTHBOROUGH HAZARD MITIGATION PLAN*

WHEREAS, the Town of Northborough established a Committee to prepare the 2025 update of the *Northborough Hazard Mitigation Plan*; and

WHEREAS, the updated *Northborough Hazard Mitigation Plan* contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Northborough; and

WHEREAS, duly-noticed public meetings were held by the LOCAL HAZARD MITIGATION PLANNING TEAM on July 15, 2024; and August 4, 2025

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

NOW, THEREFORE BE IT RESOLVED that the Town of Northborough SELECT BOARD adopts the 2025 update of the *Northborough Hazard Mitigation Plan*, in accordance with M.G.L. 40 or the charter and bylaws of the Town of Northborough.

ADOPTED AND SIGNED this day, August 4, 2025

Julianne S. Hirsh, Chair

Laura Ziton, Vice Chair

Michael Tietjen, Clerk

Jonathan Rea, Member

Jacob Jones, Member

This Certificate of Adoption helps meet the following FEMA local mitigation plan requirements:

- *F1. "For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance?" (Requirement 44 CFR § 201.6(c)(5)).*

ACKNOWLEDGEMENTS

This Acknowledgements section helps meet the following FEMA local mitigation plan requirements:

- *A1. "Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))"*

This Hazard Mitigation Plan (HMP) update was funded by the Federal Emergency Management Agency (FEMA) via the Massachusetts Emergency Management Agency (MEMA). This report was prepared for the community of Northborough by the Central Massachusetts Regional Planning Commission (CMRPC).

The Northborough Select Board extends its thanks to participants in the Local Hazard Mitigation Team for their time and hard work in participating in this timely project. Core Team members include:

Brian Griffin, Police Department, Chief

Bill Griffin, Police Department, Lieutenant

Scott Charpentier, Department of Public Works, Director

David Parenti, Fire Department, Chief and Emergency Management Director

Neal Aspesi, Fire Department, Deputy Chief

Michael Parr, Fire Department / Local Emergency Planning Committee, Hazmat Assistant

Vincent Vignaly, Conservation Commission, Conservation Agent

Laurie Connors, Planning Department, Director

Robert Fredrico, Building Department, Inspector of Buildings / Zoning Enforcement Officer

Michael Seager, Health Department, Health Agent

William Lyver, Police Department, Chief (former)

CMRPC would also like to thank Administration Department Executive Assistant Lynda LePoer and Fire Department Administrative Assistant Lorraine Thompson for their help throughout the HMP update process.

In addition, thanks are extended to the staff of the Central Massachusetts Regional Planning Commission for process facilitation and preparation of this document.

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Thanks are also due to the Massachusetts Emergency Management Agency (MEMA) for guidance and feedback regarding this plan.

Contents

1.0 INTRODUCTION

1.1 DISASTER MITIGATION PLAN

Congress enacted the Disaster Mitigation Act of 2000 (DMA 2000) on October 10, 2000. Also known as the Stafford Act Amendments, this bill was signed into law by President Clinton on October 30, 2000, creating Public Law 106-390. The law established a national program for pre-disaster mitigation and streamlined the federal administration of disaster relief. Specific rules on the implementation of DMA 2000 were published in the Federal Register in February 2002 and required that all communities must have a Hazard Mitigation Plan in place in order to qualify for future federal disaster mitigation grants following a Presidential Disaster Declaration. Hazard Mitigation Plans emphasize measures that can be taken to reduce or prevent future disaster damage caused by natural hazards. In the context of natural hazard planning, Pre-Disaster Mitigation refers to any action that permanently reduces or eliminates long-term risks to human life and property.

1.2 PLAN PURPOSE

Section 1.2 helps meet the following FEMA local mitigation plan requirements:

- *A1. "Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction?" (Requirement 44 CFR § 201.6(c)(1))*

This plan identifies the natural hazards facing the Town of Northborough, assesses the vulnerabilities of the Town's critical facilities, infrastructure, residents, and businesses to these hazards, and presents recommendations to mitigate the adverse effects of these hazards.

New England weather is renowned for its mercurial and dramatic nature. Late summer hurricanes, major winter blizzards, and summer droughts are all experienced in Central Massachusetts. These natural hazards occur frequently enough to be familiar scenes to residents of Northborough. The negative effects of these natural hazards on the built environment can lead these events to be classified as natural disasters. As climate change continues to progress, the severity and frequency of natural hazard risk will increase.

This planning effort has drawn on the knowledge of local municipal officials and residents. The recommendations presented in the following report are intended to be realistic and practical steps for mitigating natural hazards and preparing Northborough as best as possible for the effects of climate change. Implementation of these actions will translate into savings – fewer lives lost, less property destroyed, and less disruption to essential services and ecological systems.

1.3 PLANNING PROCESS

Section 1.3 helps meet the following FEMA local mitigation plan requirements:

- *A1. "Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction?" (Requirement 44 CFR § 201.6(c)(1));*
- *A2. "Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process?" (Requirement 44 CFR § 201.6(b)(2)); and*
- *A3. "Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval?" (Requirement 44 CFR § 201.6(b)(1))*

This Plan is funded through a Fiscal Year 2023 Pre-Disaster Mitigation grant to the Town of Northborough from the Federal Emergency Management Agency (FEMA) through the Massachusetts Emergency Management Agency (MEMA).

The planning process in Northborough was composed of two distinct but related phases:

1. data collection and technical review, and
2. public input and planning.

The identification of natural hazards impacting the Town of Northborough was accomplished through a review of available information from various sources. These sources included federal and state reports and datasets, existing plans, and in some cases engineering documents. An assessment of risks and vulnerabilities was performed primarily using geographic information systems (GIS) to identify the infrastructure (critical facilities, public buildings, roads, neighborhoods, etc.) at the highest risk of being damaged by hazards, particularly flooding. Local knowledge as imparted by Town officials, staff, emergency management volunteers, and others was a critical element of this phase.

The second phase of the planning process was focused on outreach, public participation and input, and planning. This phase was critical to fostering awareness of the process among a wide range of local officials, coordinating updates to different plan elements in ways that included important stakeholders, and providing opportunities for public comment and input from a representative base of residents and other stakeholders, including community lifelines, in Northborough. Through community engagement, CMRPC was better able to gauge community priorities for mitigation and understand local resources as well as existing policies and procedures. With information from this phase of the planning process in hand, the local planning team was able to develop an informed list of mitigation strategies for the Town.

The Northborough Hazard Mitigation Planning team, consisting of local staff, included:

Brian Griffin, Police Department, Chief

Bill Griffin, Police Department, Lieutenant

Scott Charpentier, Department of Public Works, Director

David Parenti, Fire Department, Chief and Emergency Management Director

Neal Aspesi, Fire Department, Deputy Chief

Michael Parr, Fire Department / Local Emergency Planning Committee, Hazmat Assistant

Vincent Vignaly, Conservation Commission, Conservation Agent

Laurie Connors, Planning Department, Director

Robert Fredrico, Building Department, Inspector of Buildings / Zoning Enforcement Officer

Michael Seager, Health Department, Health Agent

William Lyver, Police Department, Chief (former)

To discuss hazard areas, critical infrastructure and other assets, and plan priorities and strategies, the Hazard Mitigation Planning team met six times on July 31st, 2023, September 25th, 2023, December 12th, 2023, March 5th, 2024, May 8th, 2024, and August 2nd, 2024. Between meetings and during development of the draft and final plans, information and comments were shared among the local team and CMRPC. On January 4th, 2024, the Hazard Mitigation Planning team launched a public survey to gauge resident, worker, visitor, and business owner concerns about and experiences with natural hazards in Town. The survey was distributed on the Town's website and social media pages, the survey was advertised through the town news subscription, the Northborough public schools family communication, and flyers for and paper copies of the survey were distributed around Town, including at the town hall, senior center, public library, fire station, and police station. A total of 213 responses were collected. Survey responses were discussed by the local planning team at its May 2024 meeting and helped inform the development and prioritization of the plan's mitigation strategies. Representatives from the surrounding communities of Berlin, Boylston, Marlborough, Shrewsbury, Southborough, and Westborough were invited to comment on the draft plan during the public comment period in an effort gather input from surrounding communities who might have shared interests or concerns. As planning activities progressed, a public presentation was made by CMRPC and the local planning team on July 15th, 2024 at a Northborough Select Board meeting to provide a summary of key aspects of the draft plan report then being finalized. The presentation was televised on the local cable access channel, and the opportunity for public comment was emphasized during this presentation. Materials and notes from this presentation and the public comment period are included in Appendix D and Appendix E, respectively. A full draft plan was provided to the Town for distribution and made available online at CMRPC's website for public comment for two weeks from July 15th, 2024 through July 29th, 2024. In addition, the final draft plan was distributed to officials in all neighboring communities for review and input regarding shared hazards. Feedback from Select Board members during the public presentation and from several town residents during the public comment period was received. This feedback was considered and, where deemed appropriate by the local planning team, incorporated as final edits were made to the plan.

The final draft plan was submitted to MEMA for review on October 8th, 2024, and was then relayed to FEMA for federal review. After receipt of FEMA's notice of approval pending adoption on May 8th, 2025, the plan was formally adopted by vote of the Board at the August 4th, 2025 meeting of the Select Board.

The Northborough Planning Board is the primary Town agency responsible for regulating development in town. Feedback to the Planning Board was ensured through the participation of the Town Planner on the local hazard mitigation planning team. In addition, CMRPC, which is the State-designated Regional Planning Agency (RPA) for Northborough, works with all agencies that regulate development in its region; these agencies that CMRPC works with include both the municipal entities listed above and state agencies such as the Department of Conservation and Recreation (MassDCR) and the Department of Transportation (MassDOT). The regular collaboration between CMRPC and these municipal entities and state agencies ensured that the operational policies of and any mitigation strategies or hazards identified by these entities and agencies were incorporated in this Northborough Hazard Mitigation Plan.

The engagement of a diverse array of representatives, stakeholders, community lifelines, and organizations during the planning process promoted the creation of mitigation strategies for local recovery and resilience efforts in town. This hazard mitigation planning process included stakeholders from a broad range of sectors both inside and outside of local government. The inclusion of these stakeholders in the planning process is a critical step towards ensuring equitable, effective, and comprehensive risk reduction outcomes.

The following community lifelines were sent the full draft plan during the public comment period for their review and input. FEMA defines community lifelines as "the most fundamental services in the community that, when stabilized, enable all other aspects of society to function.[1]" In addition, these community lifelines were sent a survey in which they could describe any concerns related to natural hazards in Northborough they have as well as how they would like to participate in the Northborough HMP planning process. Nine of these community lifelines responded to this survey, and their input was considered by CMRPC and the HMP planning team in town during the planning process. This survey is shown in Appendix B.

Safety and Security Lifelines:

- National Grid
- Lakeside Oil Co. (Richard's Oil)
- Northborough Oil Co.
- Osterman Propane

Food, Water, and Shelter Lifelines:

- Melican Middle School
- Wegman's
- American Red Cross
- Coleman House
- Whitney Place
- Northborough Housing Authority Properties
    - Heritage Village
    - Rutland Road
    - Colonial Village
    - Centre Drive
- Memory Care Units at 38-43 King Street (have not yet been developed, are in the design / permitting phase)
- The Bridge of Central Mass
- Teamworks, Inc.
- AMEGA
- Cornerstone Academy
- Goddard School

[1] FEMA, "Local Mitigation Planning Policy Guide," FEMA.gov, Federal Emergency Management Agency, April 19, 2022, page 17, https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-policy-guide_042022.pdf.

- Nativity Nursery School
- Skribbles Learning Center, LLC
- St. Bernadette's School
- Church of Christ
- Church of the Nativitiy
- First Parish Unitarian Church
- Jehovah Witness Church
- Rice Memorial Baptist Church
- Seventh Day Adventist Church
- Shri Gurusthan Sai Temple
- St. Bernadette's Church
- St. Rose of Lima Church
- Trinity Church
- Advocates, INC
- BJ's Wholesale Club
- Cumberland Farms
- Econolodge
- Walmart
- Bartlett Crossing
- Cold Harbor Mall
- Marketplace at 318 Main Street
- Northborough Crossing Mall
- Shopping Center at 292 Main Street
- Shopping Center at 276 West Main Street
- Shopping Plaza at 265 West Main Street
- Time Square Plaza

Health and Medical Lifelines:

- Carewell
- Pedi Q
- CVS Minute Clinic
- All Care Plus Pharmacy

Communications Lifelines:

- Crown Castle
- Verizon

Transportation Lifelines:

- CSX Rail Line

Hazardous Materials Lifelines:

- National Grid (Tier 2)
- Lakeside Oil Co. (Richard's Oil) (Tier 2)
- Northborough Oil Co. (Tier 2)
- Crown Castle (Tier 2)
- Verizon (Tier 2)
- A. Duie Pyle (Tier 2)
- Amazon (Tier 2)
- Bigelow Nurseries inc. (Tier 2)
- BJ's Wholesale Club (Tier 2)
- BJ's Wholesale Club, gas station (Tier 2)
- FedEx Freight (Tier 2)
- FedEx Ground (Tier 2)
- Iron Mountain (Tier 2)
- Juniper Hill Golf Course (Tier 2)
- Kimball Sand (Tier 2)
- Lowe's Pro Supply (Tier 2)
- Max Finkelstein, Inc. (Tier 2)
- McKesson Corporation (Tier 2)
- NewCorr Pkg (Tier 2)
- Northborough Oil (Tier 2)
- Richards / Lakeside Oil (Tier 2)
- Saint-Gobain (Tier 2)
- Sanofi Genzyme (Tier 2)
- STERIS (Tier 2) – In their community lifelines survey response, STERIS noted that they have had issues with power outages/surges during the summer months and severe weather.
- Trelleborg Sealing Solutions (Tier 2)

Emergency Shelter Lifelines:

- Melican Middle School

2.0 Community Profile and Development Trends

2.1 Regional and Community Profile

The Central Massachusetts Regional Planning Commission (CMPRC) region occupies roughly 1,000 square miles in the southern two-thirds of Worcester County, Massachusetts. The City of Worcester, which is the second-largest city in Massachusetts and New England with a population of 206,518 according to the 2020 United States Census, is relatively in the central part of the region. Nearly 588,141 people live in the CMRPC Region, of whom 15,741 reside in Northborough.[2]

The CMRPC region is bordered to the west by the Central Massachusetts uplands, to the south by Rhode Island and Connecticut, to the east by the Boston metropolitan area, and to the north by the Montachusett region in northern Worcester County. The forty-community region has been divided for planning purposes into six sub-regions, as determined by shared characteristics and roadway corridors. Northborough is located in the northeast sub-region consisting of 5 towns located to the east and northeast of Worcester, including: Berlin, Boylston, Northborough itself, Shrewsbury, and Westborough.

Massachusetts has a humid continental climate, with maritime influences increasing from northwest to southeast. According to the National Oceanic and Atmospheric Association's National Weather Service, between 2000 and 2024, the Worcester, MA area saw monthly mean temperatures ranging from 15.1 degrees Fahrenheit in January to 74.7 degrees Fahrenheit in July.[3] According to this same source, between 2003 and 2023, average annual precipitation in the Worcester, MA area has been relatively high at 51.43 inches,[4] and, between 1999-2000 and 2023-2024, average annual snowfall has been 70.7 inches.[5] Approximately 30 miles from the Atlantic coast, Northborough and its neighboring communities are subject to a variety of types of severe storms, including hurricanes, nor'easters, thunderstorms, and blizzards.

The Town of Northborough, Massachusetts was incorporated in 1766. Northborough is situated along several major east-west corridors which help connect Boston to Worcester and western Massachusetts. Interstate 290 runs across the north of town, while US Route 20 runs across the town from the east, through downtown, and to the southwest. State Route 9 crosses the southwest corner

[2] "P1: Race," Data.Census.gov, United States Census Bureau, accessed June 21, 2024, https://data.census.gov/table?q=northborough%20town%20Massachusetts.

[3] These Worcester area temperature estimates are based on data recorded at a weather station at Worcester Regional Airport.
"Monthly Mean Avg Temperature for Worcester Area, MA (ThreadEx)," Weather.gov, National Oceanic and Atmospheric Association National Weather Service, accessed September 11, 2024, https://www.weather.gov/wrh/Climate?wfo=box.

[4] These Worcester area precipitation estimates are based on data recorded at a weather station at Worcester Regional Airport. The calculation of this average does not incorporate data from the year 2021, as precipitation data for January 2021 is missing for this station.
"Monthly Total Precipitation for Worcester Area, MA (ThreadEx)," Weather.gov, National Oceanic and Atmospheric Association National Weather Service, accessed September 11, 2024, https://www.weather.gov/wrh/Climate?wfo=box.

[5] These Worcester area snowfall estimates are based on data recorded at a weather station at Worcester Regional Airport.
"Monthly Total Snowfall for Worcester Area, MA (ThreadEx)," Weather.gov, National Oceanic and Atmospheric Association National Weather Service, accessed September 11, 2024, https://www.weather.gov/wrh/Climate?wfo=box.

of the Town, where there is an interchange between it and Route 20, while State Route 135 runs from the Town's border with Westborough north to the town center, where it terminates. Northborough is known in the region for its quality schools and large, desirable businesses. Its employment base is healthy: as of May 2024, 7,920 Northborough residents were employed[6] and, as of 2021, 9,343 people were employed in Northborough.[7] Northborough is bordered by Berlin to the north, Boylston and Shrewsbury to the west, Westborough to the south, and Marlborough and Southborough to the east.

Northborough has a total area of 18.8 square miles and a population of 15,741.[8] According to CMRPC's Long Range Transportation Plan (LRTP), Northborough's population is projected to continue growing.[9] Northborough is expected to grow by approximately 24% between 2020 and 2050, reaching 19,502 residents. The number of residents in town nearly tripled from 3,122 to 9,218 between 1950 to 1970; The Town's population has grown by at least 10% each decade between 1970 and 2020, except for between 2000 and 2010, when it only grew by around 1%.[10] According to the 2020 US Census, 76.7% of Northborough's population identifies as white, 11.9% of the Town's population identifies as Asian, 1.4% of the Town's population identifies as Black or African American, 2.3% of the Town's population identifies as some other race, and 7.5% of the town's population identifies as belonging to two or more races.[11] In addition, according to the 2020 Census, about 4.0% of Northborough residents identify as Latino or Hispanic. According to the 2020 US Census, 22.8% of the Town's population is under 18 years old, while 16.9% of the population is 65 years and over.[12]

The median age in town, according to the 2020 US Census, is 42.5 years old, which is comparatively higher than the State's median age of 39.9[13] At $160,801, median household annual income in Northborough (according to 2022 American Community Survey 5-year estimates) is significantly higher than the State's median household annual income of $96,505 and Worcester County median household annual income of $88,524.[14] The poverty rate in town (according to 2022 ACS 5-year estimates) is 3.8%, less than half of the State's and Worcester County's poverty rates of,

[6] Massachusetts Department of Economic Research, "Municipal Employment Data: Northborough - 2010," lmi.dua.eol.mass.gov, March 2024, https://lmi.dua.eol.mass.gov/lmi/MunicipalEmploymentData/LmiTown?A=000269.

[7] "Work Area Profile Analysis: Workers: Employed in Northborough town (Worcester, MA)," Onthemap.ces.census.gov, United States Census Bureau, accessed July 22, 2024, https://onthemap.ces.census.gov/.

[8] "P1: Race," Data.Census.gov

[9] Central Massachusetts Metropolitan Planning Organization. "2050 Connections: 2024 Long Range Transportation Plan for the Central Massachusetts Metropolitan Planning Organization," Cmrpc.org, Central Massachusetts Regional Planning Commission, July 19, 2023, page III-5, https://cmrpc.org/wp-content/uploads/2024/05/2050-Connections-Endorsed-Document.pdf.

[10] "Northborough," Cmrpc.org, Central Massachusetts Regional Planning Commission, accessed June 21, 2024, https://cmrpc.org/data-center/community-snapshots/northborough/.

[11] "DP1: Profile of General Population and Housing Characteristics," Data.Census.gov, United States Census Bureau, accessed June 21, 2024, https://data.census.gov/table?q=dp1%20northborough%20town%20ma.

[12] Ibid

[13] Ibid

[14] "S1903: Median Income in the Past 12 Months (in 2022 Inflation-Adjusted Dollars)," Data.Census.gov, United States Census Bureau, accessed June 21, 2024, https://data.census.gov/table/ACSST5Y2022.S1903?q=ACS%20Massachusetts%20s1903&g=050XX00US25027_060XX00US2502746820.

respectively, 9.9% and 10.0%.[15] With a median value of owner-occupied housing units of $548,400 according to 2022 ACS 5-year estimates, housing costs in Town are relatively higher compared to in the State and to Worcester County, whose comparable numbers are $483,900 and $363,200, respectively.[16] According to 2022 ACS 5-year estimates, 84.9% of occupied homes in town are single-family homes (detached or attached), and 15.1% are multi-unit structures.[17] With a 3.5% vacancy rate according to the 2020 US Census, the vacancy rate in Northborough is relatively lower than the comparable rates in the State and Worcester County, which are 8.3% and 5.7%, respectively.[18] Most homes in town are relatively new, with only 9.9% of them being built before 1940 according to 2022 ACS 5-year estimates.[19]

[15] "S1701: Poverty Status in the Past 12 Months," Data.Census.gov, United States Census Bureau, accessed June 21, 2024, https://data.census.gov/table/ACSST5Y2022.S1701?q=ACS%20Massachusetts%20s1701&g=050XX00US25027_060XX00US2502746820.

[16] "DP04: Selected Housing Characteristics," Data.Census.gov, United States Census Bureau, accessed June 21, 2024, https://data.census.gov/table/ACSDP5Y2022.DP04?q=ACS%20Massachusetts%20dp04&g=050XX00US25027_060XX00US2502746820.

[17] "S2504: Physical Housing Characteristics for Occupied Housing Units," Data.Census.gov, United States Census Bureau, accessed June 21, 2024, https://data.census.gov/table/ACSST5Y2022.S2504?q=ACS%20Massachusetts%20s2504&g=050XX00US25027_060XX00US2502746820.

[18] "DP1: Profile of General Population and Housing Characteristics," Data.Census.gov.

[19] "S2504: Physical Housing Characteristics for Occupied Housing Units," Data.Census.gov.

2.2 Development Trends

Section 2.2 helps meet the following FEMA local mitigation plan requirements:

- *C1. "Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs?" (Requirement 44 CFR § 201.6(c)(3)); and*
- *E1. "Was the plan revised to reflect changes in development?" (Requirement 44 CFR § 201.6(d)(3))*

Table 1: Town of Northborough Development Projects between 2018 - 2024

Name	Status	Permitting Year	Housing Units	Commercial SQ Feet	Project Type
1 & 2 family	Complete	2018-2024	51	NA	Single Family & Two-Family Homes
301 Bartlett St.	Complete	2019	0	220,000	Warehouse / Distribution Facility
330 Bartlett St.	Complete	2022	0	330,000	Warehouse / Distribution Facility
350 Bartlett St.	Complete	2022	0	330,000	Warehouse / Distribution Facility
150 Hayes Memorial Dr.	Complete	2020	0	150,000	Warehouse / Distribution Facility
1008 Shops Way	Complete	2024	0	3,600	School of Rock
50-52 SW Cutoff	Complete	2022	0	16,000	Contractor Condos
442 W. Main St.	Complete	2023	0	4,600	Office Building
66 Lyman St	Complete	2021	0	70,000	Addition to Paper/Box Company
25 West Main St	Complete	2023	0	4,400	Addition to Existing Commercial Site for Retail and Medical Uses
9 Monroe St	Complete	2019	0	8,000	Business Offices
455 Whitney Street	Complete	2023	0	4,500	Expansion of Existing Light Manufacturing Facility
5 Goddard Rd.	Complete	2022	0	8,700	Contractor Yard
273 Southwest Cutoff	Complete	2021	0	4,700	Dental Facility
400 Cedar Hill St	Complete	2022	0	50,000	Indoor Soccer Facility

Table 2: Town of Northborough Potential Future Development

Name	Status	Year Permitted	Housing Units	Municipal / Commercial / Industrial SQ Feet	Project Type
0 Newton Street	Permitted	2014	8	0	Common Driveway for Single-family Homes
85 & 95 West Street	Permitted	2021	5	0	Common Driveway for Single-family Homes
90 West Main Street	Under Construction	2021	3	3,440	Mixed Use Development
1 Lyman Street	Permitted	2021	0	20,232	Warehouse
39-43 King Street Assisted Living Facility	Permitted	2021	88	0 (services for clients may be available)	Assisted Living Facility
0 Bartlett Street	Permitted	2023	0	150,900	Warehouse / Distribution Facility
89 West Main St	Under Construction	2020	7	4,700	Mixed Use Development
300 Bartlett Street	Permitted	2023	0	22,999	Expansion of Existing Trucking Terminal & Maintenance Facility
75 Ridge Road	Under Construction	2023	3	0	Common Driveway for 3 Single Family Homes
61 & 65 West Main Street	Permitted	2024	0	30,000	Municipal Fire Station

The Town of Northborough is a suburban town with large business districts along the several major highways that cross the Town. These features of the Town's character contribute to ongoing development and redevelopment patterns throughout the Town. There are a few municipal, commercial, and industrial development projects currently underway in Town. The most noteworthy project is the 150,900 square foot distribution center approved for 0 Bartlett Street in 2023; the total size of this site is 66.16 acres. The project at 300 Bartlett Street is an expansion of the already existing Fed-Ex Distribution facility. All subdivisions and new developments in town are rigorously reviewed by the Planning Board, Fire Department, Police Department, Zoning Board of Appeals, and Design Review Committee, as well as any other applicable departments, boards, and committees, to ensure that new construction complies with bylaws and ensures emergency vehicle access.

A few residential construction projects are currently under construction in town. Residential development in town has slowed considerably over the last several years when compared to the housing boom of 1970-2000, when housing growth averaged 854 dwelling units per year.

Between 2018 and 2023, 49 new construction residential building permits were issued by the Town. During the 10-year period between 2013 and 2023, the Town issued only 152 new construction residential building permits, with an average of 15 permits being issued per year. The vast majority of dwelling units built during this period were single family homes along existing roadways or served by newly constructed common driveways.

Table 3: Number of New Construction Residential Building Permits Issued by Year in Northborough[20]

Year	Single Family Permits	Attached Single-family Permits	Multi-family / Mixed Use	All Permits
2018	11	0	1	12
2019	6	0	0	6
2020	8	0	0	8
2021	10	0	0	10
2022	6	0	1	7
2023	5	1	0	6
2018-2023 Total	46	1	2	49

Recent development in Northborough has slightly increased the Town's overall vulnerability to natural hazards, as 15 of the 59 properties which have been developed since 2018 have buildings in locally identified hazard areas and/or the FEMA 100-year and/or 500-year flood zones. 12 of these properties have buildings located in locally identified flooding hazard areas, 3 of these properties have buildings located in locally identified wildfire hazard areas, 2 of these properties have buildings located in locally identified severe snowstorm / ice storm / nor'easter hazard areas, and 1 of these properties has a building located in the 100-year and/or 500-year flood zones.

If a development is formally approved by the appropriate boards and departments, due consideration should be given to the protection of natural resources. If resilience measures are implemented in construction, new development can decrease the Town's vulnerability to natural hazards or prevent an increase in the Town's vulnerability to natural hazards. The clearing of brush and trees lessens the chance of wildfires near new development, buried powerlines can reduce risk of power loss from storm events, and the usage of flood control measures such as drainage structures, rain gardens, swales and berms can reduce flood hazard risks in an area. However, new development built without the inclusion of hazard mitigation and resiliency in mind can increase the Town's vulnerability to natural hazards; Building within the floodplain or close to the wildland interface, removing native plants, and draining wetlands can all greatly exacerbate natural hazard risks to life and property. Standardizing the incorporation of resilience measures in new development will be especially important in Northborough as climate change leads to increased natural hazard risk in town and if the pace of residential development in town increases. According to the Executive Office of Housing and Livable Communities, this would mean taking into account hazards more intentionally at the local and state level when considering housing or community investments and creating new initiatives that invest in adaptive measures. In addition, the state and municipalities must consider seriously the option of relocation or retreat

[20] "Housing Unit Building Permits for: NORTHBOROUGH TOWN, MA," Socds.huduser.gov, United States Department of Housing and Urban Development, accessed September 16, 2024, https://socds.huduser.gov/permits/.

from the areas of highest vulnerability.[21]

An increase in storm runoff in localized areas of town caused by new development is possible, and proper drainage infrastructure is necessary to mitigate disruption to surrounding properties, wetlands, streams, and aquifers caused by development-induced runoff. During the modern construction process, erosion control measures are installed to prevent the sedimentation of surface water resources, stormwater drainage facilities are installed to mimic undeveloped conditions and cleanse contaminants, trees are trimmed back from structures and power lines, utility lines are installed underground, roads are built wide enough to allow emergency vehicles to enter, modern building codes are followed, and setbacks from wetlands are required.

The Town, including various responsible boards and commissions, should ensure that new development processes take potential and known hazards into account and ensure that the mitigation of hazards occurs when needed. Northborough utilizes various methods to ensure that new development conforms with current Massachusetts General Laws as well as the Town's Bylaws. The Planning Board, Conservation Commission, and Zoning Board of Appeals (ZBA) in town consider water resource and open space preservation in decision making and, in the case of the ZBA, when hearing and deciding on appeals. This consideration includes specific evaluation criteria that are relevant to natural hazards – including requirements for preventing and mitigating flooding and stormwater impacts. The Town's Bylaws are amended and updated on an as needed basis to adapt to the needs of and the shifting forces that affect the Town.

New development in Northborough needs to be in line with the state building code. In addition, on July 1st, 2017, Northborough codified a Stretch Energy Code based on the International Energy Conservation Code (IECC) 2009 building code created by the International Code Council.[22] This Stretch Energy Code provides a more energy efficient alternative to the base energy code for both new construction and existing buildings in Northborough, strengthening the town's climate resilience and hazard mitigation capabilities.

As the population of Northborough continues to grow and additional development occurs, officials should seek to further integrate hazard mitigation practices into the Town's planning and development processes. In 2020, the Town of Northborough updated its Master Plan as well as its Open Space and Recreation Plan; these planning processes gave the Town an opportunity to identify threats and prioritize strategies to address them. Climate change, according to current predictions, will lead to an increase in extreme storm events, including more rain in shorter amounts of time. Planning for the future impacts of climate change is imperative to protecting the citizens of Northborough.

[21] HOUSING ADVISORY COUNCIL, "A HOME FOR EVERYONE: A Comprehensive Housing Plan for Massachusetts 2025 – 2029," Mass.gov, Executive Office of Housing and Livable Communities, 2025, https://www.mass.gov/doc/a-home-for-everyone/download.

[22] "Massachusetts Building Energy Code Adoption by Municipality," Mass.gov, Massachusetts Department of Energy Resources, May 28, 2024, https://www.mass.gov/doc/building-energy-code-adoption-by-municipality/download.

3.0 Critical Facilities and Vulnerable Populations

A critical facility is defined as a building, structure, or location which:

- is vital to hazard response efforts,
- currently helps protect the community from hazards, and/or
- would create a secondary disaster if a hazard were to impact it.

3.1 Critical Facilities Within Northborough

This Critical Facilities List for the Town of Northborough has been created through the utilization of several online sources, several planning documents, and the knowledge and expertise of the local HMP planning team in town.

Planning documents and online resources which inform this plan include:

- Northborough's Comprehensive Emergency Management Plan,
- MassGIS data on dams,
- Massachusetts Department of Early Education and Care data on childcare facilities,
- Massachusetts Historical Commission data on historic sites,
- Employment data from the Massachusetts Department of Economic Research and the Massachusetts Department of Education, and
- Critical infrastructure mapping undertaken by CMRPC under contract with the Central Region Homeland Security Advisory Council, which is charged by the Executive Office of Public Safety and Security to administer and coordinate the State Homeland Security Grant for central Massachusetts.

Northborough's Local Hazard Mitigation Planning Team has broken up this list of critical facilities into four categories:

- Emergency response facilities needed in the event of a disaster,
- Non-emergency response facilities that have been identified by the local HMP planning team (these facilities are not required in an emergency response event, but are considered essential for the everyday operation of Northborough),
- Dams, and
- Facilities that serve vulnerable populations and/or which the Town wishes to protect in the event of a disaster.

Critical infrastructure and facilities are mapped in Appendix A.

3.2 Category 1 – Emergency Response Facilities

The Town has identified emergency response facilities and services as the highest priority facilities and services to protect in instances of natural and man-made hazards.

Table 4: Emergency Response Facilities in Northborough

Type	Name	Address	Details	Has Emergency Generator?
Emergency Operations Center/Police Station	Northborough Police Department/EOC	211 Main Street	This facility has been noted as vulnerable by the HMP local planning team in town	Yes
Fire Station	Fire Station	11 Pierce Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
Communications Facilities	Police/Fire Receiver, Fire Department Repeater	9000 Shops Way	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Voter and Tower – Radio	79 Bartlett Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Voter – Radio	300 Ball Street	This facility has been noted as vulnerable to locally identified flooding and winter storm hazards by CMRPC's GIS analysis.	No
	Voter	300 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Tower – Government	25 Gale Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Tower – Rooftop	456 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Tower	386 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No

Type	Name	Address	Details	Has Emergency Generator?
Communications Facilities (cont.)	Tower	119 Colburn Street	This facility has been noted as vulnerable to locally identified wildfire hazards by CMRPC's GIS analysis.	No
	Cell Tower	119 Bearfoot Road	This facility has been noted as vulnerable to locally identified wildfire hazards by CMRPC's GIS analysis.	No
	Cell Tower	211 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Cell Tower – Boylston Emergency Management	351 Ball Street	This facility has been noted as vulnerable to locally identified flooding and winter storm hazards by CMRPC's GIS analysis.	No
	Verizon	125 High Street, Oliver Tower Floor 2, Shrewsbury	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Crown Castle	273 Southwest Cutoff	This facility has been noted as vulnerable to locally identified flooding hazards by CMRPC's GIS analysis.	No
DPW Facilities	DPW Offices	63 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	DPW Barn / Highway Garage	190 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes, but this generator only covers 1/3rd of this facility and does not cover the fuel island.
	DPW Water Barn	200 School Street at Brigham Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	MA Highway Depot	138 Lawrence Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No

Type	Name	Address	Details	Has Emergency Generator?
Emergency Shelters	Robert E Melican Middle School	145 Lincoln Street	This shelter does not have air conditioning and is in a low-lying area which frequently floods. It has been noted as vulnerable to locally identified flooding hazards by CMRPC's GIS analysis.	Yes
	Econolodge	380 Southwest Cutoff	This facility is a temporary emergency shelter. It has been noted as vulnerable to locally identified flooding hazards by CMRPC's GIS analysis.	No
Primary Evacuation Routes	I-290	I-290	This route has been noted as vulnerable to locally identified wildfire hazards by CMRPC's GIS analysis. The route also crosses locally identified flooding and winter storm hazard areas as well as the 1% and 0.2% flood zones.	N/A
	Belmont Street / MA-9	Belmont Street / MA-9	The western part of this route has been noted as vulnerable to locally identified flooding hazards by CMRPC's GIS analysis and by the HMP local planning team in town.	N/A
	Church Street	Church Street	This route has been noted as vulnerable to locally identified wildfire hazards by CMRPC's GIS analysis. The route also crosses locally identified flooding and winter storm hazard areas as well as the 1% and 0.2% flood zones.	N/A

Type	Name	Address	Details	Has Emergency Generator?
Primary Evacuation Routes (cont.)	Main Street	Main Street	This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses a locally identified dam failure hazard area and the 1% flood zone and comes very near to the 0.2% flood zone.	N/A
	West Main Street	West Main Street	This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified flooding, severe storm, and wildfire hazard areas and it comes very near to the 1% flood zone.	N/A
	Southwest Cutoff/US-20	Southwest Cutoff/US-20	This route has been noted as vulnerable to locally identified flooding hazards by CMRPC's GIS analysis and by the HMP local planning team in town. The route also crosses locally identified severe storm hazard areas and comes very near to the 1% flood zone.	N/A
	South Street/MA-135	South Street/MA-135	This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified dam failure and severe storm hazard areas as well as the 1% flood zone.	N/A
	Bartlett Street	Bartlett Street	This route has been noted as vulnerable by CMRPC's GIS analysis because a portion of it lies along a locally identified dam failure hazard and the 1% flood zone.	N/A

Type	Name	Address	Details	Has Emergency Generator?
Primary Evacuation Routes (cont.)	Crawford Street	Crawford Street	This route has been noted as vulnerable by CMRPC's GIS analysis because it intersects locally identified flooding hazard areas, a locally identified wildfire hazard area, and the 1% flood zone; it also crosses very near to the 0.2% flood zone.	N/A
Critical Bridges, Intersections, and Sites	Bridge	27 Allen Street	This bridge has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.	N/A
	Bridge	10 Church Street	This bridge has been noted as vulnerable to a locally identified wildfire hazard by CMRPC's GIS analysis. It is also within the 1% flood zone.	N/A
	Bridge – CSX Rail Line	55 Lyman Street	This bridge has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.	N/A
	Bridge – CSX Rail Line	12 Rice Avenue	There are no noteworthy concerns regarding natural hazard impacts on this bridge.	N/A
	Bridge – CSX Rail Line	429 Whitney Street	There are no noteworthy concerns regarding natural hazard impacts on this bridge.	N/A
	Bridge	418 Davis Street	This bridge has been noted as vulnerable to a locally identified severe storm hazard by CMRPC's GIS analysis. It is also within the 1% flood zone.	N/A

Type	Name	Address	Details	Has Emergency Generator?
Critical Bridges, Intersections, and Sites (cont.)	Bridge – I-290 Overpass	202 Brewer Street	This bridge has been noted as vulnerable to locally identified flooding and wildfire hazards by CMRPC's GIS analysis. It is also near the 1% flood zone.	N/A
	Culvert – MA-135	370 South Street at Davis Street	This culvert has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.	N/A
	Bridge – US-20	410 Main Street	This bridge has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.	N/A
	Crawford Street Stone Bridge	349 Crawford Street	This bridge has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.	N/A
	Church Street & I-290	370-500 Church Street	This site has been noted as vulnerable to locally identified flooding and wildfire hazards by CMRPC's GIS analysis. It is also in the 1% flood zone.	N/A
	Hudson Street at Marlborough Boundary	405 Hudson Street	This site has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis. It is also near the 1% flood zone.	N/A
	Hudson Street & Solomon Pond Road	348 Hudson Street	There are no noteworthy concerns regarding natural hazard impacts on this site.	N/A
	US-20 at Marlborough Boundary	493 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this site.	N/A

Type	Name	Address	Details	Has Emergency Generator?
Critical Bridges, Intersections, and Sites (cont.)	MA-135 & West Main Street	5 West Main Street	This site has been noted as vulnerable to a locally identified wildfire hazard by CMRPC's GIS analysis.	N/A
	US-20 / West Main Street & Church Street	36 West Main Street	This site has been noted as vulnerable to a locally identified wildfire hazard by CMRPC's GIS analysis and by the local HMP planning team in town.	N/A
	US-20 & West Main Street	290 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this site.	N/A
	MA-135 at Westborough Boundary	370 South Street	This site has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.	N/A
	Solomon Pond Road & I-290	North of 35 Solomon Pond Road	There are no noteworthy concerns regarding natural hazard impacts on this site.	N/A
	West Main Street at Shrewsbury Boundary	540 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this site.	N/A
	68 Otis Street	68 Otis Street	There are no noteworthy concerns regarding natural hazard impacts on this site.	N/A
	MA-135 at Town line	363 South Street	There are no noteworthy concerns regarding natural hazard impacts on this site.	N/A
	I-290 overpass at Whitney Street	309-328 Whiney Street	This site has been noted as vulnerable to a locally identified wildfire hazard by CMRPC's GIS analysis.	N/A

Type	Name	Address	Details	Has Emergency Generator?
Critical Bridges, Intersections, and Sites (cont.)	MA-9 & Southwest Cutoff	333-380 Southwest Cutoff	There are flooding issues at this interchange. This site has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis and by the local HMP planning team in town.	N/A
Urgent Cares	Pedi-Q Urgent Care	10002a Shops Way	This facility has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.	No
	Carewell Urgent Care	333 Southwest Cutoff	This facility has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.	Yes
	CVS Urgent Care	24 West Main Street	This facility has been noted as vulnerable to a locally identified wildfire hazard by CMRPC's GIS analysis.	No

3.3 Category 2 – Non-Emergency Response Facilities

The Town has identified these facilities as non-emergency facilities; however, they are considered essential for the everyday operation of Northborough.

Table 5: Non-Emergency Response Facilities in Northborough

Type	Name	Address	Details	Has Emergency Generator?
Water Supply	Assabet Hill 3.5 MG Storage Tank	25 Gale Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Edmunds Hill 1 MG Storage Tank	16 Edmunds Way	This facility has been noted as vulnerable to a locally identified wildfire hazard by CMRPC's GIS analysis.	No
	DPW Water Barn	200 School Street at Brigham Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Former MWRA Connection	177A Hudson Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	MWRA Connection	See maps in Appendix A	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Well – Public	See maps in Appendix A	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Well – Public	See maps in Appendix A	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Well – Public	See maps in Appendix A	This facility has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.	No
	Well – Public	See maps in Appendix A	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Cistern	52 Moore Lane	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Cistern	60 Old Colonial Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Draft Site	32 Colburn Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Draft Site	222 Green Street	This facility has been noted as vulnerable to locally identified flooding and wildfire hazards by CMRPC's GIS analysis.	No

Type	Name	Address	Details	Has Emergency Generator?
Water Supply (cont.)	Draft Site	4 Hillside Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Draft Site	109 Howard Street	This facility has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.	No
	Draft Site	424 Howard Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Draft Site	5 Howe Lane	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Draft Site	90 Maynard Street	This facility has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.	No
	Draft Site	320 Newton Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Draft Site	2 Tomblin Hill Road	This facility has been noted as vulnerable to locally identified flooding hazards by CMRPC's GIS analysis.	No
	Draft Site	261 West Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Draft Site	2 Smith Road	This facility has been noted as vulnerable to locally identified flooding and wildfire hazards by CMRPC's GIS analysis.	No
	Draft Site	37 Fisher Street	This facility has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.	No
	Draft Site	309 Ball Street	This facility has been noted as vulnerable to locally identified flooding and winter storm hazards by CMRPC's GIS analysis.	No
	Draft Site	55 Bearfoot Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Draft Site	65 West Street / Pond at Roadside	This facility has been noted as vulnerable to locally identified flooding hazards by CMRPC's GIS analysis. It is also near the 1% flood zone.	No

Type	Name	Address	Details	Has Emergency Generator?
Water Supply (cont.)	Draft Site	257 West Street / Pond 625 Feet from West Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Aqueduct – Hultman	N/A	This facility has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified wildfire and dam failure hazard areas as well as the 1% and 0.2% flood zones.	No, but this aqueduct does not need an emergency generator because it is gravity powered and is connected to MWRA facilities which have emergency power.
	Aqueduct – Cosgrove	N/A	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No, but this aqueduct does not need an emergency generator because it is gravity powered and is connected to MWRA facilities which have emergency power.
Sewer	Wastewater Pump Station	79 Bartlett Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Wastewater Pump Station	119 Bearfoot Road, at Senior Center	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Wastewater Pump Station	11R Church Street	This facility has been noted as vulnerable to a locally identified wildfire hazard by CMRPC's GIS analysis.	Yes

Type	Name	Address	Details	Has Emergency Generator?
Sewer (cont.)	Wastewater Pump Station	30 Forbes Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Wastewater Pump Station	282 Hudson Street	This facility has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.	Yes
	Wastewater Pump Station	76 Lincoln Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Wastewater Pump Station	75 Otis Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Wastewater Pump Station	306 Southwest Cutoff	This facility has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.	Yes
	Wastewater Pump Station	101 Wesson Terrace	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Wastewater Pump Station	63 Main Street, at Town Hall	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
	Booster Pump Station	Church Street at Autumn Lane	This facility has been noted as vulnerable to a locally identified wildfire hazard by CMRPC's GIS analysis.	Yes
	Booster Pump Station	Southwest Cutoff at Shops Way	This facility has been noted as vulnerable to locally identified flooding hazards by CMRPC's GIS analysis. It is also close to the 1% and 0.2% flood zones.	Yes
	Sewer Station	235 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
Town Facilities	Town Hall	63 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes, the generator is new as of 2024 and only covers half of the building.

Type	Name	Address	Details	Has Emergency Generator?
Town Facilities (cont.)	Senior Center	119 Bearfoot Road	This facility has been noted as vulnerable to a locally identified wildfire hazard by CMRPC's GIS analysis. It is also close to the 0.2% flood zone.	Yes, but the generator only powers half of the building and does not cover the building's heating and cooling system.
	Cable Access TV	79 Bartlett Street, at Algonquin Regional High School	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Northborough Free Library	34 Main Street	This facility has been noted as vulnerable to a locally identified dam failure hazard by CMRPC's GIS analysis.	No
Utilities	CSX Rail Line	360 Cedar Hill Street, at Marlborough city line	This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified wildfire and dam failure hazards as well as the 1% and 0.2% flood zones.	No
	Railroad dock – private	66 Lyman Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	CSX Rail Line Crossing	175 Bearfoot Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	CSX Rail Line Crossing	100 Brigham Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	CSX Rail Line Crossing	15 Main Street	This site has been noted as vulnerable to a locally identified dam failure hazard by CMRPC's GIS analysis.	No
	CSX Rail Line Crossing	31 Pierce Street	This site has been noted as vulnerable to a locally identified dam failure hazard by CMRPC's GIS analysis.	No
	CSX Rail Line Crossing	50 School Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No

Type	Name	Address	Details	Has Emergency Generator?
Utilities (cont.)	Crown Castle	119 Colburn Street	This facility has been noted as vulnerable to a locally identified wildfire hazard by CMRPC's GIS analysis.	No
	Verizon	11 School Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	National Grid Service Center	55 Bearfoot Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	National Grid Woodside	193 Hudson Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Natural Gas Line	Belmont Street	This facility has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.	No
	Northborough Oil Co.	247 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Lakeside Oil Co.	244 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Tradebe Treatment and Recycling	345 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
Natural Resources and Natural Resource Protection Organizations	Central Massachusetts Mosquito Project	111 Otis Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
Miscellaneous	U.S. Post Office	235 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No

3.4 Category 3 – Dams[23]

The third category of critical infrastructure sites in this plan is a listing of dams in Northborough and dams relevant to Northborough.

Table 6: Dams in / of Concern Relating to Northborough

National ID	Dam Name	Owner	Regulatory Authority	Hazard Code	Notes
MA00959	Bartlett Pond Dam	Public – Town of Northborough	Office of Dam Safety	Low Hazard	This dam has been noted as vulnerable to a locally identified dam failure hazard by CMRPC's GIS analysis.
MA00995	Assabet River Dam	Private	Office of Dam Safety	Significant Hazard	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA00996	Cold Harbor Brook Dam	Public – MA Department of Conservation and Recreation (DCR)	Office of Dam Safety	High Hazard	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is extremely close to the 1% flood zone.
MA00998	Hop Brook Dam	Public – MA Department of Conservation and Recreation (DCR)	Office of Dam Safety	High Hazard	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone and is close to a locally identified flooding hazard. This dam is planned to be rebuilt; a design for the rebuilding of the dam is currently underway.
MA00999	Smith Pond Dam	Private	Office of Dam Safety	Low Hazard	There are concerns that this dam may fail.
MA01234	Northborough Reservoir Dam	Public – Town of Northborough	Office of Dam Safety	Significant Hazard	This dam is owned by the Town of Northborough, is located in Shrewsbury and Boylston, and is planned to be partially removed. Massachusetts DCR Dam and Seawall Grant, local water enterprise fund, and state earmark funding have been secured to use for the partial removal of this dam.

[23] "MassGIS Data: Dams," Mass.gov, Massachusetts Bureau of Geographic Information, February 2012, https://www.mass.gov/info-details/massgis-data-dams.

National ID	Dam Name	Owner	Regulatory Authority	Hazard Code	Notes
MA02843	Old Mill Pond Dam	Private	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this dam.
MA02845	Wallace Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable to a locally identified dam failure hazard by CMRPC's GIS analysis.
MA02846	Old Saw Mill Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02847	Old Adams Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02848	Small Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02849	Ellis Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02850	Storage Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02851	Cider Mill Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02852	Old Mill Pond Dam	Private	Non-Jurisdictional - Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this dam.
MA02853	Farm Pond Dam	Private	Non-Jurisdictional - Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this dam.
MA02854	West Meadow Country Club Pond Dam	Private	Non-Jurisdictional - Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.

For additional information on dams and the dam failure hazard in Northborough, also see Chapter 4.

3.5 Category 4 – Facilities/Populations to Protect

The fourth category of critical infrastructure sites in this plan is facilities that serve vulnerable populations and/or which the Town wishes to protect in the event of a disaster.

Table 7: Facilities and Populations to Protect in Northborough

Type	Name	Address	Details
Facilities for People with Special Needs, Apartment Complexes, Assisted Living Facilities, and Housing Authority Properties	Beaumont/Whitney Place	238 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Coleman House	112 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	The Bridge of Central Mass	59 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Avalon Bay Apartments	14 Avalon Drive	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Housing Authority – Heritage Village	5-19 Center Drive	This facility has been noted as vulnerable to a locally identified dam failure hazard by CMRPC's GIS analysis.
	Housing Authority – Rutland Road	2 Rutland Road	This facility has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.
	Housing Authority – Colonial Village	26 Village Drive	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Housing Authority / Advocates Inc.	152 East Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Northborough Manor	39 Pleasant Street	This facility is extremely close to the 1% and 0.2% flood zones.
	Otis Street Adult Daycare	155 Otis Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Memory Care Facility	43 King Street	This facility has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis. It is also close to the 0.2% flood zone.
	Tougas Family Farm Worker Dorm	234 Ball Street	This facility has been noted as vulnerable to locally identified flooding and winter storm hazards by CMRPC's GIS analysis.

Type	Name	Address	Details
Facilities for People with Special Needs, Apartment Complexes, Assisted Living Facilities, and Housing Authority Properties (cont.)	Alcohol / Substance Recovery Center	144 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Alcohol / Substance Recovery Center	150 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Luther Rice Home	81 Lincoln Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Justice Resource Institute Developing Abilities	453 Whitney Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Community Resources for Justice	490 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Residential Board and Care – Vinfen Group Home	165 Howard Street	This facility has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.
	Residential Board and Care – Advocates Inc.	178 South Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Residential Board and Care – Advocates Inc.	29 Thoreau Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Residential Board and Care – Advocates Inc.	342 Boundary Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Residential Board and Care	8 Saddle Hill Drive	This facility is close to the 1% and 0.2% flood zones.
	Residential Board and Care – Mentor Neuro Restorative	6 Leland Drive	There are no noteworthy concerns regarding natural hazard impacts on this facility.
Services	TeamWorks, Inc.	185 Otis Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
Schools/Daycares[24]	Melican Middle School	145 Lincoln Street	This facility has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.
	Algonquin Regional High School	79 Bartlett Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Fitzgerald Institute	261 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.

[24] "Licensed Child Care Search," Childcare.Mass.gov, Massachusetts Department of Early Education and Care, accessed June 21, 2024, https://childcare.mass.gov/findchildcare.

Type	Name	Address	Details
Schools/Daycares (cont.)	Lincoln Street School	76 Lincoln Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Peaslee School	31 Maple Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Proctor School	26 Jefferson Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	St. Bernadette's School	266 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Marion E. Zeh School	33 Howard Street	This school is located in a flood zone. This facility has been noted as vulnerable to locally identified flooding and winter storm hazards by CMRPC's GIS analysis.
	Cornerstone Academy	5 Oak Avenue	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Goddard School	10 Davis Street	This facility has been noted as vulnerable to a locally identified severe storm hazard by CMRPC's GIS analysis.
	Nashoba Montessori School, Inc.	40 Church Street	This facility has been noted as vulnerable to locally identified flooding, winter storm, and wildfire hazards by CMRPC's GIS analysis.
	Amego, Inc.	71 Lyman Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Northborough Extended Day Program	76 Lincoln Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Northborough Extended Day Program	26 Jefferson Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Skribbles Learning Center, LLC	348 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Skribbles Learning Center, LLC	325 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.
	Nativity Nursery School	45 Howard Street	This facility has been noted as vulnerable to locally identified flooding and winter storm hazards by CMRPC's GIS analysis. It is also near the 1% flood zone.
	Tiny Tomahawks - Algonquin Regional High School	79 Bartlett Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.

Type	Name	Address	Details
Schools/Daycares (cont.)	Aprende Spanish Immersion Daycare	300 West Main Street Building C	There are no noteworthy concerns regarding natural hazard impacts on this facility.
Faith Institutions	Church of Christ	456 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this church.
	Church of the Nativity	45 Howard Street	This church has been noted as vulnerable to locally identified flooding and winter storm hazards by CMRPC's GIS analysis. It is also near the 1% flood zone.
	First Parish Unitarian Church	40 Church Street	Structural work is needed for this church's steeple. This church has been noted as vulnerable to locally identified flooding, winter storm, and wildfire hazards by CMRPC's GIS analysis.
	Jehovah Witness Church	419 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this church.
	Rice Memorial Baptist Church	85 Lincoln Street	There are no noteworthy concerns regarding natural hazard impacts on this church.
	Seventh Day Adventist Church	30 Brigham Street	There are no noteworthy concerns regarding natural hazard impacts on this church.
	Shri Gurusthan Sai Temple	107 Otis Street	There are no noteworthy concerns regarding natural hazard impacts on this temple.
	St. Bernadette's Church	266 Main Street	There are no noteworthy concerns regarding natural hazard impacts on this church.
	St. Rose of Lima Church	244 West Main Street	There are no noteworthy concerns regarding natural hazard impacts on this church.
	Trinity Church	23 Main Street	This church has been noted as vulnerable to a locally identified dam failure hazard by CMRPC's GIS analysis.

Historic Buildings/Sites[25]	According to the Massachusetts Cultural Resources Information System (MACRIS) online database accessed in April 2024, there are 19 Areas, 322 Buildings, 2 Burial Grounds, 6 Objects, and 18 Structures listed in the MACRIS database in Northborough. 13 of these historic areas, 61 of these buildings, 1 of these burial grounds, 2 of these objects, and 8 of these structures lie within regulated or locally identified flood areas within town. The following historic sites were identified by the Northborough HMP Core Team as critical facilities or infrastructure: the Allen Street Bridge, the Church Street Stone Bridge, First Parish Unitarian Church, the Northborough Free Library, the Juniper Hill Golf Course Club House, the Northborough Historical Society building, the Northborough Town Hall, the Old Mill Pond Dam, the Route 9 Bridge over Route 20, Trinity Church, and the Wachusett Aqueduct.

[25] "Search Results," Mhc-macris.net, Massachusetts Historical Commission, accessed June 21, 2024, https://mhc-macris.net/queryresults.

Employment Centers

Based on data obtained from the Massachusetts Executive Office of Labor and Workforce Development (EOLWD)[26] and the Massachusetts Department of Elementary and Secondary Education[27] as well as the knowledge of local HMP committee members, the largest employers in Northborough are listed in the following table:

Table 8: Employment Centers in Northborough

Company name	Address	Number of Employees	NAICS Code
Wegmans	Shops Way	500-999	4451
Algonquin Regional High School	Bartlett St	100-249	6111
Aspen Aerogels Inc	Forbes Rd # B	100-249	4441
Bigelow Nurseries Inc	W Main St	100-249	5617
Boston Group	SW Cutoff # 100	100-249	5415
Home Instead	W Main St # 14	100-249	6216
Kohl's	Shops Way	100-249	4551
Lexus of Northborough	Belmont St	100-249	4411
St-Gobain Ceramics & Plastics	Goddard Rd	100-249	5417
Walmart Supercenter	Otis St # 2158	100-249	4551
Beaumont Rehabilitation	W Main St	50-99	6233
Bertucci's Corp	Otis St # 2	50-99	7223
Coldwell Banker Realty	Main St # 165	50-99	5312
Coleman House	W Main St	50-99	6233
DICK'S Sporting Goods	Shops Way	50-99	4591
Fedex Ground Economy	Beeman Rd	50-99	4841
Geological Survey United	Bearfoot Rd # 6	50-99	9211
Hope Group	Bearfoot Rd	50-99	4238
Isomedix Massachusetts Inc	Whitney St	50-99	5619
Juniper Hill Golf Course	Brigham St	50-99	7139
Lincoln Street School	Lincoln St	50-99	6111
Mainstreet Bank	W Main St	50-99	5221
Margaritas Mexican Restaurant	Shops Way	50-99	7225

[26] "Largest 100 Employers in Northborough," Lmi.dua.eol.mass.gov, Massachusetts Department of Economic Research, accessed June 21, 2024, https://lmi.dua.eol.mass.gov/LMI/LargestEmployersArea/LEAResult?A=05&GA=000269.

[27] "School and District Profiles: Search Results – Northborough," Profiles.doe.mass.edu, Massachusetts Department of Education, accessed August 12, 2024, https://profiles.doe.mass.edu/search/map.aspx?mode=g&county=Worcester&town=298.

Company name	Address	Number of Employees	NAICS Code
Mass Electric Construction Co	Bearfoot Rd	50-99	2382
Mc Kesson Corp	Lyman St	50-99	4242
Melican Middle School	Lincoln St	50-99	6111
Newcorr Packaging LP	Lyman St	50-99	3222
Omark Consultants Inc	W Main St # 4	50-99	2382
Peaslee Elementary School	Maple St	50-99	6111
Pepper's Fine Foods Catering	Hudson St	50-99	7223
Perimeter Brand Packaging	Main St # 190	50-99	3261
Premier Home Health Care Svc	W Main St	50-99	6216
Proctor Elementary School	Jefferson Rd	50-99	6111
TJ Maxx	Shops Way	50-99	4551
Toolmex Corp Inc	Talbot Rd	50-99	4237
Town of Northborough	Main St	50-99	6111
Viewpoint Sign & Awning	Lyman St # 1	50-99	3399
Zeh Elementary School	Howard St	25-49	6111

Environmental Justice and Vulnerable Populations

The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) Environmental Justice (EJ) Policy sets the state's definition for Environmental Justice areas. The policy states that EJ populations are groups within the larger populace that EEA has determined to be most at risk of being unaware of or unable to participate in environmental decision-making, to be most at risk of being unable to gain access to state environmental resources, or to be especially vulnerable. The policy also states that EJ areas are defined as U.S. Census Bureau census block groups (which are often the size of neighborhoods) that meet one or more of the following criteria:

- The annual median household income is not more than 65% of the statewide annual median household income (according to American Community Survey 2020 5-year estimate data);
- Minorities comprise 40% or more of the population (according to 2020 US Census data);
- 25% or more of households lack English language proficiency (according to American Community Survey 2020 5-year estimate data); or
- Minorities comprise 25% or more of the population and the annual median household income of the municipality in which the block group is located does not exceed 150% of the statewide annual median household income (according to 2020 US Census data and 2020 5-year estimate American Community Survey data, respectively).

According to the EEA, there are no Environmental Justice areas in Northborough.[28] Although there are no EJ areas in town, it is still important for the Town to consider EJ populations and other vulnerable community members in the hazard mitigation planning process. In Northborough, according to the 2020 US Census, 22.8% of the population is under the age of 18 and 16.9% of the population is 65 years and over.[29] According to 2022 ACS 5-year estimate data, approximately 16.4% of the population in town speaks a language other than English at home;[30] Approximately 8.7% of the population in Northborough has a disability according to this same data.[31] This 2022 ACS 5-year estimate data also shows that people without health insurance account for about 1.2% of Northborough's population[32] and that about 3.8% of the Town's population is living in poverty.[33]

Outreach to vulnerable community members was a vital part of the public outreach strategy for the Northborough Hazard Mitigation Plan. Paper HMP surveys were made available at the town hall, library, and senior center, and CMRPC staff conducted a presentation at a hybrid Select Board meeting in town during the planning process. These measures allowed residents who lack access to reliable Internet service and/or who have difficulty using the Internet to have a chance to complete the survey as well as hear about the planning process. The public presentation for the draft plan was also televised on local cable access TV.

[28] "Massachusetts 2020 Environmental Justice Populations," Mass-eoeea.maps.arcgis.com, Massachusetts Executive Office of Energy and Environmental Affairs, November 12, 2022, https://mass-eoeea.maps.arcgis.com/apps/webappviewer/index.html?id=1d6f63e7762a48e5930de84ed4849212.

[29] "DP1: Profile of General Population and Housing Characteristics," Data.Census.gov.

[30] "S1601: Language Spoken at Home," Data.Census.gov, United States Census Bureau, accessed June 21, 2024, https://data.census.gov/table?q=s1601%20northborough%20town.

[31] "S1810: Disability Characteristics," Data.Census.gov, United States Census Bureau, accessed June 21, 2024, https://data.census.gov/table?q=s1810%20northborough%20town.

[32] "S2701: Selected Characteristics of Health Insurance Coverage in the United States," Data.Census.gov, United States Census Bureau, accessed June 21, 2024, https://data.census.gov/table?q=s2701%20northborough%20town.

[33] "S1701: Poverty Status in the Past 12 Months," Data.Census.gov.

4.0 HAZARD PROFILES, RISK ASSESSMENT, AND VULNERABILITIES

Sections 4.0-4.13 help meet the following FEMA local mitigation plan requirements:

- *A4. "Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information?" (Requirement 44 CFR § 201.6(b)(3));*
- *B1. "Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events?" (Requirement 44 CFR § 201.6(c)(2)(i);*
- *B2. "Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods?" (Requirement 44 CFR § 201.6(c)(2)(ii));*
- *C1. "Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs?" (Requirement 44 CFR § 201.6(c)(3));*
- *C2. "Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate?" (Requirement 44 CFR § 201.6(c)(3)(ii));*
- *C4. "Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?" (Requirement 44 CFR § 201.6(c)(3)(ii)); and*
- *E1. "Was the plan revised to reflect changes in development?" (Requirement 44 CFR § 201.6(d)(3))*

The following section of this plan includes a summary of natural hazards that have affected or could affect Northborough in the future. Natural hazards are weather-related, climate-related, or other environmental processes which threaten people's lives as well as property and/or other valuable assets to human society. By examining historical data on natural hazard occurrences, as well as future projections on how climate change will interact with natural hazards, it is possible to approximate the future risk of natural hazards.

Historical documents relating to natural hazard occurrences, discussions with local officials and emergency management personnel, available hazard mapping and databases, and weather-related databases were used to develop the following list of the most significant identified natural hazards which affect Northborough:

- Flooding
- Severe Snowstorms / Ice Storms/ Nor'easters
- Hurricanes
- Severe Thunderstorms / Wind / Tornadoes
- Wildfires
- Earthquakes
- Dam Failure
- Drought
- Extreme Temperatures
- Invasive Species
- Other Hazards

4.1 State-wide Overview of Hazards

4.1.1 Massachusetts State Hazard Mitigation and Climate Adaptation Planning

The state of Massachusetts under Governor Healy's administration has updated the 2018 State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) pursuant to Executive Order 569. The 2023 ResilientMass Plan updates and expands upon the previous SHMCAP and outlines how the state of Massachusetts must prepare strategies to prevent, respond to, and mitigate natural hazards.[34] This plan incorporates climate change adaptation into a state-level hazard mitigation plan. The plan is also the document which makes Massachusetts eligible for federal disaster recovery and hazard mitigation funding. The plan is effective under FEMA from September 12, 2023 to September 13, 2028. The Massachusetts SHMCAP is a useful model for incorporating considerations relating to the effects of climate change into the natural hazard mitigation planning process.

4.1.2 Climate Change Interactions

As part of the SHMCAP planning process, the state of Massachusetts performed a statewide analysis which detailed the effects of climate change on the cities and towns of Massachusetts. This analysis was included in the 2022 Climate Change Assessment, which detailed the impacts of climate change on the Central Region of Massachusetts (which includes 55 cities and towns) along with the other regions of the state. This report refocuses climate change impact assessment away from the specific hazards and towards how the most urgent of those hazards would affect the Region in the following sectors: Human, Infrastructure, Natural Environment, Governance, and Economy. The hazards identified as having the most urgent impacts for Central Massachusetts are **Extremes in Temperature and Precipitation**, with wide fluctuations in both precipitation extremes (including both flooding and droughts) as well as extremes in temperatures (both in extremely hot days becoming more prevalent, as well as extreme lows in temperature) being anticipated to having the greatest future risk to the Central Region across these sectors.

The State plan, while being comprehensive, places different priorities on the impacts of climate change and natural hazards than this Northborough municipal plan. These different priorities are based more on the specificities of local conditions in Northborough rather than any contradictions with the State's analysis, and this local hazard mitigation planning effort was informed by the state planning process.

The following descriptions provide an overview of climate change impacts on the five sectors identified in the 2022 Climate Change Assessment.

- **Human Impacts**: The assessment identified a **Reduction in Food Safety and Security** and **Health and Cognitive Effects** from extreme heat as the most urgent human sector climate change impacts for the Central Region. The reduction in food safety and security is likely to occur at all levels of production and distribution because of both extreme heat and extreme cold causing spoilage, power outages, and extremes in precipitation creating a more unpredictable environment for the growth of produce. According to multiple studies, reductions in crop yields across the state and within the Region are anticipated to occur; research has shown that key commodity crop yields in the Central Region could decline by 12 percent by 2030.[35] These impacts to the regional food supply chain are expected to be

[34] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs, accessed June 10, 2024, https://www.mass.gov/info-details/2023-resilientmass-plan.

[35] Estimates derived from application of data from the following two sources:

similar to impacts on state and national crop yields and food distribution patterns. While our food supply networks are currently anticipated to be able to withstand these shocks, the increases in food prices which these shocks will cause will correspondingly lead to an increase in food insecurity within the Central Region.

The impacts of extreme temperatures are also projected to have a significant impact on health and cognition within the Central Region, particularly in our more urbanized areas. Currently, three annual premature deaths are attributed to extreme temperature in the Region, but approximately 35 additional premature deaths per year are expected in the Region as a result of climate change by the end of the century,[36] assuming that no new mitigation measures are taken to reduce the threat of temperature extremes. The negative impacts of extreme heat on people's physical and cognitive health can cause declines in learning outcomes, declines in workplace productivity, and increases in the usage of and strain upon emergency rooms dealing with heat related illnesses and injuries.

Additional Human Sector impacts identified in the 2022 Massachusetts Climate Change Assessment include: **Increases in Mental Health Stressors; Increases in Vector Borne Disease Incidence and Bacterial Infections; Damage to Cultural Resources; Health Effects from Aeroallergens and Mold; Emergency Service Response Delays and Evacuation Disruptions; Health Effects of Extreme Storms and Power Outages; and Health Effects from Degraded Air Quality.**

- **Infrastructure Impacts**: The assessment identified the **Loss of Urban Tree Cover** and **Damage to Electric Transmission and Distribution Infrastructure** as the most urgent infrastructure sector climate change impacts for the Central Region. Urban Trees face a broad range of climate impacts and stressors, including increasing extreme weather activity, increasing threats from invasive pests and diseases, and reduced water and soil quality; All of these impacts and stressors correspond to an increased rate of tree mortality and therefore increased urban forest management costs for municipalities. Central Massachusetts has both urban and suburban centers where projected temperature increases make urban tree coverage particularly valuable at reducing the Heat Island Effect. A prime example of a community which could benefit from increased tree coverage is the City of Worcester, which is the state's second most populous city. 75 percent of the City's area falls within state-designated environmental justice block groups, but the City has relatively low canopy coverage and is at disproportionate risk for urban tree loss.[37]

USEPA, "Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment," U.S. Environmental Protection Agency, 2017, EPA 430-R-17-001; Robert H. Beach et al., "Climate change impacts on US agriculture and forestry: benefits of global climate stabilization," *Environmental Research Letters* 10, no. 9 (2015). doi:10.1088/1748-9326/10/9/095004.

[36] Estimates derived from application of David Mills et al., "Climate change impacts on extreme temperature mortality in select metropolitan areas in the United States.," *Climatic Change* 131 (2014): 83-95. https://doi.org/10.1007/s10584-014-1154-8.

[37] "2022 Massachusetts Climate Change Assessment," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs and Massachusetts Emergency Management Agency, December 2022, https://www.mass.gov/doc/2022-massachusetts-climate-change-assessment-december-2022-volume-iii-regional-reports/download, pages RS36-RS37.

Across the Central Region, damage to electric transmission and distribution infrastructure is projected to cost orders of magnitude more in the coming decades, with additional annual costs projected to grow to $6 million by 2030; $12 million by 2050; $19 million by 2070; and $28 million by 2090.[38] These costs are anticipated to be caused by the need for repair activities in response to climate-related damages and failures, and they take into account a wide range of climate stressors beyond extremes in temperature and precipitation.

Additional Infrastructure Sector impacts identified in the 2022 Massachusetts Climate Change Assessment include: **Damage to Roads and Loss of Road Service; Reduction in Clean Water Supply; Increased Risk of Dam Overtopping or Failure; Loss of Energy Production and Resources; Damage to Inland Buildings; and Damages to Rails and Loss of Rail/Transit Service.**

- **Natural Environment Impacts**: The assessment identified **Freshwater Ecosystem Degradation** and **Forest Health Degradation** as the most urgent natural environment sector climate change impacts in the Central Region. Increased nutrient load and harmful algal bloom growth in freshwater ecosystems from increased precipitation runoff as well as increased concentrations of contaminants in these ecosystems under drought conditions are both exacerbated by climate extremes. In addition, shifts in habitat caused by increased average air and water temperatures especially threaten the cold-water habitats and fisheries of the Central Region.

  The effect of climate change on the Region's forests is harder to predict, but the potential for significant forest ecosystem loss in the Region caused by climate change cannot be understated. Statewide, a third of tree species are classified by the U.S. Forest Service as having low capacity for adapting to projected climate change, and an increased frequency of extreme events poses an additional threat to forests in the Central Region.[39]

  Additional Natural Environment Sector impacts identified in the 2022 Massachusetts Climate Change Assessment include: **Shifting Distribution of Native and Invasive Species and Soil Erosion.**

- **Governance Impacts**: As is true for other parts of the state, the assessment identified **Increase in Costs of Responding to Climate Migration**; an **Increase in Demand for State and Municipal Government Services**; and a **Reduction in State and Municipal Revenues** caused by climate change as the most urgent governance sector climate change impacts in the Central Region. Climate Migration, whether forced or voluntary, is already being felt

[38] Estimates derived from application of Charles Fant et al., "Climate change impacts and costs to U.S. electricity transmission and distribution infrastructure," *Energy*, 195 (2020). https://doi.org/10.1016/j.energy.2020.116899.
[39] Estimates derived from application of US Forest Service Tree Atlas for Massachusetts.
Northern Research Station Landscape Change Research Group: Iverson, Peters, Prasad, Matthews. "Massachusetts - Climate Change Atlas Tree Species: Current and Potential Future Habitat, Capability, and Migration," Fs.usda.gov, United States Department of Agriculture Forest Service, September 2022, https://www.fs.usda.gov/nrs/atlas/combined/resources/summaries/states/Massachusetts.pdf; "Climate Change Atlas," Fs.usda.gov, United States Department of Agriculture Forest Service, accessed June 10, 2024, https://www.fs.usda.gov/nrs/atlas/combined/resources/summaries/states.

by Massachusetts communities; it has been identified by the state as an impact which causes major consequences and will be the most difficult climate change impact to adapt to in the Central Region. Urban centers, particularly in and around Worcester, as well as towns serviced by state and regional transit services, are likely to become receiving zones for climate migration based on the relative assessment of climate hazards nationwide. The new influx of population caused by climate migration is expected to increase demand for government services. The need to increase government expenditures to maintain the current level of service for the existing population in addition to climate migrants and refugees is expected to be a significant stressor for local governments. Increased needs for MassHealth, food security support, and emergency services are expected in the Central Region due to population growth caused by climate migration in addition to other climate change impacts.

Many climate change impacts are expected to be concentrated in low-income areas. Existing inequalities in the Region may become exacerbated if steps are not taken to prepare for these impacts, as an influx of climate migrants and refugees may increase demand for and place strain on public services.

An increase in natural hazard impacts due to climate change is expected to increase disruptions to State and municipal revenue generation in the Region; these disruptions may include property tax and sales tax losses caused by interruptions to business and the economy.

Additional Governance Sector impacts identified in the 2022 Massachusetts Climate Change Assessment include: **an Increased Need for State and Municipal Policy Review and Adaptation Coordination and Damage to Inland State and Municipal Buildings.**

- **Economic Impacts**: The assessment identified a **Reduced Ability to Work** and a **Decrease in Agricultural Productivity** caused by climate change as the most urgent economic sector climate change impacts in the Central Region. Both of these impacts relate to an increase in dangerous temperature extremes causing to a decrease in workers' abilities to work; these impacts also relate to other natural hazards affecting workers' abilities to get to the job safely and increases in illnesses among workers caused by primary or secondary effects of natural hazards and climate change. Workers in the Region in high-risk industries (those exposed to outdoor conditions) are projected to lose 31 hours of work per worker per year by 2050 and 128 hours of work per worker per year by 2090; these projected losses in work hours by the end of the century are the highest in the Commonwealth.[40]

  While the agricultural sector is a small part in the Central Region's economy, the impacts to this sector of the economy through climate change-induced lower crop yields have the potential to severely disrupt the local economy and regional food systems. Key commodity crop yields in the Central Region could decline by 12 percent by 2030 and by 14 percent by 2070; these declines in key commodity crop yields carry potentially disproportionate

[40] Estimates derived from application of Matthew Neidell et al., "Temperature and work: Time allocated to work under varying climate and labor market conditions," *PloS One*, 16, no. 8 (2021), https://doi.org/10.1371/journal.pone.0254224.

impacts on the local economies that rely on agricultural production and the individual farm workers and employers who work in this sector.[41]

Additionally, though not identified as the one of the most urgent economic sector climate change impacts in the Central Region in the state's assessment, the expected **Reduction in Availability of Affordably Priced Housing** has become a more prevalent issue since the assessment was released. As affordable properties are typically situated in more hazard-prone areas, climate change-induced natural hazard impacts may lead to a decrease in the supply of affordable housing over time. Also, as increases in demand for housing continue in the Region due to a disproportionate economic impact on working families from climate change-induced natural hazard, the overall resiliency of the Region to shocks will also decrease.

Additional Economic Sector impacts identified in the 2022 Massachusetts Climate Change Assessment include: **Damage to Tourist Attractions and Recreation Amenities and Economic Losses from Commercial Structure Damage and Business Interruptions.**

During the local Hazard Mitigation Planning process, the local HMP planning team in Northborough noted that their chief concerns related to the natural hazard impacts of climate change are extremes in precipitation in the form of rain or snow; these concerns are in concurrence with the state assessment.

4.1.3 Previous Federally Declared Disasters and Massachusetts State of Emergency Declarations in Worcester County

From 2018 to the present, the following Federally Declared Disasters and Massachusetts State of Emergency Declarations have occurred in Worcester County:

Table 9: Previous Federally Declared Disasters and Massachusetts State of Emergency Declarations in Worcester County[42]

Disaster Declaration	Disaster Type	Incident Period	Declaration Date
Massachusetts Severe Storms and Flooding (DR-4780-MA)	Flooding	September 11, 2023 - September 13, 2023	May 15, 2024
Massachusetts Hurricane Lee (EM-3599-MA)	Hurricane	September 15, 2023 - September 17, 2023	September 15, 2023
Shelter Capacity Crisis	Not a Natural Hazard	August 8, 2023 - Present	August 8, 2023

[41] Estimates derived from application of USEPA (2017) and Beach et al. (2015)

[42] "Disaster Declarations for States and Counties," FEMA.gov, Federal Emergency Management Agency, accessed September 16, 2024, https://www.fema.gov/data-visualization/disaster-declarations-states-and-counties; "State of Emergency Information," Mass.gov, Massachusetts Emergency Management Agency, accessed December 12, 2024, https://www.mass.gov/info-details/state-of-emergency-information.

Massachusetts Covid-19 Pandemic (DR-4496-MA)	Pandemic	January 20, 2020 - May 11, 2023	March 27, 2020
Massachusetts Severe Winter Storm and Snowstorm (DR-4379-MA)	Snow	March 13, 2018 - March 14, 2018	July 19, 2018

All of the disaster occurrences described in the above table were both Federal Disaster Declarations and Massachusetts State of Emergency Declarations with the exception of the Shelter Capacity Crisis, which is a Massachusetts State of Emergency Declaration but not a Federal Disaster Declaration, and the March 13th-14th, 2018 Severe Winter Storm and Snowstorm, which was a Federal Disaster Declaration but not a Massachusetts State of Emergency Declaration.

The majority of these disaster occurrences directly relate to the natural hazard concerns of towns within Worcester County; flooding from rain events and other extremes in precipitation (such as snowfall events) are the chief concerns of residents and local hazard mitigation planners alike in the Region.

4.2 Natural Hazard Identification and Analysis

This section of the plan examines the hazards in the Massachusetts SHMCAP which are identified as likely to affect Northborough. This analysis is organized into the following sections: Hazard Description, Location, Extent, Previous Occurrences, Probability of Future Events, Impact, Exposure, Potential Climate Change Effects, Vulnerability, and Mitigation Strategies. A description of each of these sections of the analysis and the risk assessment summary table which includes each hazard identified are provided below.

4.2.1 Hazard Description

The natural hazards identified for Northborough are:

- Flooding,
- Severe Snowstorms / Ice Storms / Nor'easters,
- Hurricanes,
- Severe Thunderstorms / Wind / Tornadoes,
- Wildfire,
- Earthquakes,
- Dam Failure,
- Drought,
- Extreme Temperatures, and
- Invasive Species.

Many of these hazards result in similar impacts to a community. For example, hurricanes, tornadoes and severe snowstorms all may cause wind-related damage.

4.2.2 Location

Location refers to the geographic areas within the planning area that are affected by the hazard. Some hazards affect the entire planning area universally, while others apply to a specific portion of the planning area, such as a floodplain or area that is susceptible to wildfires. Location classifications (large, medium, or small) are based on the area that would potentially be affected by the hazard, on the following scale:

Table 10: Percentage of Town Impacted by Natural Hazard

Land Area Affected by Occurrence	Percentage of Town Impacted
Large	More than 50% of the town affected
Medium	10 to 50% of the town affected
Small	Less than 10% of the town affected

4.2.3 Extent

Extent describes the strength or magnitude of a hazard. Where appropriate, extent is described using an established scientific scale or measurement system. Other descriptions of extent include

water depth, wind speed, and duration.

4.2.4 Previous Occurrences

Previous hazard events that have occurred are described in this section. Depending on the nature of the hazard, events listed may have occurred on a local, state-wide, or regional level.

4.2.5 Probability of Future Events

The likelihood of future events occurring in the planning area for each natural hazard was classified according to the following scale:

Table 11: Frequency of Occurrence and Annual Probability of Given Natural Hazard

Frequency of Occurrence	Probability of Future Events
Very High	70-100% probability in the next year
High	40-70% probability in the next year
Moderate	10-40% probability in the next year
Low	1-10% probability in the next year
Very Low	Less than 1% probability in the next year

4.2.6 Impact

Impact refers to the effect that a hazard may have on people and property in a planning area, based on the assessment of the extent and the severity of the hazard. Impacts are classified according to the following scale:

Table 12: Impacts, Magnitude of Multiple Impacts of Given Natural Hazard

Impacts	Magnitude of Multiple Impacts
Catastrophic	Multiple deaths and injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of facilities for 30 days or more.
Critical	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.
Minor	Very few injuries, if any. Only minor property damage and minimal disruption to quality of life. Temporary shutdown of facilities.

4.2.7 Exposure

Certain features of a community's infrastructure, society, and environment may face more of, or may be disproportionately impacted by, natural hazards; these features therefore can be described as experiencing increased exposure to natural hazards. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3.

4.2.8 Potential Climate Change Effects

Each natural hazard is influenced by one or more of the climate change interactions listed in Section 4.1.2 Climate Change Interactions. Climate change interactions can modify the location, extent, and/or probability of future events depending on the hazard. The hazard risk assessment table in section 4.2.11 of this plan lists climate change interactions as described by the 2023 ResilientMass Plan.

4.2.9 Vulnerability

Based on the above metrics, a hazard index rating was determined for each hazard. The hazard index ratings are based on a scale of 1 through 5 as follows:

1 – Highest risk

2 – High risk

3 – Medium risk

4 – Low risk

5 – Lowest risk

This ranking is qualitative and is based, in part, on the local HMP planning team's knowledge of past experiences with each hazard. The size and impacts of a natural hazard can be unpredictable; However, many of the mitigation strategies currently in place and many of those proposed for implementation in Northborough can be applied to expected natural hazards, regardless of their unpredictability.

4.2.10 Mitigation Strategies

Based on meetings with the local planning team, a selection of mitigation strategies that address the specific hazard is included at the end of each hazard analysis section.

4.2.11 Risk Assessment

Table 13: Hazard Risk Assessment for Each Natural Hazard in Northborough

Type of Hazard	Location of Occurrence	Probability of Future Events	Impact	Potential Climate Change Effects	Hazard Risk Index Rating
Flooding	Small	Moderate	Minor	Increase extent; increase probability	3
Severe Snowstorms / Ice Storms / Nor'easters	Large	Very High	Minor	Increase extent	2
Hurricanes	Large	Low	Minor	Increase extent; increase probability	4
Severe Thunderstorms / Wind	Small	Moderate	Minor for severe thunderstorms; Limited for severe wind	Unclear	2
Tornadoes	Small	Very Low	Limited	Unclear	3

Type of Hazard	Location of Occurrence	Probability of Future Events	Impact	Potential Climate Change Effects	Hazard Risk Index Rating
Wildfire	Small	Moderate	Minor	Increase extent; increase probability	4
Earthquakes	Large	Very Low	Minor	None	5
Dam Failure	Small	Very Low	Limited	Indirect effects related to flooding	4
Drought	Large	Low	Minor	Increase extent; increase probability	4
Extreme Temperatures	Large	Moderate	Minor	Increase in average temperature; increase in probability of extreme heat	4
Invasive Species	Large	Very High	Critical	Increase in range and severity of invasive species	3

Source: based on Massachusetts Resilient Mass Plan 2023;[43] modified to reflect conditions in Northborough.

[43] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

4.2.12 Natural Hazard Impacts from Changes in Future Conditions

The following table summarizes how changes in future conditions, including changes in population, changes in land use and development, and climate change could potentially change natural hazard impacts on people and vulnerable community assets in Northborough.

Table 14: Natural Hazard Impacts from Changes in Future Conditions

Type of Hazard	Impacts from Changes in Population	Impacts from Changes in Land Use and Development	Impacts from Climate Change
Flooding	The Housing Authority at Rutland Road, the Memory Care Facility, the Tougas Family Farm Worker Dorm, the Vinfen Group Home, the Melican Middle School, the Marion E. Zeh School, the Nashoba Montessori School, the Nativity Nursery School, the Church of the Nativity, and the First Parish Unitarian Church have been identified as vulnerable to flooding by CMRPC's GIS analysis or are very close to flooding hazard areas; if more people from vulnerable populations live in and/or frequent these critical infrastructure sites in the case that the Town ages and continues to grow, the Town would be at higher risk in the case of flooding occurring.	If commercial and industrial development continues to be built in town and/or the pace of residential development in town increases from its currently low level, the Town will face increased flooding risk (and therefore increased risk from hurricanes and severe thunderstorms) if these developments are built near the 100-year, 500-year, and locally identified flooding hazard areas and/or have large amounts of impervious surface.	The Town may no longer be able to safely develop in areas of town that experience frequent flooding, so the Town may need to change its zoning bylaw to emphasize stormwater resilience. New areas of town may be subject to severe and/or frequent flooding. Dams in town may face more pressure from flooding.
Severe Snowstorms / Ice Storms / Nor'easters	The Tougas Family Farm Worker Dorm, the Marion E. Zeh School, the Nashoba Montessori School, the Nativity Nursery School, the Church of the Nativity, and the First Parish Unitarian Church have been identified as vulnerable to winter storms by CMRPC's GIS analysis; if more people from vulnerable populations frequent these critical infrastructure sites in the case that the Town continues to grow, the Town would be at higher risk in the case of winter snow and ice storms occurring.	If developments with flat roofs are built in town in the future, the Town will face increased snow and ice load risk.	An increase in wintertime rains may lead to more frequent occurrences of hazardous roadway conditions. Snow and ice storms will become less frequent but will become more severe when they occur; this may lead to a need for more sheltering infrastructure in town.

Type of Hazard	Impacts from Changes in Population	Impacts from Changes in Land Use and Development	Impacts from Climate Change
Hurricanes	The critical infrastructure sites described above that were identified as vulnerable to flooding by CMRPC's GIS analysis would likely be at risk in the case of hurricanes occurring in town; if more people from vulnerable populations live in and/or frequent these critical infrastructure sites in the case that the Town ages and continues to grow, the Town would be at higher risk in the case of hurricanes occurring.	If most developments in town continue to not be built to Zone 1 Design Wind Speed Codes, the Town will continue to face increased risk from hurricanes.	More intense hurricanes may lead to the need to increase stormwater resilience measures in the Town's zoning bylaw and the need for more sheltering infrastructure in town.
Severe Thunderstorms / Wind	The critical infrastructure sites described above that were identified as vulnerable to flooding by CMRPC's GIS analysis would likely be at risk in the case of severe thunderstorms / wind occurring in town; if more people from vulnerable populations live in and/or frequent these critical infrastructure sites in the case that the Town ages and continues to grow, the Town would be at higher risk in the case of severe thunderstorms / wind occurring.	If most developments in town continue to not be built to Zone 1 Design Wind Speed Codes, the Town will continue to face increased risk from severe thunderstorms and wind.	More intense severe thunderstorm and wind events may lead to the need to increase stormwater resilience measures in the Town's zoning bylaw and the need for more sheltering infrastructure in town.
Tornadoes	There are no anticipated impacts from changes in population on the impacts of tornadoes in Northborough.	If most developments in town continue to not be built to Zone 1 Design Wind Speed Codes, the Town will continue to face increased risk from tornadoes.	More research needs to be conducted on the anticipated climate change impacts of tornadoes in Northborough, but some studies indicate that the number of days with tornadoes will decrease but the number of tornadoes on these days will increase.[44]

[44] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," page 5.1-56.

Type of Hazard	Impacts from Changes in Population	Impacts from Changes in Land Use and Development	Impacts from Climate Change
Wildfire	The Town's Senior Center and the Nashoba Montessori School have been identified as vulnerable to wildfires by CMRPC's GIS analysis; if more older adults and young people frequent these critical infrastructure sites in the case that the Town ages and continues to grow, the Town would be at higher risk in the case of wildfire occurring.	If commercial and industrial development continues to be built in town and/or the pace of residential development in town increases from its currently low level, the Town will face increased wildfire risk if these developments are built near the densely forested areas of the wildland-urban interface.	The Town may no longer be able to safely develop near densely forested areas in the wildland-urban interface. The Town may have less access to water to fight wildfires due to the increased prevalence of drought. Wildfire-related air quality risks may become more prevalent in town.
Earthquakes	There are no anticipated impacts from changes in population on the impacts of earthquakes in Northborough.	If many developments in town continue to not be built to the Massachusetts State Building Code's seismic standards, the Town may continue to face increased risk from earthquakes.	There are no anticipated climate change impacts on earthquakes in Northborough.
Dam Failure	The Housing Authority at Heritage Village and the Trinity Church have been identified as vulnerable to potential dam failure by CMRPC's GIS analysis; if more people from vulnerable populations live in and/or frequent these critical infrastructure sites in the case that the Town continues to grow, the Town would be at higher risk in the case of dam failure occurring.	If new developments in town are built in the potential inundation zones of dams, the Town will face increased risks from potential dam failure.	Dams in town may face more pressure from flooding, and therefore will face a higher risk of overtopping.
Drought	There are no anticipated impacts from changes in population on the impacts of drought in Northborough.	If commercial and industrial development is built in and/or the pace of residential development in town increases from its currently low level in areas of town not served by the public reservoir-fed water system, the Town will face increased risk from wells drying out during drought.	Land in Northborough may become harder or impossible to farm due to more frequent and severe drought. The Town may see an increase in population, with people from parts of the country facing more severe drought impacts moving to the northeast.

Type of Hazard	Impacts from Changes in Population	Impacts from Changes in Land Use and Development	Impacts from Climate Change
Extreme Temperatures	If the Town's population ages, the Town will face increased risk from extreme temperatures, as older adults are more vulnerable to extremely hot and cold conditions.	If the Town does not sufficiently prioritize artificial and/or passive/natural heating and cooling measures, both inside and outside, as the Town's development pattern changes in the future, the Town will face increased risk from extreme temperatures.	Growing seasons, ecosystem types, and migratory patterns in Northborough will shift, and farmers and wildlife may be forced to adapt. More intense extreme heat events will lead to a need for more sheltering infrastructure in town, and residents and businesses in town may need to alter work patterns due to more frequent and severe extreme heat events. Northborough may see an increase in population, with people from parts of the country facing more severe extreme heat impacts moving to the northeast.
Invasive Species	There are no anticipated impacts from changes in population on the impacts of invasive species in Northborough.	If the Town does not sufficiently prioritize the control of invasive species when new developments and changes in land use encroach on wild areas, the Town will face increased risk from invasive species.	Changing climatic conditions, including warming temperatures, may assist invasive species in outcompeting native species in town. Invasive species may take advantage of climatic shocks and disturbances and may be more easily able to damage agricultural crops. Invasive vegetation species may be more easily able to build up as fuel that can increase the Town's wildfire risk.

Northborough has grown steadily in population in recent decades. The Town has a high population of pre-retirement age older adults between 40 and 64 years old, with the Town's largest five-year age cohort being older adults between 50 and 54 years old. The Town also has a high population of school-aged children and young adults between 10 and 19 years old, with the Town's largest five-year age cohort of people under 40 years old being teenagers between 15 and 19 years old. [45] If many older adults continue to live in town after they retire, the Town's number of retirement-age residents facing increased vulnerability to natural hazard impacts will rise. If a greater number of families with school-aged children choose to live in town in the future, the Town's number of young residents facing increased vulnerability to natural hazards will rise. If the proportion of new construction built in vulnerable areas in town remains the same, the Town's vulnerability to natural hazards will slightly increase over time if the population continues to increase.

[45] "Northborough," Cmrpc.org

4.3 FLOODING

The local HMP planning team identified flooding as one of the most prevalent natural hazards in Northborough. Flooding is generally caused by hurricanes, nor'easters, severe rainstorms, and thunderstorms. Global climate change has the potential to exacerbate the hazards which cause flooding over time by leading to more severe and frequent storm and rainfall events. There are several different types of flood hazards – from stormwater inundation and poor drainage infrastructure to riverine flooding and storm surges to dam failures. Riverine and stormwater flooding both occur in Northborough, though stormwater flooding is more common. Riverine flooding occurs when the surge of water comes from the top of streams, ponds, and rivers. Stormwater flooding occurs when the amount of precipitation in a storm is greater than the volume that the stormwater management system can handle.

FEMA Flood Zones

FEMA creates and manages Flood Insurance Rate Maps (FIRMs) that identify local Special Flood Hazard Areas (SFHAs). These SFHAs are locations that will be inundated by a flood event with a 1% or greater chance of occurring in any year. These areas are also referred to as the base flood, or 1% flood zone. These areas are considered at high risk of flooding and have around a 1 in 4 chance of flooding during a 30-year mortgage.

FEMA FIRMs also identify areas with a "moderate" flood risk, defined as locations outside of the 1% flood zone that will be inundated by a flood event with between a 1% and a .2% chance of occurring in any year. These areas are also known as the 0.2% flood zone.

LOCATION

Flooding and flood-prone areas in Northborough are closely associated with the 1% (or 100-year) flood areas identified by FEMA. According to a GIS analysis performed by CMRPC, there are 776 parcels in Northborough that are susceptible to 1% (100-year) floods, with 103 of them containing structures. See below for a discussion of previous flood occurrences in town and their locations. Building footprints that overlap with flood zones may be impacted by flooding, especially if residents and building owners do not act to mitigate their personal flood risk. Despite Northborough having numerous flooding problems, most of Northborough is upland and built away from rivers and ponds. Northborough's affected area from this hazard, or its location, is considered "small" (less than 10% of the Town). Map 2 in Appendix A illustrates the FEMA FIRM 1% flood zones in town as well as locally identified flooding areas.

The 2023 Worcester County Flood Insurance Study from FEMA lists the following flooding sources which impact Northborough:

- The Assabet River (flood zone AE),
- Cold Harbor Brook (lower and upper reaches, flood zone AE),
- Howard Brook and Howard Brook Split Flow (flood zone AE), and
- Zone A Flooding Sources of the Concord River Watershed.

The 2023 Worcester County FIS also notes that causes of severe flooding in the county include hurricanes, melting snow in combination with rain in the spring, heavy thunderstorms and resulting rapid downstream runoff, ice jams, and the accumulation of debris at bridges. In addition, the study notes that flooding can occur in any season in the county, but that major flooding is less common in

the summer than in other seasons.[46]

As of September 2022, the Town of Northborough has no repetitive loss structures according to FEMA's National Flood Insurance Program (NFIP). As defined by the NFIP, a repetitive loss property is any property which the NFIP has paid out two or more flood claims of $1,000 or more for in any given 10-year period since 1978. For more information on repetitive loss properties, see https://www.fema.gov/repetitive-flood-claims-grant-program-fact-sheet. The Town of Northborough has 16 NFIP policy holders in town, and the NFIP insures up to $6,384,000.00 of property in the Town. NFIP has paid out 6 claims in total to policy holders in Northborough.[47]

Extent

The average annual precipitation for the closest weather station to Northborough (which is located at the Worcester Regional Airport) has been 53.64 inches for the period from 2017 to 2023.[48] Water levels in Northborough's rivers, streams, and wetlands rise and fall seasonally and rise during high rainfall events. High water levels in town are typical in spring due to snowmelt and ground thaw; This is the period when flood hazards are normally expected. Low water levels occur in summer due to high evaporation and plant uptake (transpiration). Monthly precipitation levels in town are highly variable, but for the period between 2017 and 2024, Northborough received on average the most precipitation in the months of July, September, October, and December; July was also uncharacteristically rainy in 2021 and 2023, in a deviation from expected norms. At any time, heavy rainfall may create conditions that raise water levels in rivers and streams above bank full stage; this results in overflow which floods adjacent lands.

More severe flooding occurrences in town will lead to more impactful changes in the levels and quality of groundwater. The United States Geological Survey National Groundwater Conditions web application measures groundwater levels by monthly percentiles as compared to historic levels at each particular site.[49] In Massachusetts, the quality of drinking water, including from groundwater sources, is assessed by measuring maximum containment levels (MMCLs) from a number of inorganic and organic chemical, radionuclide, and biological contaminants.[50]

Based on past records and the knowledge and experience of members of the Northborough Hazard Mitigation Planning Team as well as town residents, the extent of the impact of localized flooding would be "minor" in town.

Previous Occurrences

In addition to experiencing flooding in the floodplains mapped by FEMA as 1% and .2% annual chance flood zones, Northborough periodically experiences minor flooding at isolated locations

[46] Federal Emergency Management Agency, "Flood Insurance Study: Worcester County, Massachusetts (All Jurisdictions)," Map1.msc.fema.gov., FEMA Flood Map Service Center, accessed August 21, 2024, https://map1.msc.fema.gov/mipdata/25027CV001C.pdf?LOC=2cdcfcb8d29a9ba73c75a69614806808.

[47] "Community Overview: Northborough, Town of," NFIP Community Information System, accessed July 2, 2024.

[48] The calculation of this average does not incorporate data from the year 2021, as precipitation data for January 2021 is missing for this station.
"Monthly Total Precipitation for Worcester Area, MA (ThreadEx)," Weather.gov, National Oceanic and Atmospheric Association National Weather Service, accessed October 30, 2024, https://www.weather.gov/wrh/Climate?wfo=box.

[49] Lee Stanish, "Introducing the National Groundwater Conditions web application," Waterdata.usgs.gov, United States Geological Survey, accessed April 7, 2025, https://waterdata.usgs.gov/blog/groundwater-levels-app/.

[50] "Drinking Water Standards and Guidelines," Mass.gov, the Massachusetts Department of Environmental Protection, accessed April 7, 2025, https://www.mass.gov/guides/drinking-water-standards-and-guidelines.

due to drainage problems or problem culverts. Town staff have reported that flooding events are becoming more frequent in recent years. The following specific flooding locations (mapped in Appendix A) were identified by the Northborough Hazard Mitigation Planning Team:

- Cherry St
- US-20 @ Tomblin Hill Rd
- Howard St
- Green St
- Ball St
- West St
- Southwest Cutoff
- Brewer St

Most of the flood hazard areas listed here were identified due to known past occurrences in the respective areas. There are other areas with no record of previous flood incidents that could be affected in the future by heavy rain and runoff. Additionally, some areas in town have experienced erosion and stormwater drainage failures. It is important to note that many of these areas are near or along evacuation routes and cause concern in cases of evacuation from affected parts of town.

In the past 10 years, there have been a number of major flooding events that have occurred in and around Northborough;[51] major events near and/or in town described as part of the National Oceanic and Atmospheric Administration (NOAA)'s National Centers for Environmental Information (NCEI) database are listed below:

- 7/01/2013 – Flash Flood: A series of shortwaves moved along a stationary boundary to the west of Southern New England, igniting showers and thunderstorms. An atmosphere characterized by low CAPE and decent deep layer shear resulted in showers and thunderstorms producing heavy rain and rotating thunderstorms. One of these storms produced a microburst in Agawam.
- 7/27/2014 – Flash Flood: An upper level disturbance moving out of the Great Lakes initiated showers and thunderstorms over New York and New England. Enough instability was present in the region for some of these storms to become severe, producing strong to damaging winds and at least one funnel cloud.
- 08/15/2015 – Flood: A weak cold front moving through southern New England brought showers and thunderstorms to the region. These storms produced hail and damaging winds as well as some poor drainage street flooding.
- 7/22/2016 – Flood: A cold front moved through southern New England and when coupled with the existing heat and humidity, resulted in showers and thunderstorms

[51] "Storm Events Database Search Results for Worcester County, Massachusetts," NCDC.NOAA.gov, National Oceanic and Atmospheric Administration National Centers for Environmental Information, accessed September 17, 2024, https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Flash+Flood&eventType=%28Z%29+Flood&eventType=%28C%29+Heavy+Rain&beginDate_mm=11&beginDate_dd=01&beginDate_yyyy=2000&endDate_mm=11&endDate_dd=30&endDate_yyyy=2023&county=WORCESTER%3A27&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS.

developing over much of the area late in the day and continuing into the evening and overnight hours. Minor street flooding occurred on Route 135 in Westborough.

- 10/21/2016 – Flash Flood: Low pressure tracking toward southern New England tapped into a plume of tropical moisture and produced torrential rainfall over parts of central and northeast Massachusetts in the matter of a few hours. This resulted in prolific urban flash flooding in the greater Worcester area and significant urban flooding in greater Boston. The highest single rainfall total from this event was within the City of Worcester, where a Skywarn Spotter reported 5.24 inches of rainfall.
- 06/27/2017 – Flood: A disturbance at mid-levels in the atmosphere moved from the Great Lakes across New England during the afternoon and evening. This along with daytime heating through partly sunny skies allowed afternoon and evening thunderstorms to develop.
- 10/24/2017 – Flood: Low pressure moved north through the Great Lakes. This swung a cold front slowly east into Southern New England on October 25. The front stalled over the region during the 25th before moving off to the east on the 26th. Strong low level winds brought a flow of tropical moisture ahead of the front. The strong winds aloft were brought to the surface in damaging wind gusts, with speeds reaching 45 to 55 mph. The tropical moisture was converted to heavy downpours, with storm rainfall totals ranging from 2 inches to 6 1/2 inches. This brought widespread urban and poor drainage flooding. State Route 9 at Saybrook Road in Shrewsbury was flooded.
- 7/17/2018 – Flash Flood: A cold front moved east from the Great Lakes, crossing Massachusetts during the night of the 17th. The thunderstorms brought strong wind gusts and wind damage during the afternoon and evening. Thunderstorms also brought downpours in Western, Central, and Northeast Massachusetts. Two to four inches of rain fell from Westfield through Worcester to Boston.
- 08/11/2018 – Flood: A cold front stalled over Southern New England on the 11th. Low pressure from the Midwest then moved slowly east along the front. The weather system drew upon warm and very humid air to create showers with local downpours, resulting in rainfall amounts of two to five inches in Northern Massachusetts on August 11th and 12th. An exceptionally powerful downpour left 8.15 inches in the city of Lynn.
- 8/23/2020 – Flash Flood: Diurnally driven thunderstorms brought wind damage, hail, and some flooding to mainly western and central Massachusetts.
- 9/11/2023 – Flash Flood: A deamplifying mid level shortwave with dewpoints in the 70s and decent instability brought scattered thunderstorms and widespread flash flooding to Massachusetts and Rhode Island. There were many streets closed, many cars stranded in flood waters, and several houses with flooded basements or first floors.

In addition, minor flooding related to changes in groundwater was identified as affecting the Town, as basement flooding has been experienced by town residents who responded to the survey. The 2023 ResilientMass Plan describes how flooding resulting from changes in groundwater can impact communities in Massachusetts.[52]

[52] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.1-34-5.1-35.

Probability of Future Events

Based upon previous data, there is a "moderate" probability (a 10% to 40% chance) of localized flooding occurring in Northborough in the next year. This represents a slight increase as compared to the last HMP update in town due to increased precipitation driven by climate change.

Impact

The Town faces a minor impact from flooding, with less than 10% of properties in the affected area of town likely to be damaged or destroyed by a 1% annual chance flooding event. Based on the HAZUS analysis described below, a .2% annual chance flood event in Northborough is unlikely to destroy any buildings, but such a .2% annual chance flood event could displace residents and come at a significant economic cost.

HAZUS-MH (multiple-hazards) is a computer program developed by FEMA to estimate losses due to a variety of natural hazards. The HAZUS software was used to model potential damage to the community from a .2% annual chance flood event, assuming a 1 square mile data resolution.

Table 15: HAZUS Potential Damages to Northborough from .2% Annual Chance Flood Event

	.2% annual chance flood event
Building Characteristics	
Estimated total number of buildings in Northborough	5,155
Estimated total building replacement value (2024 $)	$ 3,604,141,000.00
Building Damages	
# of buildings sustaining minor damage (1-10%)	3
# of buildings sustaining moderate damage (11-40%)	0
# of buildings sustaining severe damage (41-50%)	0
# of buildings destroyed	0
Population Needs	
# of households displaced	75
# of people seeking public shelter	55
Value of Damages	
Total property damage (buildings and content)	$15,980,000.00
Total losses due to business interruption	$ 17,800,000.00
Total Economic loss	**$33,780,000.00**

Though there are no recorded instances of a flood event of this size in Northborough, this model shows a reasonable "worst case scenario" that would help planners and emergency personnel evaluate the impacts of flooding that might be more likely in the future as the region experiences a period of more intense and frequent storms. For more information on the HAZUS-MH software, go to http://www.fema.gov/hazus-software.

EXPOSURE

Certain features of Northborough's infrastructure, society, and environment may face more flooding, or may be disproportionately impacted by it, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- Low-lying areas, including but not limited to the FEMA 1% and .2% annual chance flood zones;
- Specific locations with undersized or outdated storm water infrastructure that cannot handle sudden surges in precipitation;
- Residents who may have trouble evacuating from their residences due to age, health concerns, or lack of a vehicle;
- Flood-prone municipal buildings and critical infrastructure that are subject to flooding and potential contamination from flood waters;
- Septic systems, especially in flood prone areas or locations with high water tables;
- Aquatic ecosystems, which may suffer from erosion, eutrophication, or sedimentation due to stormwater;
- The municipal financial burden of infrastructure maintenance and upgrades needed to address flooding;
- Highway department staff, who sometimes must unclog storm drains during extreme weather events. Due to limited staffing, highway department employees often have to go out alone, making safety a concern; and
- Sides of roadways, which may be eroded due to excessive rainfall. Lack of funding to make road repairs may compound this issue.

POTENTIAL CLIMATE CHANGE EFFECTS

According to the 2023 State Hazard Mitigation and Climate Adaptation Plan, climate change effects coupled with changes in development and population density can increase the risk of flooding from precipitation. As noted earlier in this plan, the Central Region is most likely to be impacted by extremes in precipitation in the following ways:

- Climate change is projected to increase the variability of precipitation events in any given year, including the potential for extreme precipitation events. Instances of inland flooding, river overflows, and pressure on dams may result; and
- Projected changes in precipitation patterns in all seasons, as well as higher frequency of extreme weather (including hurricanes and nor'easters), will change patterns of river flow and increase the frequency and severity of inland riverine flooding.

According to the 2023 ResilientMass Plan, climate change is predicted to affect groundwater levels; Sea level rise, extreme temperature events, and changes in precipitation patterns will all affect groundwater conditions and may increase the risk in town of minor basement flooding.[53]

In summary, climate change is likely to increase the extent and probability of future flood events in

[53] Ibid.

Northborough, which will make it more likely for multiple storms in a short duration to cause cumulative damage; These impacts can affect land use and development by causing people to no longer be able to develop in parts of town that flood frequently and causing the Town's government to zone for increased stormwater resilience.

VULNERABILITY

Based on this analysis and the assessment of the Northborough Local HMP Planning Team, Northborough faces a hazard index rating of "3 – medium risk" from flooding. A culvert along Route 135 is located within the 100-year flood zone. Additionally, sections of evacuation routes, including Main Street, Church Street, South Street/Route 135, West Main Street, Hudson Street, Whitney Street, and I-290, are located in or adjacent to 1% (100-year) flood zones. Moreover, the local HMP planning team in town identified 8 locations in Northborough susceptible to flooding; these locations are identified above in the Previous Occurrences section. If evacuation routes and critical facilities such as those listed above are flooded, emergency response and/or evacuations could be hampered; some locations along Cherry St, Route 20 and the Southwest Cutoff, among others, are along secondary and tertiary evacuation routes and have been identified as potential flood hazard areas.

MITIGATION STRATEGIES

The Town of Northborough is currently able to effectively respond to flooding through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand upon its existing capabilities to mitigate and respond to flooding. The local HMP planning team identified the following strategies that could be used to reduce the threat of flooding in Northborough:

- Explore options for working with MassDOT to construct water retention structures / swales at the Route 9 – Route 20 Interchange.
- Protect additional open space for hazard mitigation purposes through acquisition or conservation restriction, especially floodplains, riverfront areas, wetlands, and steep slopes.
- Protect municipal buildings and services against flooding and provide adequate staffing and training.
- Educate the public about strategies for preventing basement flooding, such as with rain gardens or other nature-based and small-scale mitigation strategies.
- Update subdivision regulations to incorporate current construction practices and stormwater mitigation measures. Create homeowners' associations to permanently maintain stormwater basins and fire protection systems (such as cisterns). Update the common driveway bylaw.
- Integrate hazard mitigation into subdivision, site plan review, 40B review, and other zoning reviews; In particular, require the consideration of downstream flooding impacts caused by new projects. Enforce the reduction of impervious surface (pavement) and reserve parking so that stormwater can be recharged and retained. Enforce groundwater protection in overlay district.

4.4 Severe Snowstorms / Ice Storms / Nor'easters

Severe winter storms can pose a significant risk to property and human life. Severe snowstorms and ice storms can involve rain, freezing rain, ice, snow, cold temperatures, and wind. Heavy snowfall and extreme cold can immobilize an entire region. Even areas that normally experience mild winters can be hit with a major snowstorm or extreme cold event. Winter storms can result in flooding, storm surges, closed highways, blocked roads, downed power lines, and hypothermia among residents. A northeast coastal storm, known as a nor'easter, is typically a large counterclockwise wind circulation around a low-pressure center; nor'easters often result in heavy snow, high winds, and rain.

Location

The entire Town of Northborough is susceptible to severe snowstorms, ice storms, and nor'easters; this means that the location of occurrence of winter storms in town is "large." Because these storms occur regionally, the entire town is equally vulnerable to them.

Extent

The Northeast Snowfall Impact Scale (NESIS) characterizes and ranks high-impact snowstorms in the northeast USA. These storms have large areas of 10-inch or greater snowfall accumulations. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus, NESIS gives an indication of a storm's societal impacts.

NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the storm's path. The aerial distribution of snowfall and population information are combined in an equation that calculates a NESIS score which varies from around one (for smaller storms) to over ten (for extreme storms). The raw score is then classified into one of the five NESIS categories. The largest NESIS values are given to storms producing heavy snowfall over large areas which include major metropolitan centers.

Table 16: Northeast Snowfall Impact Scale Categories[54]

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

The Sperry-Piltz Ice Accumulation Index rates approaching ice storms based on the potential damage they are projected to cause, their projected footprint, and their predicted total ice accumulation.

[54] National Centers for Environmental Information, "The Northeast Snowfall Impact Scale (NESIS)," Ncei.noaa.gov, National Oceanic and Atmospheric Association, accessed June 12, 2024, https://www.ncei.noaa.gov/access/monitoring/rsi/nesis.

Table 17: The Sperry-Piltz Ice Accumulation Index[55]

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

The Miller classification is a system used to classify nor'easters.[56] The types of storm classifications under the Miller classification are listed below.

Table 18: The Miller Classification for Nor'easters

Miller Classification	Description
Miller A / Storm Type A	Miller A, or Storm Type A, nor'easters form in the southeastern USA or along the Gulf of Mexico and intensify as they move north until turning east to the Atlantic Ocean. They are most impactful the mid-Atlantic region but can also lead to major snow events in New England if they are strong enough.
Miller B / Storm Type B	Miller B, or Type B, nor'easters form in the midwestern USA and move slightly southeast to the southern mid-Atlantic region until they combine with / transfer energy to a storm originating along the coast in this region. This combined storm then travels north, impacting inland and coastal areas of the northeast USA with major snow events, before turning east to the Atlantic Ocean.

[55] "What is the Sperry-Piltz Ice Accumulation Index?," Spia-index.com, SPIA Index, accessed March 18, 2025, https://spia-index.com/

[56] Mike Priante, "The Miller Classification," Weatherworksinc.com, WeatherWorks, December 4, 2020, https://weatherworksinc.com/news/Miller-A-vs-Miller-B; "Mid-Atlantic Winter Storm Patterns," Glenallenweather.com, Glen Allen, VA Weather, accessed March 20, 2025, https://glenallenweather.com/alink/18snow/stormtypes.htm.

Miller C / Storm Type C	Miller C, or Type C, nor'easters are similar to Miller B nor'easters but are stronger and tend to be more impactful in the midwestern USA and southern New England.
Miller D / Storm Type D	Miller D, or Type D, nor'easters are similar to Miller B nor'easters but are weaker and tend to have more limited impacts in the southern mid-Atlantic region.
Miller E / Storm Type E	Miller E, or Type E, nor'easters are similar to Miller B nor'easters but form further to the south and tend to have a long band of area they are highly impactful in which stretches from the northern part of the inland southeastern states, through the mid-Atlantic region, and to inland New England.

Previous Occurrences

Based on data available from the National Oceanic and Atmospheric Administration, there have been 88 high-impact snowstorms since 1956 that have affected the northeast USA. Of these, approximately 35 storms resulted in at least 10 inches of snow fall in Northborough. These storms are listed in the table below:[57]

Table 19: High-Impact Snowstorms with Snow Falls in Northborough of at Least 10 Inches Since 1958

Start Date	NESIS Value	NESIS Category	NESIS Classification
1/28/2022	1.73	1	Notable
1/30/2021	4.93	3	Major
12/14/2020	3.21	2	Significant
3/03/2019	1.29	1	Notable
3/11/2018	3.16	2	Significant
1/3/2018	2.27	1	Notable
3/12/2017	5.03	3	Major
2/8/2015	1.32	1	Notable
1/29/2015	5.42	3	Major
1/25/2015	2.62	2	Significant
3/4/2013	3.05	2	Significant
2/7/2013	4.35	3	Major
1/26/2011	2.17	1	Notable
1/9/2011	5.31	3	Major
12/24/2010	4.92	3	Major
12/18/2009	3.99	2	Significant
2/12/2006	4.10	3	Major
1/21/2005	6.80	4	Crippling
2/15/2003	7.50	4	Crippling

[57] Ibid.

Start Date	NESIS Value	NESIS Category	NESIS Classification
3/31/1997	2.29	1	Notable
2/8/1994	5.39	3	Major
3/12/1993	13.2	5	Extreme
2/10/1983	6.25	4	Crippling
4/6/1982	3.35	2	Significant
2/5/1978	5.78	3	Major
1/19/1978	6.53	4	Crippling
2/18/1972	4.77	3	Major
2/22/1969	4.29	3	Major
2/8/1969	3.51	2	Significant
2/5/1967	3.50	2	Significant
2/2/1961	7.06	4	Crippling
1/18/1961	4.04	3	Major
12/11/1960	4.53	3	Major
3/2/1960	8.77	4	Crippling
2/14/1958	6.25	4	Crippling

Additionally, the National Centers for Environmental Information (NCEI) database notes the following instance of heavy snowfall in Worcester County:[58]

- 01/07/2024 – Heavy Snow: A strong storm moved up the east coast passing near the 70/40 benchmark brought heavy snow to southern New England beginning late Monday night and continuing on Sunday. The first round of heavy snow fell overnight followed by a lull in the snow and mixing with rain Sunday morning. Comma head snow then filled back into eastern MA and RI bringing moderate to heavy snow Sunday afternoon and evening. Snow amounts ranged from 2 to 18 inches.

The 2023 ResilientMass Plan notes that, on average, Massachusetts experiences one to two nor'easters per year.[59] Between 2013 and 2022, there were 63 heavy snow days, 12 blizzard days, and two ice storm days in Massachusetts.

Probability of Future Events

Based upon the availability of records for Worcester County, the likelihood that a severe snowstorm, ice storm, or nor'easter will affect Northborough in any given year is "very high" (70% or greater).

[58] "Storm Events Database Search Results for Worcester County, Massachusetts," NCDC.NOAA.gov, National Oceanic and Atmospheric Administration National Centers for Environmental Information, accessed September 17, 2024, https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Heavy+Snow&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2020&endDate_mm=06&endDate_dd=30&endDate_yyyy=2024&county=WORCESTER%3A27&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS.

[59] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

IMPACT

Northborough faces a "minor" impact, with less than 10% of total property in affected areas damaged, from snowstorms, ice storms, and nor'easters. The weight from multiple snowfall events can test the load ratings of building roofs and can potentially cause significant damage. Multiple freeze-thaw cycles can also create large amounts of ice and can lead to even heavier, even more dangerous roof loads.

Other impacts from snowstorms, ice storms, and nor'easters include:

- Tree damage and fallen branches that cause utility line damage and roadway blockages;
- Disrupted power and phone service;
- Unsafe roadways and increased traffic accidents;
- Infrastructure and other property also being at risk from severe winter storms and the associated flooding that can occur following heavy snow melt;
- Damage to telecommunications structures; and
- Reduced ability of emergency officials to respond promptly to medical emergencies and fires.

The local HMP planning team in Northborough noted icing concerns along Ball Street.

EXPOSURE

Certain features within Northborough's infrastructure, society, and environment may face more exposure to severe snowstorms, ice storms, and nor'easters, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3 of this plan. These features include:

- Elderly residents, who may have more difficulty clearing snow and walking on icy or snow-covered sidewalks. Elderly residents may also be more vulnerable to extremely low temperatures;
- Households with low or fixed incomes, who may be less able to afford sufficient heating or home improvements to improve energy efficiency and insulation;
- Renters, who may have less control over their living situation and indoor environment than homeowners;
- Public safety, utility, and highway department workers, who are tasked with responding to emergency calls, keeping the heat and power on, and keeping the streets clear during winter storms.

POTENTIAL CLIMATE CHANGE EFFECTS

According to the 2023 ResilientMass Plan, sea level rise, warming ocean temperatures, and changing atmospheric circulation patterns are likely to increase the frequency and severity of winter storms.[60] Warmer temperatures indicate that more precipitation will fall as rain rather than snow throughout the 21st century. The result of this will be fewer overall snowstorms; however, the

[60] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

snowstorms that do occur will likely be worse. Increased wintertime rain also creates a greater risk for wintery mix, sleet, and ice storms; in addition, it will cause hazardous roadway conditions, as temperature drops overnight will cause transportation infrastructure to ice over if mitigation measures are not put in place.

In summary, climate change is likely to increase the extent and probability of future severe snowstorm, ice storm, and nor'easter events in Northborough. This may have societal impacts; more frequent severe winter storms may change land use and development protocols, as more homes and community buildings may need to have greater sheltering infrastructure to prepare for heavy snowfall. The local HMP planning team in town noted that extreme snowfall events are high on their list of concerns.

Vulnerability

Based on the above assessment, Northborough has a hazard index rating of "2 – high risk" from snowstorms, ice storms, and nor'easters. Snowstorms, ice storms, nor'easters, and other forms of winter precipitation are a frequent occurrence in Massachusetts, and they are expected to only become more frequent over time. Additionally, the expected increase in "wintery-mix" precipitation may lead to increased roadway hazards, as standing water freezing in overnight temperatures creates hazardous road conditions for travelers and responders.

Mitigation Strategies

The Town of Northborough is currently able to effectively respond to severe snowstorms, ice storms, and nor'easters through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. Given that Northborough, as well as other towns in the region, experience snowstorms frequently, local and state officials as well as emergency response personnel amply prepare for major snow events. However, there are numerous opportunities to expand upon the Town's existing capabilities to mitigate and respond to severe snowstorms, ice storms, and nor'easters. The local HMP planning team identified the following strategies that could be used to reduce the threat of snowstorms in Northborough:

- Improve and maintain emergency services for vulnerable populations such as seniors, which could require increasing emergency transportation options (rideshare options), diversifying communications, expanding planning, and ensuring reliable power.
- Develop a back-up strategy for the town's DPW building, including the fuel island. Purchase a dedicated stationary generator for the DPW building, including the fuel island, to ensure that the town has access to fuel in the event of an emergency.

4.5 HURRICANES

Hurricanes begin as tropical storms that form over warm ocean waters in the Atlantic Ocean off the west coast of Africa or the Pacific Ocean. These storms form as heated, moist air is drawn up into the atmosphere and begins circulating clockwise or counterclockwise, depending on which hemisphere they are in. Tropical storms become hurricanes when their sustained winds exceed 74 miles per hour. The primary damaging forces associated with these storms are high-level sustained winds and heavy precipitation. Hurricane winds can reach speeds of up to 200 miles per hour and can grow to 500 miles in diameter. The official hurricane season starts on June 1st. In New England, hurricanes generally occur in August, September, and the first half of October due to the time required for the waters south of Long Island to warm enough to sustain hurricane activity this far north. Hurricanes in the region can result in flooding and wind damage to structures and above-ground utilities.[61]

LOCATION

Because of this hazard's regional nature, all of Northborough is at risk from hurricanes, meaning the location of occurrence is "large." Ridgetops in town are more susceptible to wind damage. Areas susceptible to flooding are also likely to be affected by heavy rainfall from hurricanes.

EXTENT

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, is given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour, the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Hurricane Wind Scale, which rates hurricane wind intensity on a scale of 1 to 5, with 5 being the most intense.

Table 20: The Saffir-Simpson Scale (1)[62]

Category	Maximum Sustained Wind Speed
1	74–95 mph: very dangerous winds will produce some damage
2	96–110 mph: extremely dangerous winds will cause extensive damage
3	111–129 mph: devastating damage will occur
4	130–156 mph: catastrophic damage will occur
5	157 + mph: catastrophic damage will occur

[61] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

[62] National Hurricane Center and Central Pacific Hurricane Center, "Saffir-Simpson Hurricane Wind Scale," National Oceanic and Atmospheric Association, accessed June 10, 2024, https://www.nhc.noaa.gov/aboutsshws.php.

Previous Occurrences

Hurricanes which have affected the region near Northborough are shown in the following table:[63]

Table 21: Hurricanes Which Have Affected the Region Near Northborough

Storm Name	Year	Saffir/Simpson Category (when reached MA)
Belle	1976	Tropical Storm
Gloria	1985	1
Henri	1985	Tropical Storm
Chris	1988	Minor Storm
Bob	1991	2
Beryl	1994	Tropical Storm
Bertha	1996	Tropical Storm
Floyd	1999	Tropical Storm
Gordon	2000	Minor Storm
Hermine	2004	Tropical Storm
Barry	2007	Minor Storm
Hanna	2008	Minor Storm
Irene	2011	Tropical Storm
Sandy	2012	Extratropical Storm, made landfall south of MA but still had impacts in the state
Andrea	2013	Minor Storm
Elsa	2021	Tropical Storm
Fred	2021	Extratropical Storm
Henri	2021	Tropical Storm/Depression

Probability of Future Events

Northborough's inland location in central Massachusetts reduces the risk to in town of extremely high winds that are associated with hurricanes, although the Town can still experience some high wind events. Based upon past occurrences, it is reasonable to say that there is a "low" probability (1% to 10% in any given year) of hurricanes in Northborough. However, climate change is projected to result in more severe weather, including increased occurrence of hurricanes and tropical storms. Because of this, the occurrence of hurricanes will likely increase in town in the future.

[63] "Historical Hurricane Tracks," Coast.noaa.gov, National Oceanic and Atmospheric Administration, accessed September 17, 2024, https://coast.noaa.gov/hurricanes/#map=6.02/42.065/-71.688&search=eyJzZWFyY2hTdHJpbmciOiJNYXNzYWNodXNldHRzLCBVU0EiLCJzZWFyY2hUeXBlIjoiZ2VvY29kZWQiLCJvc21JRCI6IjYxMzE1IiwiY2F0ZWdvcmllcyI6WyJINSIsIkg0IiwiSDMiLCJIMiIsIkgxIiwiVFMiLCJURCIsIkVUIl0sInllYXJzIjpbXSwibW9udGhzIjpbXSwiZW5zbyI6W10sInByZXNzdXJlIjp7InJhbmdlIjpbMCwxMDMwXSwiaW5jbHVkZVVua25vd25QcmVzc3VyZSI6dHJ1ZX0sImJ1ZmZlciI6NjAsImJ1ZmZlclVuaXQiOlsiTmF1dGljYWwgTWlsZXMiXSwic29ydFNlbGVjdGlvbiI6eyJ2YWx1ZSI6InllYXJzX25ld2VzdCIsImxhYmVsIjoiWWVhciAoTmV3ZXN0KSJ9LCJhcHBseVRvQU9JIjp0cnVlLCJpc1N0b3JtTGFiZWxzVmlzaWJsZSI6dHJ1ZX0=.

IMPACT

Descriptions of damages that could occur due to hurricanes of different storm categories of the Saffir-Simpson scale are shown below:

Table 22: The Saffir-Simpson Scale (2)

Storm Category	Damage Level	Description of Damages	Wind Speed (MPH)
1	MINIMAL Very dangerous winds will produce some damage	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage. An example of a Category 1 hurricane is Hurricane Dolly (2008).	74-95
2	MODERATE Extremely dangerous winds will cause extensive damage	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings. An example of a Category 2 hurricane is Hurricane Francis in 2004.	96-110
3	EXTENSIVE Devastating damage will occur	Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland. An example of a Category 3 hurricane is Hurricane Ivan (2004).	111-129
4	EXTREME Catastrophic damage will occur	More extensive curtain wall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland. An example of a Category 4 hurricane is Hurricane Charley (2004).	130-156
5	CATASTROPHIC Catastrophic damage will occur	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to the lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required. An example of a Category 5 hurricane is Hurricane Andrew (1992).	157+

HAZUS-MH (multiple-hazards) is a computer program developed by FEMA to estimate losses due to a variety of natural hazards. The HAZUS software was used to model potential damage to Northborough from 1% and 0.2% hurricane events (storms that are 1% and 0.2% likely to happen each year, and roughly equivalent to Category 1 and Category 2 hurricanes, respectively). The damage 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.

Table 23: HAZUS Potential Damages to Northborough from 1% and .2% Annual Chance Hurricane Events

	1% storm (89 mph winds)	0.2% storm (102-105 mph winds)
Building Characteristics		
Estimated total number of buildings	5,155	
Estimated total building replacement value (2024 $)	$ 3,604,466,000.00	

Building Damages		
# of buildings sustaining minor damage	260	911
# of buildings sustaining moderate damage	21	155
# of buildings sustaining severe damage	1	12
# of buildings destroyed	0	10
Population Needs		
# of households displaced	3	25
# of people seeking public shelter	3	13
Debris		
Building debris generated (tons)	1,169	4,620
Tree debris generated (tons)	8,953	16,243
# of truckloads to clear building debris	47	185
Value of Damages		
Total property damage (buildings and content)	$ 25,600,980.00	$ 82,989,660.00
Total losses due to business interruption	$ 901,710.00	$ 6,260,730.00

Though there are no recorded instances of a hurricane equivalent to a 0.2% storm passing through Massachusetts, this model was included in this plan in order to present a reasonable "worst case scenario" that can help planners and emergency personnel evaluate the impacts of storms that might be more likely in the future, as more intense and frequent storms become more common. For more information on the HAZUS-MH software, go to http://www.fema.gov/hazus-software.

Northborough faces a "minor" impact from hurricanes, with 10% or less of property in the affected area of town being damaged or destroyed in any given hurricane instance.

EXPOSURE

Certain features within Northborough's infrastructure, society, and environment may face more exposure to hurricanes, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- The electrical grid, which is vulnerable to outages from trees falling across power lines. National Grid proactively trims trees in their right of way in Northborough, and the local HMP planning team notes that that the Town has not had too many calls for emergency tree removal in between the last plan and this one.
- Municipal buildings have been impacted by high winds in the past. Damage to these buildings could impact critical town functions and distract people from other essential emergency response and recovery activities; and

- Public safety, utility, and highway department workers, who are tasked with responding to emergency calls and keeping the streets clear during hurricanes.

In addition to high winds, hurricanes can also bring heavy precipitation and cause flooding. The vulnerable features identified in the flooding section above also apply to hurricanes.

Potential Climate Change Effects

According to the 2023 ResilientMass Plan, there are two major ways that climate change influences hurricanes and tropical storms:[64]

- Warming oceans will provide more energy for hurricanes and tropical storms, which could lead to more intense or potentially damaging storms in the future, and larger storms could result in more storms that are likely to impact Massachusetts; and
- Warmer air can hold more water vapor and will enable greater precipitation rates during future storms.

In summary, climate change is likely to increase the frequency and extent of hurricanes in Northborough.

Vulnerability

Based on the above analysis, Northborough has a hazard index rating of "4 – low risk" from hurricanes. Its location and elevation decrease the risk of hurricane force winds and rains, though it does not remove them entirely. Historically, by the time a storm has arrived in Northborough, it has been typically downgraded to a tropical storm or tropical depression; however, climate change may increase the severity of these types of storms in town in the future.

Mitigation Strategies

The Town of Northborough is currently able to effectively respond to hurricanes through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities to expand upon the Town's existing capabilities to mitigate and respond to hurricanes. The local HMP planning team identified the following strategies that could be used to reduce the threat of hurricanes in Northborough:

- Enhance the Town's participation with National Grid through their First Responder App.
- Continue to properly clean, at least annually, or more often as required, all stormwater structures and basins (this action is currently budgeted by the Town).
- Enhance the development and distribution of educational materials for residents about protecting wetlands, preventing flooding, and stormwater mitigation.

[64] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

4.6 Severe Thunderstorms / Wind / Tornadoes

A thunderstorm is a storm with lightning and thunder produced by a cumulonimbus cloud; thunderstorms usually produce gusty winds as well as heavy rain and sometimes generate hail. Effective January 5, 2010, the National Weather Service (NWS) modified the hail size criterion to classify a thunderstorm as 'severe' when it produces damaging wind gusts in excess of 58 mph (50 knots), hail that is 1 inch in diameter or larger (quarter size), or a tornado.

Every thunderstorm has an updraft (rising air) and a downdraft (sinking air). Sometimes strong downdrafts, known as downbursts, can cause tremendous wind damage that is similar to that of a tornado. A small (less than 2.5-mile path) downburst is known as a "microburst", and a larger downburst is called a "macro-burst." An organized, fast-moving line of microbursts traveling across large areas is known as a "derecho" – these occasionally occur in Massachusetts. The strongest downburst ever recorded was a 175 mph downburst in North Carolina. Downburst winds exceeding 100 mph have been measured in Massachusetts.[65]

Wind is air in motion relative to the surface of the earth. For non-tropical events over land, the NWS issues a Wind Advisory (for sustained winds of 31 to 39 mph for at least 1 hour and for any gusts of 46 to 57 mph) or a High Wind Warning (for sustained winds 40+ mph and for any gusts 58+ mph). For non-tropical events over water, the NWS issues a small craft advisory (for sustained winds of 25 to 33 knots), a gale warning (for sustained winds of 34 to 47 knots), a storm warning (for sustained winds of 48 to 63 knots), or a hurricane force wind warning (for sustained winds of 64+ knots). For tropical systems, the NWS issues a tropical storm warning for any areas (inland or coastal) that are expecting sustained winds from 39 to 73 mph, and a hurricane warning is issued for any areas (inland or coastal) that are expecting sustained winds of 74 mph or greater. High winds are a hazard for the boating, shipping, and aviation industry sectors. They can also cause scattered power outages, downed trees and/or power lines, and damage to parts of structures like roofs and windows.

Tornadoes are swirling columns of air that typically form in the spring and summer during severe thunderstorm events. In a relatively short period of time and with little or no advance warning, a tornado can attain rotational wind speeds in excess of 250 miles per hour and can cause severe devastation along paths that range from a few dozen yards to over a mile in width. The path of a tornado can be unpredictable because tornadoes can stall or change direction abruptly. High wind speeds, hail, and debris generated by tornadoes can result in loss of life, downed trees and power lines, and damage to structures and other personal property. In Massachusetts, tornadoes have occurred most frequently in the Connecticut River Valley and in western Worcester County, with Northborough approximately 40 miles east of the zone of most frequent past occurrences.

Location

As per the 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan, the entire Town is at risk of high winds, severe thunderstorms, and tornadoes. This plan identifies Northborough and the communities surrounding it as having a moderate frequency of tornado occurrence within the Massachusetts context. However, the area affected by thunderstorms, wind, or tornadoes in town is "small," with less than 10 percent of the Town generally affected.

Extent

An average thunderstorm is 15 miles across and lasts for 30 minutes; severe thunderstorms can be

[65] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

much larger and longer. Southern New England typically experiences 10 to 15 days per year with severe thunderstorms. Thunderstorms can cause hail, wind, lightning damage, and flooding.

High wind is linked to a number of other hazards, including hurricanes and winter storms, in addition to thunderstorms and tornadoes. High winds can cause damage to structures and trees and can also increase the risk of wildfire.

Tornadoes are measured using the Enhanced Fujita Scale, which is shown below with the following categories and corresponding descriptions of damage:

Table 24: Enhanced Fujita Scale Levels and Descriptions of Damage[66]

EF-Scale Number	Intensity Phrase	3-Second Gust (MPH)	Type of Damage Done
EF0	Gale	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damage to sign boards.
EF1	Moderate	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	Significant	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	Severe	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	Devastating	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.

Table 25: Extent Scale for Hail[67]

Hail Size (in.)	Object Analog Reported
.50	Marble, moth ball
.75	Penny
.88	Nickel
1.00	Quarter
1.25	Half Dollar
1.50	Walnut, ping pong
1.75	Golf ball
2.0	Hen egg
2.5	Tennis ball

[66] National Weather Service, "The Enhanced Fujita Scale (EF Scale),"Weather.gov, National Oceanic and Atmospheric Administration, accessed June 10, 2024, https://www.weather.gov/oun/efscale.
[67] Storm Prediction Center, "Converting Traditional Hail Size Descriptions," Spc.noaa.gov, National Oceanic and Atmospheric Administration, accessed June 10, 2024, https://www.spc.noaa.gov/misc/tables/hailsize.htm.

2.75	Baseball
3.00	Tea cup
4.00	Grapefruit
4.50	Softball

Previous Occurrences

Because thunderstorms and wind affect Northborough regularly, there is not a comprehensive record available of all thunderstorm and wind events which have affected the Town. As per the Massachusetts State Hazard Mitigation and Climate Adaptation Plan, there are approximately 10 to 30 days of thunderstorm activity in the state each year.

In Worcester County, there have been several F1 tornadoes over the years; Tornadoes with a rating of 3 or above and tornadoes resulting in a death or injury, or significant property damage, are listed below.[68]

- In 1953, an F4 tornado struck Worcester. The event resulted in at least 90 fatalities and more than 1,200 injuries. There was extensive property damage. On the same date, an F3 tornado began in the Town of Sutton.
- In 1981 an F3 tornado struck Westminster, resulting in 3 injuries and very little reported property damage.
- In June 2011, an F3 tornado struck Massachusetts. Few deaths were reported, all in Hampden County. No deaths were reported in Worcester County.

In the last 6 years, there has only been one small tornado that has affected communities near Northborough:

- 2018 Tornado (East Douglas, Uxbridge, Upton)[69]

[68] "Tornado Paths," Arcgis.com, ESRI, accessed March 13, 2025, https://www.arcgis.com/apps/View/index.html?appid=01672085b139432e8fe1296a743f67d7.
[69] Ibid.

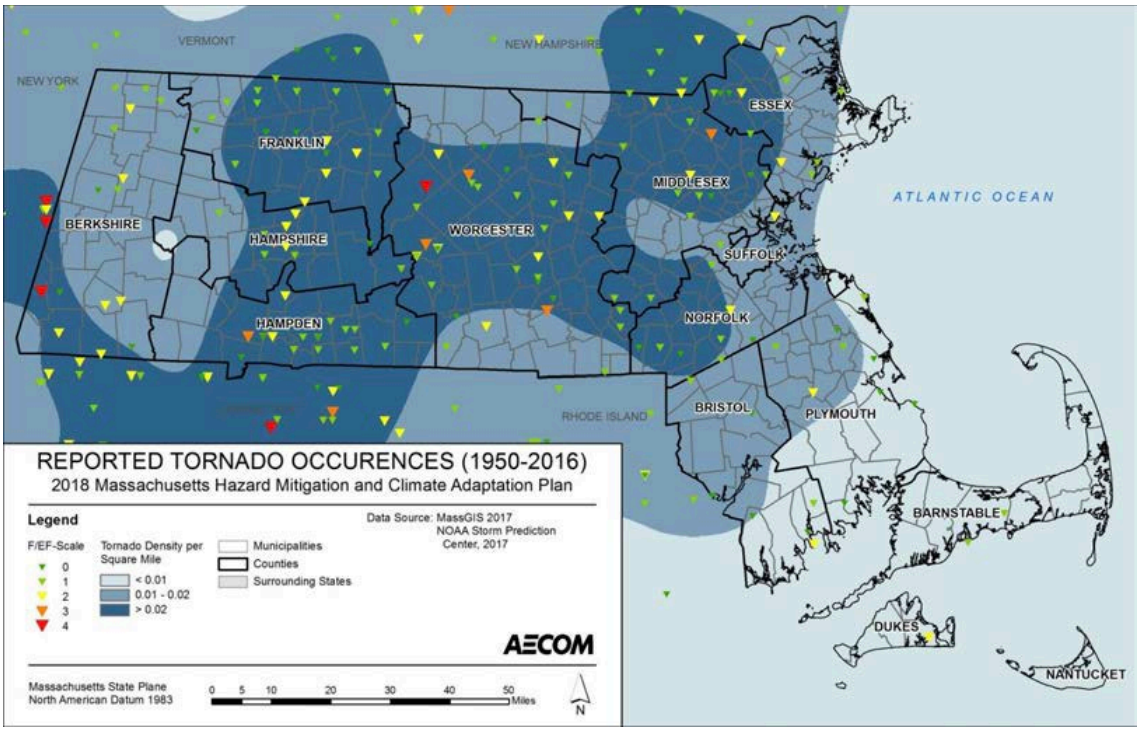

Figure 1: Density of Reported Tornados per Square Mile (1950-2016)[70]

Image 1: Above - NASA released this image of part of the 39-mile-long tornado track through south-central Mass. The image was captured on June 5, 2011 by the Landsat 5 satellite.

[70] "Massachusetts State Hazard Mitigation and Climate Adaptation Plan," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs and Massachusetts Emergency Management Agency, September 2018, https://www.mass.gov/doc/state-hazard-mitigation-and-climate-adaptation-plan/download.

Thunderstorm occurrences are more frequent in Massachusetts than occurrences of tornados, and thunderstorms have the potential to produce tornadoes. Supercells are the type of storm that most commonly produces tornadoes; they are severe, long-lived thunderstorms. Approximately 20 percent of supercells produce tornadoes. In Northborough there have been several severe thunderstorm/wind occurrences:[71]

- 01/31/2013 – High Wind: A warm front moved northward across southern New England. This brought a period of mainly rain and warm temperatures. In addition, a strong low level jet (up to 80 kts) resulted in high winds across much of southern New England. There was some tree damage and downed power lines with winds gusting to 60 to 70 mph. An amateur radio operator in Milford recorded a wind gust to 64 mph on their home weather station. The Automated Surface Observation System at Worcester Regional Airport (KORH) recorded a wind gust to 55 mph.
- 02/25/2015 – High Wind: A storm moving north through the Great Lakes redeveloped along the Mid Atlantic coast on the 24th, then moved up the coast past Southern New England. This coastal storm brought damaging west-northwest winds to Massachusetts as it moved off through the Maritimes on the 25th.
- 07/17/2019 – Thunderstorm Wind: An approaching cold front, coupled with moisture associated with the remnants of Barry brought showers and thunderstorms to the region. A few of these storms were severe, with damaging wind gusts. There was also isolated flooding from heavy rainfall. In Northborough, trees were downed on School Street.
- 12/25/2020 – Thunderstorm Wind: An anomalously deep, full-latitude mid-level trough over the Mississippi Valley caused a strong frontal system to move up the Appalachians. It brought strong to damaging winds, heavy rain with minor flooding, and well above normal temperatures to southern New England early on Christmas Day. Winds generally gusted to 40 to 60 mph, except 65 to 70 mph along the southeast Massachusetts coast. South winds were blowing more than 100 mph only 2000 feet above the ground in eastern Massachusetts and Rhode Island, but despite temperatures in the lower 60s there, a surface inversion was strong enough to prevent these very damaging winds from reaching the surface. Two to four inches of rain fell across the region, with the highest totals from central Rhode Island northwestward across northern Connecticut and portions of western and central Massachusetts. Winds generally were gusting to around 50 mph. In Dudley at 333 AM EST, a large tree branch was down on Dresser Hill Road. In Upton at 530 AM EST, a tree was down on Glenview Street. In Southbridge at 604 AM EST, a tree was down on Main Street. In Northborough at 737 AM EST, a tree was down on Franklin Circle. In Webster at 940 AM EST, a tree was down on South Shore Road. In Milford at 10 AM EST, a large tree was down on Dogwood Lane by Wildwood Drive.
- 07/27/2021 – Thunderstorm Wind: A cold front entered a marginally unstable, but highly sheared environment during the late afternoon and evening hours. A broken line of severe

[71] "Storm Events Database Search Results for Worcester County, Massachusetts," NCDC.NOAA.gov, National Oceanic and Atmospheric Administration National Centers for Environmental Information, accessed September 17, 2024, https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28C%29+Hail&eventType=%28Z%29+High+Wind&eventType=%28Z%29+Strong+Wind&eventType=%28C%29+Thunderstorm+Wind&eventType=%28C%29+Tornado&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2013&endDate_mm=11&endDate_dd=30&endDate_yyyy=2023&county=WORCESTER%3A27&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS.

thunderstorms moved across most of Massachusetts and a portion of northern Connecticut and northern Rhode Island. In Northborough, siding was blown off the side of a house at the intersection of Brigham Street and South Street.

- 02/28/2024 – High Wind: A strong cold front crossed southern New England on Wednesday night the 28th bringing soaking rains and strong wind gusts to southern New England followed by sharply falling temperatures. This cold frontal passage included a fine line stronger storms. Winds generally gusted 45 to 55 mph. The strongest gusts were 59 mph at the Worcester Airport ASOS (KORH) at 2:18 AM EST on the 29th and a gust to 55 mph at the Fitchburg Airport ASOS (KFIT) at 1:57 AM EST on the 29th.

Probability of Future Events

According to the 2023 ResilientMass Plan, Massachusetts averages two to five tornadoes per year.[72] Only two tornadoes in the state (which occurred in 1953 and 2011) received disaster declarations. Massachusetts has experienced 12 EF0 to EF1 tornadoes since 2018; six EF0 tornadoes occurred in the state in 2021, and these 2021 EF0 tornadoes caused under $50,000 in property damage. Because tornadoes are relatively rare in the Commonwealth, residents are less likely to be prepared for them in the Commonwealth than in other parts of the country. People who live in manufactured housing, such as mobile homes, are more at risk to tornadoes. Tornadoes can affect all sectors and populations, and their primary effect is damage from their high winds to structures and the environment. Any structure located in a tornado zone or path is at risk. Tornado activity may become more variable due to climate change, so predicting the likelihood of future tornado events in Northborough is difficult.

Based upon the available historical record, as well as Northborough's location in a moderate-density cluster of tornado activity for Massachusetts, there is a "very low" probability (less than 1% chance in any given year) of a tornado affecting the Town, and a moderate (10% to 40% chance in any given year) probability of a severe thunderstorm and/or high winds affecting the Town.

Impact

Overall, Northborough faces a "minor" impact from severe thunderstorms, with less than 10% of property in the affected area of town expected to be damaged in this type of hazard event. Northborough also faces a "limited" impact from severe winds and tornados, with between 10% and 25% of property in town expected to be damaged in these types of hazard events.

As indicated in Table 24 above, the following likely impacts on the physical environment can result from tornadoes of different levels:

- EF0 - Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damage to sign boards.
- EF1 - The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving automobiles pushed off the roads; attached garages may be destroyed.
- EF2 - Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
- EF3 - Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.

[72] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

- EF4 - Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.

The potential for locally catastrophic damage is a factor in any tornado, severe thunderstorm, or wind event. In Northborough, a tornado that hits residential areas would leave much more damage than a tornado with a travel path that ran along the town's uplands, where there is less settlement. Most buildings in town have not been built to Zone 1 Design Wind Speed Codes. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975, and 49.8% of the Town's 5,934 total housing units were constructed in 1979 or earlier (according to 2022 American Community Survey 5-year estimates).[73]

Northborough's median home value is $548,400 (according to 2022 American Communities Survey 5-year estimates).[74] Utilizing the total value of all property in town, $4,255,632,328,[75] and an estimated 10 percent of damage to 5 percent of all structures, the estimated amount of damage from a tornado in town is $21,278,161.64. The cost of repairing or replacing roads, bridges, utilities, and contents inside structures is not included in this estimate.

Exposure

Certain features within Northborough's infrastructure, society, and environment may face more exposure to severe thunderstorms/wind/tornadoes, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. Vulnerable features to severe thunderstorms/wind/tornadoes overlap with the features vulnerable to hurricanes and flooding described in the sections of this plan focusing on these other hazards.

Potential Climate Change Effects

The 2023 ResilientMass Plan identifies that current climate models predict an increase in severe thunderstorms, which have the potential to produce tornadoes. However, it is unknown 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.[76]

Without a clear understanding of how climate change will impact tornadoes, the Town is not able to determine exactly how this hazard will impact population patterns and land use needs for the Town of Northborough. However, if climate change does increase the likelihood of tornado occurrence, the Town may have to incorporate additional emergency shelters into development and land use.

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[73] "DP04: Selected Housing Characteristics," Data.Census.gov, United States Census Bureau, accessed September 24, 2024, https://data.census.gov/table/ACSDP5Y2022.DP04?q=dp04%20selected%20housing%20characteristics&g=060XX00US2502746820.

[74] Ibid.

[75] Data Analytics and Research Bureau, "Assessed Values by Class," Dlsgateway.dor.state.ma.us, Massachusetts Department of Revenue, September 16, 2024, https://dlsgateway.dor.state.ma.us/reports/rdPage.aspx?rdReport=PropertyTaxInformation.AssessedValuesbyClass.assessedvaluesbyclass&tblassessedvalues-PageNr=27&rdDataCache=400584956&rdShowModes=&rdSort=&rdNewPageNr=True1&rdRequestForwarding=Form.

[76] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," page 5.1-56.

VULNERABILITY

Based on the above assessment, Northborough has a hazard index rating of "2 – high risk" from severe thunderstorms and winds, and a "3 – medium risk" hazard index rating from tornadoes. The relatively old age of the housing stock in Northborough makes the Town particularly vulnerable to tornadoes, despite their relative infrequency.

MITIGATION STRATEGIES

The Town of Northborough is currently able to effectively respond to severe thunderstorms, wind, and tornadoes through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand upon its existing capabilities to mitigate and respond to severe thunderstorms, wind, and tornadoes. The local HMP planning team identified the following strategies that could be used to reduce the threat of severe thunderstorms, wind, and tornados in Northborough:

- Expand on and maintain the Town's vegetative debris program (e.g. by acquiring additional equipment); thereby mitigate risks in town of stormwater flooding, riverine flooding, and winter storm damage. Collaborate with organizations such as the Central Massachusetts Mosquito Control Project on this strategy. Possible funding for this effort could be included in the Town's Capital Improvement Plan. Create a town debris management plan as an appendix to the Comprehensive Emergency Management Plan and have it approved by FEMA.
- Enhance the utilization of hazard warning systems and notifications, including by using social media, town webpages, Code Red, and other communication methods. Interns are currently taking senior citizen information to sign them up for CodeRed. Post generator safety and use information on social media. The Health Department is going to put out a brochure on 72-hour kits through Town-wide mailing, school take-home packets, and other communication methods. Enhance and maintain the Town's internal instant messaging system to allow for the rapid response of emergency personnel.

4.7 WILDFIRES

Wildfires are fires involving full-sized trees, meadows, and/or scrublands. Typical causes of wildfires are lightning strikes, human carelessness, and arson. Relative humidity and wind and two weather-related factors that influence fire danger. Relative humidity refers to "the ratio of the amount of moisture in the air to the amount of moisture necessary to saturate the air at the same temperature and pressure."[77] When relative moisture drops, light fuels like grasses become drier and burn more easily.[78]

FEMA has classifications for three different types of wildfires:

- Surface fires are the most common type of wildfire, with the surface burning slowly along the floor of a forest, killing or damaging trees.
- Ground fires burn on or below the forest floor and are usually started by lightning.
- Crown fires move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions.

Potential effects of wildfires include damage to structures and other human infrastructure as well as impacts on natural resources. Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations including children, the elderly, and people with respiratory and cardiovascular diseases.

LOCATION

Approximately 74.4% of total land area in Worcester County is deciduous forest, evergreen forest, forested wetland, scrub/shrub land, scrub/shrub wetland, or grassland.[79] Much of this region of Massachusetts, including the Northborough area, has a high risk of wildfires for the state.[80] In Northborough, approximately 33.4% of land is deciduous forest, approximately 13.3% of land is evergreen forest, approximately 12.9% of land is forested wetland, approximately 0.8% of land is scrub/shrub land, and approximately 1.9% of land is grassland.[81] Northborough is developed in a moderately suburban pattern, with few uninterrupted tracts of forest present. Although the substantial tree cover in town does present some risk for wildfires, the total amount of the Town that could be affected by a wildfire is categorized as "small," or less than 10 percent of its total area.

Northborough is vulnerable to interface problems (fires spreading from unoccupied land to human development) because of Mount Pisgah and its hiking trails. Human activity, which may involve cooking and camping fires as well as carelessly tossed cigarettes and other fire sources, can lead to problems for residents living near Mount Pisgah on Lyman Road, Howard Street, Howard Lane, and Green Street as well as residents living in other nearby areas. Additionally, lightning strikes and faulty power infrastructure can lead to wildfires developing in town.

[77] "Understanding Fire Danger," Nps.gov, United States National Park Service, August 17, 2023, https://www.nps.gov/articles/understanding-fire-danger.htm.
[78] Ibid.
[79] Massachusetts Bureau of Geographic Information, "MassGIS Data: 2016 Land Cover/Land Use," Mass.gov, Massachusetts Executive Office of Technology Services and Security, May 2019, https://www.mass.gov/info-details/massgis-data-2016-land-coverland-use.
[80] "Massachusetts State Hazard Mitigation and Climate Adaptation Plan," September 2018
[81] Massachusetts Bureau of Geographic Information, "MassGIS Data: 2016 Land Cover/Land Use"

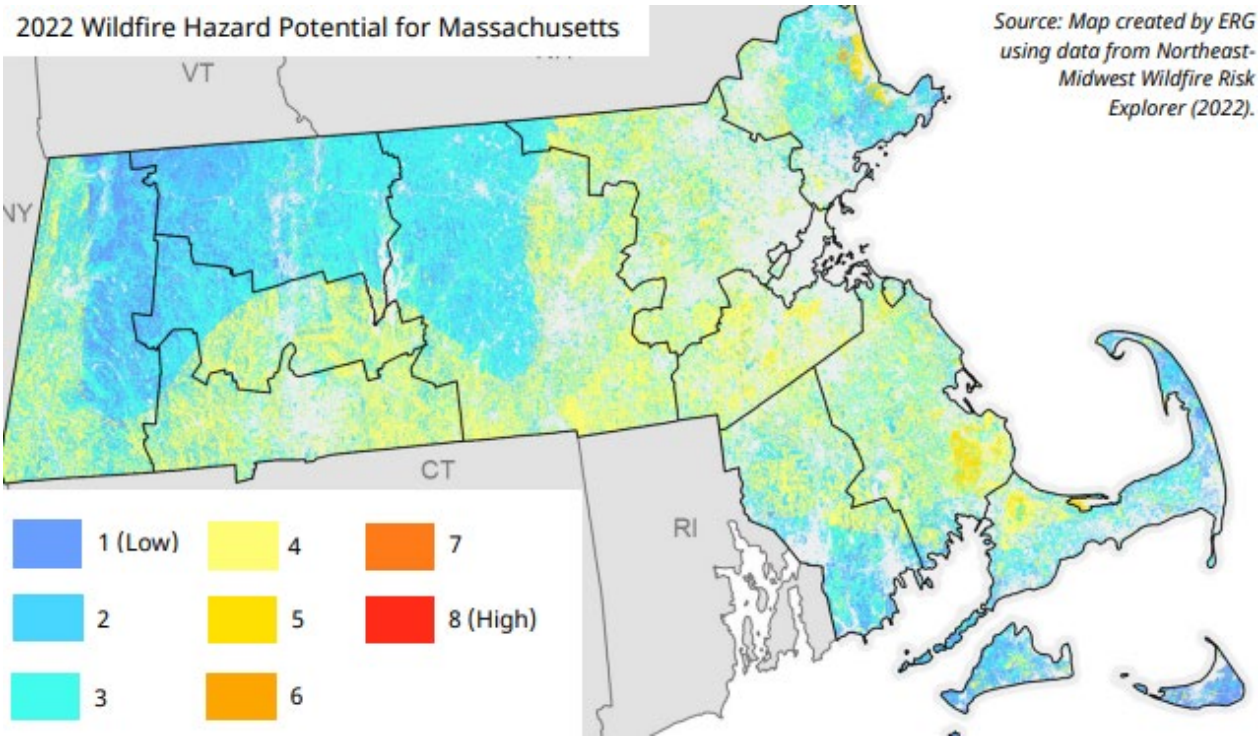

Figure 2: Wildfire Risk Areas for the Commonwealth of Massachusetts.[82]

EXTENT

Wildfires can cause widespread damage. They can spread very rapidly, depending on local wind speeds, and can be very difficult to get under control. Wildfires can last from several hours up to several days.

Approximately 62.3% of Northborough's total land area is deciduous forest, evergreen forest, forested wetland, scrub/shrub land, or grassland. These areas are at risk of fire and are spread evenly throughout the community, with developed areas, rivers, and major transportation corridors (such as Interstate 290) breaking up the forest. In drought conditions, a wildfire would be a matter of concern in town.

The National Fire Danger Rating system illustrates the potential extent of wildfires should they occur under different fire danger conditions:

Table 26: The National Fire Danger Rating System

Rating	Basic Description	Detailed Description
CLASS 1: Low Danger (L) Color Code: Green	Fires not easily started	Fire starts are unlikely. Weather and fuel conditions will lead to slow fire spread, low intensity, and relatively easy control with light mop up. Controlled burns can usually be executed with reasonable safety.

[82] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

CLASS 2: Moderate Danger (M) Color Code: Blue	Fires start easily and spread at a moderate rate	Some wildfires may be expected. Expect moderate flame length and rate of spread. Control is usually not difficult and light to moderate mop up can be expected. Although controlled burning can be done without creating a hazard, routine caution should be taken.
CLASS 3: High Danger (H) Color Code: Yellow	Fires start easily and spread at a rapid rate	Wildfires are likely. Fires in heavy, continuous fuel, such as mature grassland, weed fields, and forest litter, will be difficult to control under windy conditions. Control through direct attack may be difficult but possible, and mop up will be required. Outdoor burning should be restricted to early morning and late evening hours.
CLASS 4: Very High Danger (VH) Color Code: Orange	Fires start very easily and spread at a very fast rate	Fires start easily from all causes and may spread faster than suppression resources can travel. Flame lengths will be long with high intensity, making control very difficult. Both suppression and mop up will require an extended and very thorough effort. Outdoor burning is not recommended.
CLASS 5: Extreme (E) Color Code: Red	Fire situation is explosive and can result in extensive property damage	Fires will start and spread rapidly. Every fire start has the potential to become large. Expect extreme, erratic fire behavior. NO OUTDOOR BURNING SHOULD TAKE PLACE IN AREAS WITH EXTREME FIRE DANGER.

Beyond the direct hazards that wildfires pose, wildfires pose the indirect hazard of air quality reduction from smoke particulates. Smoke particulates are measured, along with other particulates that affect air quality, by the EPA's Air Quality Index.[83] For each pollutant, an AQI value of 100 generally corresponds to an ambient air concentration that equals the level of the short-term national ambient air quality standard for the protection of public health. AQI values at or below 100 are generally thought of as satisfactory. When AQI values rise above 100, air quality is unhealthy; at first for certain sensitive groups of people, then for everyone as AQI values get higher. The EPA establishes an AQI for five major air pollutants regulated by the Clean Air Act. Each of these pollutants has a national air quality standard set by EPA to protect public health, and these pollutants are: ground-level ozone; particle pollution (also known as particulate matter, including PM2.5 and PM10); carbon monoxide; sulfur dioxide; and nitrogen dioxide.

The AQI is divided into six categories. Each category corresponds to a different level of health concern. Each category also has a specific color. The color makes it easy for people to quickly determine whether air quality is reaching unhealthy levels in their communities.

[83] "Air Quality Index (AQI) Basics," Airnow.gov, United States Environmental Protection Agency, accessed June 10, 2024, https://www.airnow.gov/aqi/aqi-basics/.

Table 27: AQI Basics for Ozone and Particle Pollution

Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

Previous Occurrences

Northborough has an on-call paid professional fire department providing 24/7 coverage. In addition, Northborough is part of the South Middlesex County Fire Department (Mutual Aid District 14) with 23 other Towns. Northborough experienced 150 wildfires between 2011-2020; however, each of these fires were quite small, and altogether they consumed 15.9 acres of brush/wildland.[84] The local HMP planning team noted that on April 14-15, 2023, a wildfire at Mount Pisgah Conservation Area in town burned approximately 115 acres; The cause of this fire could not be determined. The emergency response to this fire involved nearly 150 people using more than 45 pieces of apparatus and equipment. A Department of Fisheries and Wildlife restoration ecologist has suggested that impacts to the forest from this fire will likely have some short-term benefit to the integrity of this fire-influenced natural community, but over the long-term, a single fire in isolation won't have much of an impact. Regular prescribed fires encourage the growth of native plant species, such as pitch pine, oak, hickory, chestnut, and blueberry, among others. In the absence of regular fires, white pine and black birch, as well as many invasive species, dominate communities

[84] "Wildfire Data," Cmrpc-my.sharepoint.com, Massachusetts Fire Incident Reporting System, accessed September 17, 2024, https://cmrpc-my.sharepoint.com/:x:/r/personal/wtalbot_cmrpc_org/_layouts/15/Doc.aspx?sourcedoc=%7B1F0B29EB-3A47-4669-B4E6-FA4FC08AD498%7D&file=Wildfire%20Data.xlsx&action=default&mobileredirect=true.

similar to the forests at Mount Pisgah.[85]

Images 2 and 3: The April 14-15, 2023 Mount Pisgah Wildfire

[85] "Northborough Trails Committee Notice on the Mount Pisgah Fire," Town.Northborough.ma.us, The Town of Northborough, accessed September 16, 2024, https://www.town.northborough.ma.us/sites/g/files/vyhlif12221/f/alerts/mount_pisgah_fire_041523_notice.pdf.

Image 4: Damage to trees caused by the April 14-15, 2023 Mount Pisgah Wildfire

During a critical drought which occurred across most of Massachusetts in late 2024 and was ongoing at the time of the writing of this plan, at least 638 wildfires which in combination burned at least 3,413 acres occurred in the state.[86]

Probability of Future Events

The 2023 ResilientMass Plan notes that climate-change driven changes in the intensity and frequency of precipitation and thunderstorms, prolonged drought conditions, and rising temperatures are expected to increase the frequency and severity of wildfires.[87] In drought conditions, forest types that are not typically prone to wildfires will become more likely to burn. Globally, wildfires are projected to increase worldwide by 14% by 2030, 30% by 2050, and 50% by 2100.

Changes in weather patterns driven by climate change can intensify fires which in turn heighten the effects of climate change. By mid-century, mean summer temperatures in the Concord River Basin are projected to increase by between 3.6° F and 8.1° F due to climate change.[88] Rising temperatures coupled with variable precipitation could exacerbate summer drought and could encourage more high-elevation wildfires; These wildfires release stores of carbon that contribute to the buildup of greenhouse gases and therefore further exacerbate climate change.

Climate change is also predicted to bring increased wind damage from major storms and bring

[86] Massachusetts Emergency Management Agency, "Massachusetts Emergency Management Agency Situational Awareness Statement # 24: Statewide Wildfire Operations," (issue brief), Boston, Massachusetts, November 21, 2024.
[87] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[88] ResilientMass Maps and Data Center, "Climate Change Projections Dashboard," Resilientma-mapcenter-mass-eoeea.hub.arcgis.com, ResilientMass, accessed July 1, 2024, https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/#ClimateDashboard.

new types of pests, including invasive species, to the region. Both increased wind and the introduction of new pests could potentially create more debris in wooded areas and result in a larger risk of fires.

The Northborough HMP Planning Team found it difficult to predict the likelihood of wildfires in a probabilistic manner because of the number of variables involved; fuel availability, weather and climate conditions, and human activity all factor into wildfire occurrences. However, based on regular previous occurrences of minor wildfires in town and the increase in invasive species within the Town of Northborough (which is elaborated on in greater details in Section 4.12), the planning team determined the probability of future damaging wildfire events to be "moderate" (10% to 40% probability in the next year).

Impact

While a large wildfire could in theory damage much of the landmass of Northborough, most forested areas are sparsely developed; this means that fires in the most wildfire-prone areas of town are not likely to cause damage to property. For this reason, the Town faces a "minor" impact from wildfires, with damage to less than 10% of property in the affected area of town likely to occur in the case of a wildfire hazard event.

Wildfires can consume homes, other buildings, and/or agricultural resources. Wildfires impact:

- Benefits that people receive from the environment, such as food/water and the regulation of floods and drought;
- Local heritage, through the destruction of natural features;
- The economy, due to damage to property and income from land following a wildfire;
- The overall destruction of property, loss of life, and/or injuries.

Utilizing the total value of all property, $4,255,632,328,[89] and an estimated 5 percent of damage to 1 percent of all structures, the estimated amount of damage from a wildfire in town is $2,127,816.16. The cost of repairing or replacing roads, bridges, utilities, and contents inside structures is not included in this estimate.

The Wildland Urban Interface (WUI) is defined as the area where houses meet or intermingle with undeveloped wildland vegetation; the WUI represents a large percentage of the land use within Worcester County as a whole.[90]

Exposure

Certain features within Northborough's infrastructure, society, and environment may face more exposure to wildfires, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- People who are sensitive to smoke, including children, the elderly, and individuals with health conditions. Air pollution from wildfires is a public health concern, as it leads to smoke inhalation which can be severe. Smoke can exacerbate respiratory conditions like asthma

[89] Data Analytics and Research Bureau, "Assessed Values by Class"

[90] Volker C. Radeloff et al., "The 1990-2020 wildland-urban interface of the conterminous United States - geospatial data," FS.USDA.gov, Forest Service Research Data Archive, 2023, https://www.fs.usda.gov/rds/archive/products/RDS-2015-0012-4/_metadata_RDS-2015-0012-4.html.

and can carry toxic chemicals and particulate matter. In 2021, wildfire smoke from western states and Canada extended across the continental US and forced the Massachusetts Department of Environmental Protection to issue an air quality alert;[91] and

- First responders, especially the town's firefighters.

As previously described in the 2021 example above, wildfires do not have to take place within town to affect the Town; in March through July of 2023, historic wildfires in Canada sent smoke across a broad swath of New England, peaking in June of that year. In Worcester County, these fires reduced air quality throughout the months of May and June. The AQI for Worcester County peaked at 148 – Unhealthy for Sensitive Groups for fine particulate matter (PM2.5) – on June 6th 2023.[92]

Potential Climate Change Effects

Climate change effects will impact future wildfires, as is noted in the "Probability of Future Events" section above. According to the 2023 ResilientMass Plan, precipitation changes, prolonged drought, rising temperatures, and increased frequency of lightning are expected to contribute to increased frequency and severity of wildfire.[93] As droughts become more frequent and severe, forest types that do not usually burn and are not fire adapted will be more likely to burn. Wildfires are projected to increase worldwide by 14% by 2030, 30% by 2050, and 50% by 2100.

Seasonal drought exacerbated by climate change may also make it more difficult to ensure a reliable water source for firefighting.

In summary, climate change is likely to increase the frequency and extent of wildfires in Northborough. This increase in wildfires may lead to changes in land use, such as the Town no longer being able to develop near dense forest. Additionally, if wildfires worsen significantly, residents may desire to move away from dense forest, shifting populations from more rural areas to cities or downtown communities. The future air quality risks to Northborough from wildfires are hard to predict with any certainty and represent a threat to the broader region; town officials could consider including air purifying equipment as a needed aspect of shelter planning in the future.

Vulnerability

Based on the above assessment, Northborough has a hazard risk index of "4 – low risk" from wildfires, in part due to recent wildfires in town reducing fuel loads. However, this risk assessment is highly dependent on short-term weather patterns like wind, lightning, and rainfall, which are nearly impossible for the Town to predict with certainty. Sustained drought conditions could put Northborough at risk to a greater frequency and ferocity of wildfires, and wildfires outside of Northborough could reduce air quality to dangerous levels in town.

Mitigation Strategies

The Town of Northborough is currently able to effectively respond to wildfires through the emergency response facilities and services identified in the critical infrastructure and facilities and

[91] Kat J. McAlpine (2021, July 27). "Wildfire Smoke in New England Is 'Pretty Severe from Public Health Perspective'," BU.edu, The Brink: Pioneering Research from Boston University, July 27, 2021, https://www.bu.edu/articles/2021/wildfire-smoke-in-new-england/.

[92] "Pre-Generated Data Files," Aqs.epa.gov, United States Environmental Protection Agency, October 26, 2023, https://aqs.epa.gov/aqsweb/airdata/download_files.html.

[93] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

existing protection sections of this plan. However, there are numerous opportunities for the Town to expand upon its existing capabilities to mitigate and respond to wildfires. The local HMP planning team identified the following strategies which could reduce the threat of wildfires in Northborough:

- Dredge fire ponds which are too shallow and dry out during the summer months. This helps with stormwater collection and helps prevent flooding in the area of the ponds.
- Expand the capacity of the DPW. Maintain the number of cisterns and fire ponds. Enhance the clearing of poison ivy from draft sites and dry hydrants, and consistently clear the drain at Route 9 and Route 20 which causes flooding.

4.8 EARTHQUAKES

An earthquake is a sudden, rapid shaking of the ground caused by the breaking and shifting of rock beneath the Earth's surface. Earthquakes can occur suddenly and without warning at any time of the year. Ground shaking from earthquakes can rupture gas mains and disrupt other utility services, can damage buildings, bridges, and roads, and can trigger other hazardous events such as avalanches, flash floods (which can be caused by dam failure), and fires. Unreinforced masonry buildings, buildings with foundations that rest on filled land or unconsolidated and unstable soil, and mobile homes not tied to their foundations are especially vulnerable during an earthquake.

LOCATION

Because of the regional nature of the hazard, the entire Town of Northborough is susceptible to earthquakes. This makes the location of occurrence for this hazard "large."

EXTENT

Earthquake magnitude and intensity are two measures of the overall extent of earthquakes in a given area. Magnitude is defined as the energy produced by an earthquake, and intensity is defined as an earthquake's level of effect on the Earth's physical environment, nature, people, and structures.

The magnitude of an earthquake can be measured using the Richter Scale, which measures the energy of an earthquake by determining the size of the greatest vibrations recorded on a seismogram. On this scale, one step up in magnitude (from 5.0 to 6.0, for example) indicates an increase in energy of an earthquake of more than 30 times. Earthquakes are also commonly measured using the moment magnitude scale, which provides similar measurements to the Richter scale but more accurately measures earthquakes with magnitudes greater than 8.[94]

Table 28: Richter Scale Magnitudes and Effects

Magnitude	Effects
< 3.5	Generally not felt, but recorded.
3.5 - 5.4	Often felt, but rarely causes damage.
5.4 - 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 kilometers across where people live.
7.0 - 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or >	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

[94] "How Do We Measure Earthquake Magnitude? Michigan Technological University," MTU.edu, Michigan Tech, accessed June 10, 2024, https://www.mtu.edu/geo/community/seismology/learn/earthquake-measure/.

The intensity of an earthquake is measured using the Modified Mercalli Scale. This scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures on a scale of I through XII; I denotes a weak earthquake and XII denotes an earthquake that causes almost complete destruction.

Table 29: Modified Mercalli Intensity Scale for and Effects[95]

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs.	
II	Feeble	Some people feel it.	< 4.2
III	Slight	Felt by people resting; like a truck rumbling by.	
IV	Moderate	Felt by people walking.	
V	Slightly Strong	Sleepers awake; church bells ring.	< 4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves.	< 5.4
VII	Very Strong	Mild alarm; walls crack; plaster falls.	< 6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged.	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open.	< 6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread.	< 7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards.	< 8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves.	> 8.1

[95] Earthquake Hazards Program, "The Modified Mercalli Intensity Scale," USGS.gov, United States Geologic Survey, accessed June 10, 2024, https://www.usgs.gov/programs/earthquake-hazards/modified-mercalli-intensity-scale?qt-science_center_objects=0#qt-science_center_objects.

Previous Occurrences

The last recorded earthquake to cause major damage in New England occurred in 1755,[96] though seismologists state that another serious earthquake occurrence in the region in the future is possible. Earthquakes which caused damage in New England occurred in:

- 1638 (magnitude 6.5, Concord, New Hampshire),
- 1727 (magnitude 5.6, Newburyport, MA),
- 1755 (magnitude 6.2, off the coast of Cape Ann, MA),
- 1791 (magnitude 4-5, East Haddam, Connecticut),
- 1904 (magnitude 5.9, far eastern Maine, at the border with New Brunswick),
- 1940 (magnitude 5.5, west of Whittier, New Hampshire), and
- 1973 (magnitude 4.8, across the Quebec border from northern Oxford County, Maine)[97]

There are five seismological faults in Massachusetts, but there is no discernible pattern of previous earthquakes along these fault lines. Additionally, earthquakes that are based in more seismologically active regions like parts of Canada may also impact Massachusetts.[98] Earthquakes occur without warning and may be followed by aftershocks. Central New Hampshire is one of the most seismically active regions of New England, and earthquakes with epicenters in this region could cause damage in Northborough, as New England's often very hard igneous and metamorphic bedrock causes earthquake shockwaves to travel further than they do in other regions, such as the US West Coast.[99] Figure 3 below shows the locations of earthquakes that have occurred across the New England region and beyond from January 1975 through October 2017.

[96] Northeast States Emergency Consortium and John E. Ebel, PhD. Boston College, Weston Observatory, "Massachusetts Earthquakes," NESEC.org, Northeast States Emergency Consortium, accessed June 10, 2024, http://nesec.org/massachusetts-earthquakes/.

[97] Ibid; "New England Significant Earthquake Atlas," Aki.bc.edu, Weston Observatory at Boston College, accessed February 14, 2025, http://aki.bc.edu/quakes_historical.htm; Juli Mancini, "Big Noises: The Great Connecticut Quake of 1791," Patch.com, Patch: The Haddams-Killingworth, CT, March 27, 2011, https://patch.com/connecticut/thehaddams-killingworth/big-noises-the-great-connecticut-quake-of-1791; Henry N. Berry IV, "Earthquakes in Maine," Maine.gov, Maine Department of Agriculture, Conservation, and Forestry, January 26, 2015, https://www.maine.gov/dacf/mgs/hazards/earthquakes/quake.htm.

[98] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

[99] "New York Earthquakes," NESEC.org, Northeast States Emergency Consortium, accessed September 16, 2024, https://nesec.org/new-york-earthquakes/; Kevin Skarupa, "Why New England earthquakes are felt so far from epicenters," WMUR.com, WMUR9-ABC, January 27, 2025, https://www.wmur.com/article/feeling-new-england-earthquakes-bedrock/63574691.

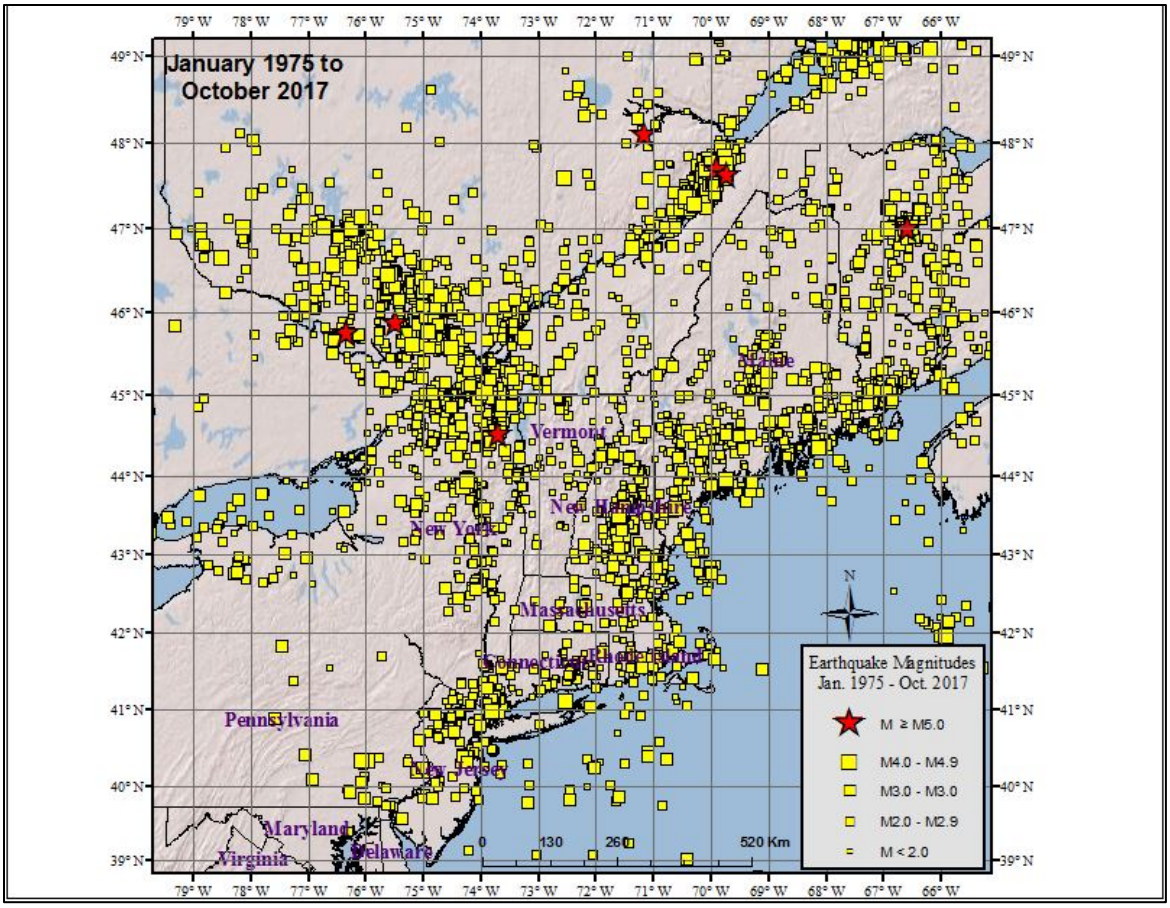

Figure 3: Map of Earthquakes of the Northeastern US and Southeastern Canada 1975 to 2017.[100]

The local hazard mitigation planning team reports that no earthquakes have recently been felt in Northborough. To determine whether earthquakes have occurred recently near Northborough, earthquake data over the past six years for all Massachusetts cities and towns gathered by the Weston Observatory at Boston College was reviewed.

The Weston Observatory utilizes two scales to track the magnitude of earthquakes. One of these scales is the Nuttli magnitude (Mn) for North America east of the Rocky Mountains. Weston Observatory also utilizes the Coda Duration magnitude (Mc) scale, which is based on the duration of shaking at a particular station. The Coda Duration magnitude can quickly estimate the magnitude of an earthquake before its exact location is known.

The following earthquakes with a magnitude of over 2.0 on either the Nuttli magnitude or Coda Duration magnitude scales have been recorded at the Weston Observatory since 2018:

- 12/21/2018 – 3 km WSW of Gardner, 2.1/2.1 [Mn*/Mc**]
- 8/21/2019 – 2 km SSE of Wareham, 1.7/2.4
- 12/3/2019 – 4 km SSE of Plymouth, 1.6/2.2

[100] "New York Earthquakes," NESEC.org, Northeast States Emergency Consortium, accessed September 16, 2024, https://nesec.org/new-york-earthquakes/.

- 11/8/2020 – 11 km SW of New Bedford, 3.8/3.4
- 11/22/2020 – 12 km WSW of New Bedford, 1.7/2.6
- 7/25/2021 – 5.0 km W of Peabody 1.4/2.5
- 1/1/2022 – 13.0 km N of Rockport 2.3/3.0
- 3/4/2022 – 5.0 km WSW of Orange 2.2/2.7
- 11/10/2022 – 12.0 km NW of Nantucket 2.6/3.0
- 11/13/2023 – 208.0 km E of Chatham 2.8/3.3
- 12/26/2023 – 52.0 km ENE of Rockport 2.2/2.8
- 3/11/2024 – 6.0 km E of Lawrence 1.1/2.1

  *Mn is the Nuttli Magnitude (see below)

  **Mc is the Coda Duration Magnitude (see below)

Each of these earthquakes are minor. Additionally, earthquakes with a magnitude of about 2.0 or less are usually called "microearthquakes" and are generally only recorded locally.

On August 23, 2011, an earthquake measuring 5.8 on the Richter scale centered in Virginia was felt in much of the northeast, but this earthquake was not felt in Northborough according to the local HMP planning team.[101]

Probability of Future Events

The 2023 ResilientMass Plan notes that "The probability of a magnitude 5.0 or greater earthquake centered in New England in a 10-year period is about 10–15%."[102] Additionally, this plan notes that while Massachusetts is not near any tectonic plate boundaries, it is still susceptible to earthquakes on the North American Plate. Earthquakes elsewhere could also have secondary effects on the state and the region, such as potentially disrupting supply chains.

Based upon existing records, there is "very low" frequency (less than 1 percent probability in any given year) of damaging earthquakes in Northborough.

Impact

Massachusetts introduced earthquake design requirements into its state building code in 1975 and improved its state building code for seismic resilience in the 1980s. However, these specifications apply only to new buildings or to extensively modified existing buildings. Buildings, bridges, water supply lines, and electrical power lines and facilities built before the 1980s may not be designed to withstand the forces of an earthquake. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975, and 49.8% of the Town's 5,934 total housing units, according to 2022 American Community Survey 5-year estimates, were constructed in 1979 or earlier.[103] Seismic standards in Massachusetts were upgraded with the 1997 revision of the state building code. Despite its fairly old housing stock, Northborough faces a "minor" impact from earthquakes,

[101] Northeast States Emergency Consortium and John E. Ebel, PhD. Boston College, Weston Observatory, "Massachusetts Earthquakes," NESEC.org.
[102] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," page 5.1-42.
[103] "DP04: Selected Housing Characteristics," Data.Census.gov

with damage to less than 10% of property in town likely to occur in the event of an earthquake due to the extreme rarity of damaging events.

HAZUS-MH (multiple-hazards) is a computer program developed by FEMA which estimates losses due to a variety of natural hazards. The HAZUS earthquake module allows users to define an earthquake magnitude and model the potential damages caused by that earthquake as if its epicenter is at the geographic center of the study area. For the purposes of this plan, a magnitude 5.0 earthquake was selected for analysis. Historically, major earthquakes are rare in New England, although a magnitude 5 earthquake occurred in the region in 1963.

Table 30: HAZUS Potential Damages from a Magnitude 5.0 Earthquake with an Epicenter in Northborough

	Magnitude 5.0
Building Characteristics	
Estimated total number of buildings	5,155
Estimated total building replacement value (2024 $)	$ 3,604,000,000.00
Building Damages	
# of buildings sustaining slight damage	1,562
# of buildings sustaining moderate damage	756
# of buildings sustaining extensive damage	155
# of buildings completely damaged	30
Population Needs	
# of households displaced	83
# of people seeking public shelter	36
Debris	
Building debris generated (tons)	66,000
# of truckloads to clear debris (@ 25 tons/truck)	2,640
Value of Damages (dollars)	
Total property damage	$428,383,100.00
Total losses due to business interruption	$62,650,400.00

For more information on the HAZUS-MH software, go to www.fema.gov/hazus-software.

EXPOSURE

Certain features within Northborough's infrastructure, society, and environment may face more exposure to earthquakes, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- Older buildings constructed prior to the first edition of the Massachusetts State Building Code (these buildings would see substantial damage in the case of an earthquake similar in magnitude and length to the 1755 Cape Ann earthquake); and
- Underground infrastructure, which is especially vulnerable to earthquakes due to the glacial outwash sand and gravel and glacio-lacustrine fine sand, silt and clay which make up a large portion of the Town's soils being prone to liquefaction during prolonged shaking when the water table is shallow.[104]

Potential Climate Change Effects

The 2023 ResilientMass Plan identifies no climate change effects that pertain to earthquake hazards.[105]

Vulnerability

Based on the above analysis, Northborough has a hazard index rating of "5 – lowest risk" from earthquakes.

Mitigation Strategies

The Town of Northborough is currently able to effectively respond to earthquakes through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand its existing capabilities to mitigate and respond to earthquakes. The local HMP planning team identified the following strategies that could be used to reduce the threat of earthquakes in Northborough:

- Protect underground utilities like gas, water, and sewer by implementing redundancies to these systems.
- Inventory unreinforced masonry and brick buildings in town which may be vulnerable to earthquakes. Conduct a study which identifies ways that these buildings can meet the Massachusetts State Building Code's seismic standards.
- Enhance the utilization of hazard warning systems and notifications, including by using social media, town webpages, Code Red, and other communication methods. Interns are currently taking senior citizen information to sign them up for CodeRed. Post generator safety and use information on social media. The Health Department is going to put out a brochure on 72-hour kits through Town-wide mailing, school take-home packets, and other communication methods. Enhance and maintain the Town's internal instant messaging system to allow for the rapid response of emergency personnel.
- Study the possibility of creating a regional shelter with a neighboring town. This would help limit the expense of maintaining separate shelters when towns have limited budgets.

[104] "What is liquefaction," USGS.gov, United States Geological Survey, April 19, 2023, https://www.usgs.gov/faqs/what-liquefaction; "Soil Survey Map," ArcGIS.com, ESRI, accessed February 14, 2025, https://www.arcgis.com/apps/View/index.html?webmap=38a93357a08b4f6d94d7e07a424fafd5.
[105] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

4.9 Dam Failure

Dams and their associated impoundments provide many benefits, such as water supply, recreation, hydroelectric power generation, and flood control, to communities. However, dams also pose a risk to lives and property in cases in which they fail. Dam failure is not a common occurrence, but dams do represent a potentially disastrous hazard.

When a dam fails, the potential energy of the stored water behind the dam is released rapidly. Some dam failures occur when floodwaters overtop and erode the material components of the dam. Other dam failures are caused by foundation defects, inadequate maintenance, internal erosion caused by seepage, and other specific causes.[106] Dam failures may be influenced by storm floodwaters, but most dam failures are caused by structural, mechanical, or hydraulic failures.[107] Dam breaches can lead to catastrophic consequences; they cause water to rush in a torrent downstream, flooding an area engineers refer to as an "inundation area." The number of casualties and the amount of property damage resulting from a dam failure will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Many dams in Massachusetts were built during the 19th century without the benefit of modern engineering design and construction oversight. Dams of this age are more vulnerable to failing because of structural problems caused by their age and/or lack of proper maintenance, as well as due to structural damage caused by an earthquake or flooding. The Massachusetts Department of Conservation and Recreation (DCR) Office of Dam Safety is the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00).[108] Dams that are in excess of 6 feet in height (regardless of storage capacity) and that have more than 15 acre-feet of storage capacity (regardless of height) are under DCR regulation. Dam safety regulations enacted in 2005 transferred significant responsibilities for dams from the Commonwealth of Massachusetts to dam owners, including the responsibility to conduct dam inspections.

Location

According to the Massachusetts Office of Dam Safety, there are sixteen dams in Northborough. Of these dams, one is ranked as Significant Hazard and two are ranked as High Hazard. In addition to the sixteen dams in Town, the Fiske Mill Pond Dam (Low Hazard, MA0062, privately owned) in neighboring Upton lies roughly 0.8 miles upgradient from Mill Pond and the West Street Bridge, which straddles Route 140, a primary evacuation route in town. The local HMP planning team also identified concerns with dams upstream in Hopkinton that control water flowing into Northborough Pond as well as concerns with the Milford Dam, which is owned by three different Towns. Dams within and/or owned by Northborough are listed below and are mapped in Appendix A:

[106] Association of State Dam Safety Officials. (n.d.). Dam Failures and Incidents. Association of State Dam Safety Officials. Retrieved December 29, 2021, from https://damsafety.org/dam-failures

[107] "Living with Dams: Know Your Risks (FEMA P-956)," Federal Emergency Management Agency, February 2013, page 9, https://www.fema.gov/sites/default/files/2020-08/fema_living-with-dams_p-956.pdf.

[108] "Section 44: Definitions applicable to Secs. 44 to 48B," MAlegislature.gov, The 193rd General Court of the Commonwealth of Massachusetts, accessed September 17, 2024, https://malegislature.gov/Laws/GeneralLaws/PartIII/TitleIV/Chapter253/Section44; "302 CMR 10.00: Dam safety," Mass.gov, The Commonwealth of Massachusetts, Massachusetts Court System, February 10, 2017, https://www.mass.gov/regulations/302-CMR-1000-dam-safety#:~:text=302%20CMR%2010.00%20provides%20regulatory%20guidelines%20for%20the,public%20review%20of%20the%20performance%20of%20a%20dam.

Table 31: Dams within and/or Owned by Northborough

National ID	Dam Name	Owner	Regulatory Authority	Hazard Code	Notes
MA00959	Bartlett Pond Dam	Public – Town of Northborough	Office of Dam Safety	Low Hazard	This dam has been noted as vulnerable to a locally identified dam failure hazard by CMRPC's GIS analysis.
MA00995	Assabet River Dam	Private	Office of Dam Safety	Significant Hazard	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA00996	Cold Harbor Brook Dam	Public – MA Department of Conservation and Recreation (DCR)	Office of Dam Safety	High Hazard	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is extremely close to the 1% flood zone.
MA00998	Hop Brook Dam	Public – MA Department of Conservation and Recreation (DCR)	Office of Dam Safety	High Hazard	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone and is close to a locally identified flooding hazard. This dam is being rebuilt; the design process for this rebuilding is currently underway.
MA00999	Smith Pond Dam	Private	Office of Dam Safety	Low Hazard	There are concerns that this dam may fail.
MA01234	Northborough Reservoir Dam	Public – Town of Northborough	Office of Dam Safety	Significant Hazard	This dam is owned by the Town of Northborough, is located in Shrewsbury and Boylston, and is planned to be partially removed. Massachusetts DCR Dam and Seawall Grant, local water enterprise fund, and state earmark funding have been secured to use for the partial removal of this dam.
MA02843	Old Mill Pond Dam	Private	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this dam.

National ID	Dam Name	Owner	Regulatory Authority	Hazard Code	Notes
MA02845	Wallace Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable to a locally identified dam failure hazard by CMRPC's GIS analysis.
MA02846	Old Saw Mill Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02847	Old Adams Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02848	Small Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02849	Ellis Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02850	Storage Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02851	Cider Mill Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.
MA02852	Old Mill Pond Dam	Private	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this dam.
MA02853	Farm Pond Dam	Private	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this dam.
MA02854	West Meadow Country Club Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 1% flood zone.

Inundation areas for these dams within Northborough cover less than 10% of the Town, or a "small" portion of its area.

EXTENT

As stated in the introduction to this dam failure section, dam or levee breaches often lead to catastrophic consequences; water released by a breach ultimately rushes in a torrent downstream, flooding an area engineers refer to as an "inundation area." The number of casualties and the amount of property damage which a dam failure causes will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Dams in Massachusetts are assessed according to their risk to life and property. The state has three hazard classifications for dams:

- High Hazard: Dams located where failure or improper operation will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.
- Significant Hazard: Dams located where failure or improper operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways, or railroads or cause interruption of use or service of relatively important facilities.
- Low Hazard: Dams located where failure or improper operation may cause minimal property damage to others; Loss of life is not expected.

Some dams do not have a hazard rating.

Previous Occurrences

To date, there have been no catastrophic dam failures in Northborough.

Probability of Future Events

The probability of future dam failure events in Northborough is "very low," with a less than 1% chance of a dam in town failing in any given year.

Impact

The Town faces a "limited impact" from the failure of dams, with 10% to 25% of property in the affected area of town likely to see damage in the case of a dam failure event.

It is not possible to estimate the property loss impacts of dam failure quantitatively given the large number of variables involved in failure events. Qualitatively, losses from failure of an individual dam could be significant but would likely be geographically limited to portions of the dam's inundation zone. The geographic areas included in dam inundation zones may change with future improvements to dam breach modeling software which are being developed and are currently in early trial stages, such as the DSS-WISE™ (Decision Support System for Water Infrastructural Security) program.[109]

Exposure

Certain features within Northborough's infrastructure, society, and environment may face more exposure to dam failures, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- Structures located within the inundation areas of Significant and High Hazard Dams;
- Downstream waterway infrastructure; and
- Poorly maintained or inspected dam infrastructure held in public or private hands.

Potential Climate Change Effects

Intensified and more frequent flooding caused by climate change can increase dam failure risk.

[109] "About DSS-WISE™ Web," Dsswiseweb.ncche.olemiss.edu, University of Mississippi, accessed June 10, 2024, https://dsswiseweb.ncche.olemiss.edu/userpages/about.php.

Flooding can cause dam failure through overtopping; Overtopping occurs when floodwaters flowing into a dammed body of water exceed the spillway capacity of the dam and cause water to flow over the top of the dam. If the water flowing over the dam erodes the dam, then a dam failure can occur. Therefore, the risk of dam failure may be indirectly impacted by climate change through intensified flooding.

VULNERABILITY

Based on a mostly qualitative assessment, Northborough has a hazard index rating of "4 – low risk" from dam failure.

MITIGATION STRATEGIES

The Town of Northborough is currently able to effectively respond to dam failure through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand its existing capabilities to mitigate and respond to dam failures. The local HMP planning team identified the following strategies that could be used to reduce the threat of dam failure in Northborough:

- Repair Bartlett Pond Dam to mitigate / remove invasive species (a contract has been signed for completing invasive plant management at the dam from 2024-2026 using local Community Preservation Act (CPA) funding).
- Remove dams and restore streams, prioritizing continuing work on the removal of Northborough Reservoir Dam. Explore options for acquiring and removing other significant and high hazard dams within town. Massachusetts DCR Dam and Seawall Grant, local water enterprise fund, and state earmark funding has been secured to use for the partial removal of the Northborough Reservoir Dam.
- Communicate with the Office of Dam Safety regarding the condition of Smith Pond Dam / Otis Street Dam.

4.10 DROUGHT

Drought is a normal and recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. Drought is a lack of precipitation over an extended period of time which results in a prolonged water shortage for some activity, group, or environmental sector. The direct impacts of droughts include: reduced crop yields; reduced rangeland and forest productivity; increased fire hazards; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat. Drought impacts can have far-reaching effects throughout the region and even the country.

LOCATION

Because of this hazard's regional nature, a drought would likely impact the entire community, meaning the location of occurrence within Northborough of this hazard is "large."

EXTENT

The National Drought Mitigation Center records information on historical drought occurrences. Unfortunately, drought data are only available at the state and county levels and not at the local level. The National Drought Mitigation Center categorizes drought severity on a D0-D4 scale as is shown below.

Table 32: National Drought Mitigation Center D0-D4 Scale[110]

Classification	Category	Description
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

More severe drought will lead to more impactful changes in groundwater by reducing water table levels and affecting groundwater quality. The United States Geological Survey's National Groundwater Conditions web application measures groundwater levels by monthly percentiles as compared to historic levels at each particular site.[111] In Massachusetts, the quality of drinking water, including from groundwater sources, is assessed by measuring maximum containment levels (MMCLs)

[110] "Drought Classification," Droughtmonitor.unl.edu, National Drought Mitigation Center, University of Nebraska-Lincoln, accessed June 10, 2024, https://droughtmonitor.unl.edu/About/AbouttheData/DroughtClassification.aspx.

[111] Lee Stanish, "Introducing the National Groundwater Conditions web application," Waterdata.usgs.gov, United States Geological Survey, accessed April 7, 2025, https://waterdata.usgs.gov/blog/groundwater-levels-app/.

from a number of inorganic and organic chemical, radionuclide, and biological contaminants.[112]

Previous Occurrences

In Massachusetts, five statewide extreme droughts have occurred since 1930. These historic major droughts range in severity and in length, lasting from three to nine years. During many of these droughts, water supply systems around the state were found to be inadequate; At the times of these droughts, water was piped into urban areas, and water-supply systems were modified to permit withdrawals at lower water levels. The Northborough area has been spared the most severe impacts in each of these droughts according to the information for Massachusetts included in the USGS Water Supply Paper #2375.[113]

The following table shows peak drought severity data in Massachusetts from the National Drought Mitigation Center for each year since 2000:

Table 33: Peak Drought Severity Data in Massachusetts Per Year Since 2000[114]

Year	Maximum Severity
2000	No drought
2001	D2 conditions in 21% of the state
2002	D2 conditions in 100% of the state
2003	No drought
2004	D0 conditions in 48% of the state
2005	D1 conditions in 7% of the state
2006	D0 conditions in 98% of the state
2007	D1 conditions in 71% of the state
2008	D0 conditions in 69% of the state
2009	D0 conditions in 45% of the state
2010	D1 conditions in 27% of the state
2011	D0 conditions in 0.01% of the state
2012	D2 conditions in 51% of the state
2013	D1 conditions in 60% of the state
2014	D1 conditions in 54% of the state
2015	D1 conditions in 58% of the state
2016	D3 conditions in 52% of the state
2017	D3 conditions in 9% of the state

[112] "Drinking Water Standards and Guidelines," Mass.gov, the Massachusetts Department of Environmental Protection, accessed April 7, 2025, https://www.mass.gov/guides/drinking-water-standards-and-guidelines.
[113] Richard W. Paulson et al., "National Water Summary 1988-89 – Hydrologic Events and Floods and Droughts," *United States Geological Survey Numbered Series Water Supply Paper,* no. 2375 (1991), https://doi.org/10.3133/wsp2375, page 329.
[114] "Statistics by Threshold," Droughtmonitor.unl.edu, National Drought Mitigation Center, University of Nebraska-Lincoln, accessed June 10, 2024, https://droughtmonitor.unl.edu/DmData/DataDownload/StatisticsbyThreshold.aspx.

2018	D1 conditions in 36% of the state
2019	D0 conditions in 85% of the state
2020	D3 conditions in 36% of the state
2021	D2 conditions in 1% of the state
2022	D3 conditions in 70% of the state
2023	D1 conditions in 0.4% of the state
2024 (through late November)	D3 conditions in 47% of the state

The following table shows peak drought severity data in Worcester County from the National Drought Mitigation Center for each year since 2018:

Table 34: Peak Drought Severity Data in Worcester County Per Year Since 2018[115]

Year	Maximum Severity
2018	D1 conditions in 33% of Worcester County
2019	D0 conditions in 100% of Worcester County
2020	D3 conditions in 14% of Worcester County
2021	D1 conditions in 51% of Worcester County
2022	D3 conditions in 53% of Worcester County
2023	D0 conditions in 74% of Worcester County
2024 (through late November)	D3 conditions in 51% of Worcester County

In Northborough, there have been no recorded drought events with substantial impacts in recent decades. The Town is supplied through the Massachusetts Water Resources Authority and is therefore more resilient to drought conditions than other towns in the region. There have been no reports of loss of private well service in town.

As of the writing of this plan, the Town of Northborough and large portions of Massachusetts are currently in critical drought conditions; since August 2024, all regions of the state except for the Cape and Islands have seen a rainfall deficit of 8 to 11 inches.[116]

Probability of Future Events

In Northborough, as in the rest of the state, the probability of extreme and exceptional droughts is "low" (a 1% to 10% chance in the next year). Based on past events and current criteria outlined in the Massachusetts Drought Management Plan, Central Massachusetts may be slightly more vulnerable than parts of eastern Massachusetts to severe drought conditions.[117] However, many

[115] Ibid.

[116] "Drought Management in Massachusetts," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs Drought Management Task Force, December 9, 2024, https://www.mass.gov/guides/drought-management-in-massachusetts.

[117] "Massachusetts Drought Management Plan," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs and Massachusetts Emergency Management Agency, December 2023,

factors such as water supply sources, population, economic factors (i.e., if an area has an agriculture-based economy), and infrastructure may affect the severity and length of a drought event in different parts of the state.

The long-term risk of drought, including extreme and exceptional drought, may increase in Northborough due to climate change influences. Specifically, climate change may cause an increase in consecutive dry days over time.

Impact

The specific impacts of historical droughts in Massachusetts are categorized by the National Drought Mitigation Center in Table 35 below:

Table 35: Historic Impacts of Drought in Massachusetts[118]

Category	Historically observed impacts
D0	Crop growth is stunted; planting is delayed
	Fire danger is elevated; spring fire season starts early
	Lawns brown early; gardens begin to wilt
	Surface water levels decline
D1	Irrigation use increases; hay and grain yields are lower than normal
	Honey production declines
	Wildfires and ground fires increase
	Trees and landscaping are stressed; fish are stressed
	Voluntary water conservation is requested; reservoir and lake levels are below normal capacity
D2	Specialty crops are impacted in both yield and fruit size
	Producers begin feeding cattle; hay prices are high
	Warnings are issued on outdoor burns; air quality is poor
	Golf courses conserve water
	Trees are brittle and susceptible to insects
	Fish kills occur; wildlife move to farms for food
	Water quality is poor; groundwater is declining; irrigation ponds are dry; outdoor water restrictions are implemented
D3	Crop loss is widespread; Christmas tree farms are stressed; dairy farmers are struggling financially
	Well drillers and bulk water haulers see increased business
	Water recreation and hunting are modified; wildlife disease outbreak is observed
	Extremely reduced flow to ceased flow of water is observed; river temperatures are warm; wells are running dry; people are digging more and deeper wells

The 2023 ResilientMass plan notes that while drought is a naturally occurring climate phenomenon,

https://www.mass.gov/doc/massachusetts-drought-management-plan/download.

[118] "State Impacts," Droughtmonitor.unl.edu, National Drought Mitigation Center, University of Nebraska-Lincoln, accessed June 10, 2024, https://droughtmonitor.unl.edu/DmData/StateImpacts.aspx.

its impacts can be exacerbated by human behavior.[119] The volume and rate of groundwater withdrawn from underground aquifers can impact the amount of water that flows through surface water bodies; therefore, high rates of groundwater withdraw can negatively impact aquatic ecosystems. Additionally, more impervious surface coverage, and some forms of stormwater infrastructure, can prevent the natural infiltration of precipitation into groundwater and can therefore exacerbate drought.[120]

Specific drought impacts in Northborough may vary among and between customers of the Town's water system and private well users. While the impact of a drought can be assessed as "minor" overall, with very little damage to property (damage to less than 10% of property in the area affected by the hazard), injuries, or loss of life likely to occur in town, drought impacts may be higher in the parts of town that are not located within the Town's water service area.

Exposure

Certain features within Northborough's infrastructure, society, and environment may face more exposure to drought, or be disproportionately impacted by it, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- Residences or businesses with shallow wells;
- Wild plants and animals, including trees; and
- Vegetation, which may become more vulnerable to wildfire due to prolonged drought.

Higher water bills and/or the cost of re-drilling private wells due to drought impacts could also negatively affect residents in town. Other factors like PFAS contamination of water sources could compound drought-related water supply challenges. Contaminants, including PFAS, can pose greater risk to the community after shifting position due to drought-driven changes in groundwater.[121]

Potential Climate Change Effects

According to the 2023 ResilientMass Plan, there are two major ways that climate change influences drought frequency and severity.[122]

- The frequency and extent of droughts are projected to increase in summer and fall as higher temperatures result in more evaporation, snow melts earlier in the year, and precipitation becoming less frequent yet more extreme when it does occur.
- Rising temperatures and changes in precipitation patterns will reduce snowpack and hasten snowmelt and therefore can exacerbate drought. The process of reduced snowmelt can result in less snowmelt recharge of groundwater, less snowmelt feeding stream flows, and less snowmelt available as an agricultural water source.

A common concern among town residents who responded to the survey was that wells in town may dry up in the future during drought events. Northborough is less vulnerable to dried-up wells resulting from drought than other communities in the CMRPC region, as the majority of the Town's

[119] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[120] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[121] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.1-34-5.1-35.
[122] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

residents are connected to the Town's public water system and get their water from Massachusetts Water Resources Authority-owned reservoirs. According to the 2023 ResilientMass Plan, climate change is predicted to affect groundwater availability;[123] the increased frequency and duration of drought conditions will increase the risk in town of wells drying up.

In summary, climate change is likely to increase the frequency and extent of drought in Massachusetts. Drought that is worsened by climate change can have numerous community-wide implications in Northborough. Due to the impacts of drought on crop yield, land use designated for farming could be altered or reduced. In addition, drought is predicted to worsen significantly in other parts of the country, particularly in the southwestern United States, and it is possible that this could result in people from other parts of the country moving to the northeast, including to Northborough.

VULNERABILITY

Based on the above assessment, Northborough has a hazard index rating of "4 – low risk" from drought. Minimal or no loss of or damage to property, injuries, or loss of life is expected from drought in town.

MITIGATION STRATEGIES

The Town of Northborough is currently able to effectively respond to drought through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand its existing capabilities to mitigate and respond to drought. The local HMP planning team identified the following strategies that could be used to reduce the threat of drought in Northborough:

- Evaluate climate change's impacts on private drinking water wells.
- Explore establishing a redundant MWRA connection, as recommended by MassDEP, to ensure a reliable water supply for the Town.

[123] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.1-34-5.1-35.

4.11 Extreme Temperatures

The 2023 ResilientMass Plan states that there are no universal definitions of "extreme heat," "extreme cold," or "extreme temperatures"; these terms are relative terms whose meaning depends on the normal average temperatures and climatic highs and lows in a region.[124] Extreme heat in Massachusetts is typically defined as a period of three or more consecutive days with temperatures above 90 °F.[125] Extreme heat may also refer to any prolonged period of especially hot weather (which is called a heat wave) which may also be accompanied by high humidity. Extreme cold, like extreme heat, is a dangerous situation that can result in health emergencies for susceptible people. People without shelter, who are stranded, or who live in homes that are poorly insulated or are without heat and/or air conditioning are especially at risk to extreme temperatures.

For Massachusetts, extreme temperatures can be defined as those that are far outside the normal ranges. Normal temperatures within the period ranging from 1991-2020 for the area near Northborough are:

Table 36: Normal Temperatures in the Period Between 1991-2020 in the Area Near Northborough[126]

	July (Hottest Month)	January (Coldest Month)
Average High (°F)	79.8°	32.3°
Average Low (°F)	61.7°	17.1°

The National Weather Service's (NWS's) specific criteria for issuing extreme heat and extreme cold watches, warnings, and advisories are described in the Extent section below.

Location

Extreme temperatures can be expected to be uniform across Northborough during a given extreme temperature event, due to the Town's lack of extreme elevations, urban areas, and coastal areas. Therefore, this hazard has a "large" geographic coverage in town.

Extent

The NWS uses the heat index scale to categorize extremely hot temperatures. This scale combines relative humidity with actual air temperature to determine the risk to humans. The NWS issues an Excessive Heat Advisory if the heat index is forecast to reach 95°F-99°F for 2 or more hours over 2 consecutive days, or 100°F-104°F for 2 or more hours over 1 day. The NWS issues an Excessive Heat Warning when the daytime heat index is forecasted to reach 105°F for 2 or more hours. The NWS defines a Heat Wave as 3 or more days of greater than or equal to 90°F temperatures. The following chart indicates the relationship between heat index and relative humidity:

[124] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[125] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-1-5.2-2.
[126] These temperature estimates are based on data recorded at a weather station at Worcester Regional Airport. "U.S. Climate Normals Quick Access," Ncei.noaa.gov, National Oceanic and Atmospheric Administration National Centers for Environmental Information, accessed September 25, 2024, https://www.ncei.noaa.gov/access/us-climate-normals/.

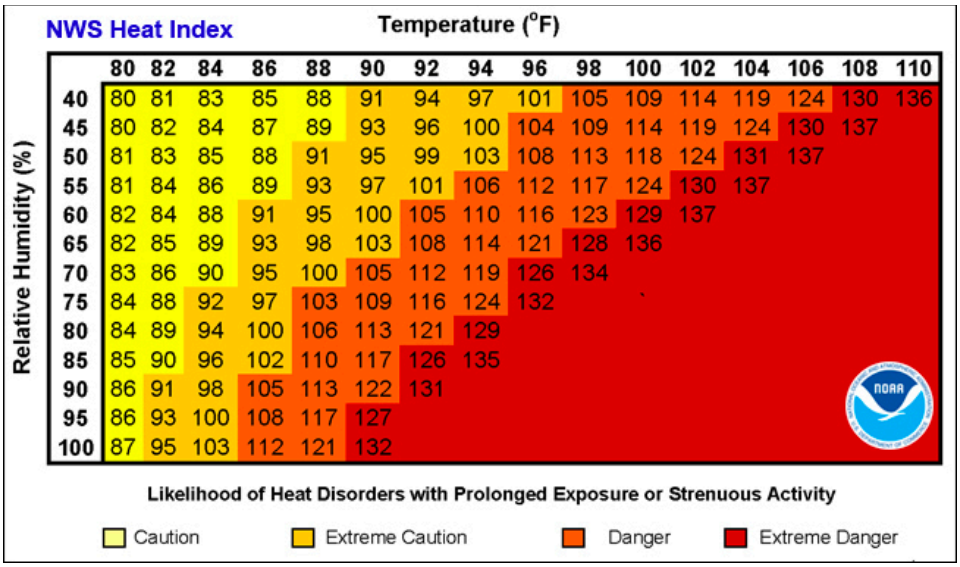

Figure 4: Heat Index[127]

Extreme heat causes more fatalities in the United States that all other weather-related natural hazards combined.[128] Extreme heat can be the underlying cause of death or can worsen other medical conditions like heart disease, hypertension, alcohol poisoning, and drug overdoses.[129] The heat-related mortality rate is higher among males and people aged 65 years and older.[130]

Table 37: Heat Effects on the Body lists the effects of extreme heat on the body at different levels of the heat index. It is important to note that while temperatures exceeding 100°F are unusual for Central Massachusetts, high humidity is very common during the summer and can drive the heat index in the region to dangerous levels / temperatures above 100°F.

Table 37: Heat Effects on the Body[131]

Classification	Heat Index	Effect on Body
Caution	80°-90°F	Fatigue possible with prolonged exposure and/or physical activity.
Extreme Caution	90°-103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°-124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F+	Heat strokes highly likely.

[127] National Weather Service, "What is the heat index?," Weather.gov, National Oceanic and Atmospheric Administration, accessed September 16, 2024, https://www.weather.gov/ama/heatindex.
[128] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,"
[129] Ambarish Vaidyanathan et al., "Heat-Related Deaths—United States, 2004–2018," *Morbidity and Mortality Weekly Report* 69, no. 24 (2020): 729-734. https://doi.org/10.15585/mmwr.mm6924a1.
[130] Ibid.
[131] National Weather Service, "What is the heat index?," Weather.gov, National Oceanic and Atmospheric Administration, accessed June 10, 2024, https://www.weather.gov/ama/heatindex.

Other impacts of high temperatures include drought, wildfire, and the formation of ground-level ozone.[132] Prolonged heat can cause power use to spike and in turn can overload the electrical grid, causing outages.[133] Extreme heat and cold can both negatively impact transportation infrastructure; Railroad tracks are a particular concern because metal rails can kink in high temperatures.[134]

The 2023 ResilientMass Plan notes that the extent (severity or magnitude) of extreme cold temperatures is generally measured through the Wind Chill Temperature Index. The wind chill temperature is the temperature that people and animals feel when outside; it is based on the rate of heat loss from exposed skin due to the effects of wind and cold.[135] In Massachusetts, the National Weather Service (NWS) Norton Forecast Office issues a wind chill warning when the Wind Chill Temperature Index, based on sustained wind, is –25°F or lower for at least three hours. The NWS Wind Chill Chart below shows three shaded areas of combinations of wind and temperature conditions in which there is frostbite danger; Each shaded area shows how long a person can be exposed before frostbite develops.

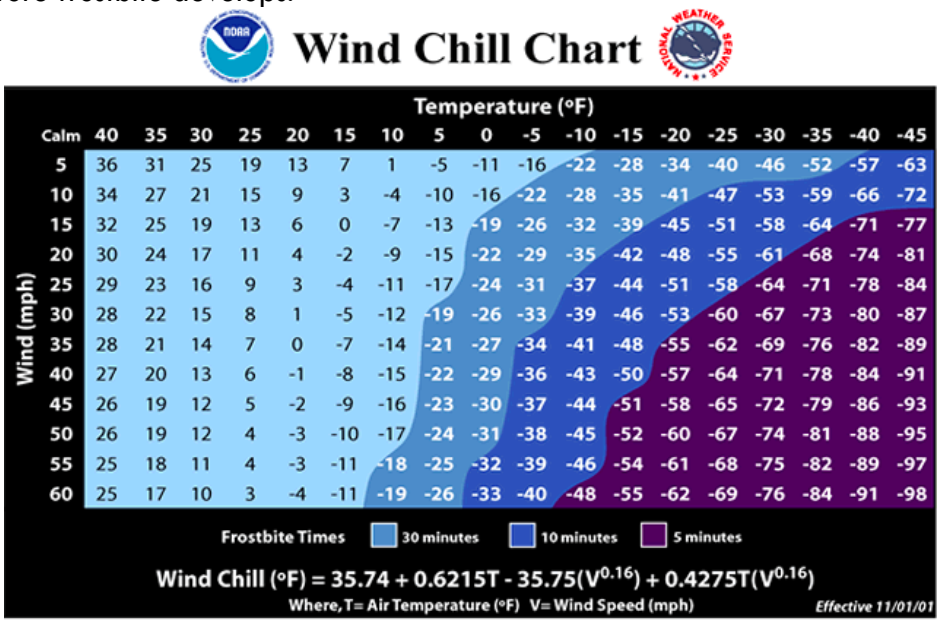

Figure 5: NWS Wind Chill Temperature (WCT) index.[136]

Cold temperatures are often combined with winter storms. People may experience the loss of heat and power in their homes and workplaces due to storm damage, which could further subject them to the cold.[137] Carbon monoxide poisoning is another risk during cold weather, especially when households lack adequate power or heat.[138]

[132] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,"
[133] Ibid.
[134] Ibid.
[135] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-1-5.2-3.
[136] National Weather Service, "Understanding Wind Chill," Weather.gov, National Oceanic and Atmospheric Administration, accessed September 16, 2024, https://www.weather.gov/safety/cold-wind-chill-chart.
[137] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-1-5.2-3.
[138] Ibid.

Previous Occurrences

There is not a comprehensive data source that lists instances when the National Weather Service has issued extreme heat or cold warnings or advisories in Worcester County.

According to the 2023 Resilient Mass Plan, there have been 118 warm weather events (heat and excessive heat events) in the state between 1995 and 2022.[139] 2010–2022 had seven of the 10 warmest summers on record in the state.

2012 and 2013 were notably hot summers in Massachusetts[140] In July 2013, a long period of hot and humid weather occurred throughout New England. One fatality occurred on July 6, when a postal worker collapsed as the heat index reached 100°F.[141]

The hottest two summers on record in the Commonwealth were 2020 and 2022.[142] August 2022 was the hottest August ever recorded in the Commonwealth, with temperatures more than 6°F greater than the 20th century average. In August 2022, Boston experienced at least 17 days above 90 degrees, including two six-day heat waves.

Statewide, there were 33 extreme cold weather events between 1994 and 2018. The NOAA storm Events database lists the following Extreme Cold / Wind Chill Events as having occurred in Worcester County since the last Northborough HMP was developed in 2018:[143]

- 01/06/2018: Strong west winds trailed the January 4 winter storm. These winds drew bitterly cold arctic air over Massachusetts. The combination of strong wind and low temperatures created a dangerous wind chill, with readings reaching 25 degrees below zero or colder in a couple of locations during the early mornings of January 6 and 7.
- 01/21/2019: Strong west to northwest winds trailing the January 20th storm drew cold air across Southern New England on January 21st and caused wind chill values of 25 below zero or colder in Central and Western Massachusetts. The wind diminished during the afternoon and evening of January 21st allowing wind chill values to become less extreme, in the teens below zero.

The local HMP planning team in Northborough identified an extreme cold weather event on February 3-4, 2023; an extreme cold blast was experienced in town during these days, and a housefire occurred at Verjuniel Ave on February 4th at 2:02 A.M.

Inland portions of Massachusetts are more subject to extreme temperatures because they lack the moderating effect of the Atlantic Ocean. However, densely developed cities are more likely to be impacted by heat waves than smaller towns like Northborough.

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[139] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-7-5.2-8.
[140] Ibid.
[141] Ibid.
[142] Ibid.
[143] "Storm Events Database Search Results for Worcester County, Massachusetts," NCDC.NOAA.gov, National Oceanic and Atmospheric Administration National Centers for Environmental Information, accessed September 17, 2024, https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Extreme+Cold%2FWind+Chill&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2018&endDate_mm=12&endDate_dd=31&endDate_yyyy=2024&county=WORCESTER%3A27&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=25%2CMASSACHUSETTS.

Probability of Future Events

The probability of future extreme heat or extreme cold events occurring in Northborough is considered to be "moderate," or between 10% and 40% in the next year.

Impact

The impact of extreme heat or cold in Northborough is considered to be "minor," with no property damage and a limited effect on humans anticipated in the case of extreme temperature events.

Exposure

Certain features within Northborough's infrastructure, society, and environment may face more exposure to extreme temperatures, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- Children and elderly residents, who are more vulnerable to the effects of extremely hot or cold conditions;
- Low-income residents who are unable to afford adequate cooling or heating;
- Renters who may have few home improvement options for mitigating extreme heat and cold;
- People who work outdoors such as construction or farm workers;
- The utility grid, which could be vulnerable to outages due to surges in power use during extreme temperatures. Power outages during extremely hot or cold days could cause further problems for people who rely on air conditioners or electric heaters; and
- Certain forms of agriculture which may be negatively affected by extreme temperatures, especially extreme heat.

Potential Climate Change Effects

According to the 2023 ResilientMass Plan, climate change is already causing more high heat days and fewer extreme cold events in Massachusetts and beyond.[144] Climate change is also shifting the average temperature in Massachusetts higher, leading to longer warm seasons as well as shifts to growing seasons, habitat and vegetation ecosystems, and migratory patterns. Rising temperatures will also cause warming seas, a degradation in air quality, impacts on people's health, and an increased demand for energy and government services. Secondary climate change effects of extreme temperatures include increased severity of wildfires, droughts, and flooding as well as encroachment by invasive species. According to the 2023 ResilientMass Plan:[145]

- By 2050, average annual temperatures are expected to increase by between 5.9° and 7.9°F. This is a drastically shortened timeline from the 2018 state hazard mitigation plan, where increases of this magnitude were not expected until the end of the century.
- By 2100, annual average temperatures are expected to increase by between 10.0° and 12.9°F compared to the 1971-2000 baseline.

According to the 2022 Massachusetts Climate Change assessment, by 2030, the summer mean

[144] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[145] Ibid.

temperature could increase by 3.6°F from the period between 1950 and 2013, worsening stress on electric transmission and utility distribution infrastructure.[146]

In summary, climate change is likely to increase the frequency and duration of extreme heat events in Massachusetts. Changes to average annual temperatures will also impact Northborough. Seasonal temperatures will shift, with spring and summer temperatures extending through more of the year.[147] Winters may also be milder than historical norms.[148] Changes to average temperatures could impact the agricultural industry and the natural environment. Farmers may need to shift their practices to account for new climate conditions, and certain specific plants and animals may need to migrate to new ranges to find suitable habitat.[149]

To respond to climate change-induced changes in temperatures, Northborough residents and businesses may have to alter work patterns during extreme heat days and events to reduce workplace injuries in vulnerable jobs such as construction trades and agricultural labor. The Town may have to plan to offer more cooling stations for residents, particularly vulnerable populations such as the elderly and low-income residents. Northborough may also have to account for an increase in people moving to town and/or visiting town to seek refuge from extreme heat in other parts of the country.[150]

Vulnerability

Northborough's vulnerability to extreme heat and cold is considered to be "4 – low risk." The Town has operated heating and cooling shelters and continues to do so at their senior center.

Mitigation Strategies

The Town of Northborough is currently able to effectively respond to extreme temperatures through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, the Town has numerous opportunities to expand upon its existing capabilities to mitigate and respond to extreme temperatures. The local HMP planning team identified the following strategies that could be used to reduce the threat of extreme temperatures in Northborough:

- Incorporate low-impact development (LID) measures to reduce heat island impacts in town and deal with stormwater mitigation issues.
- Encourage tree planting on public lands through collaboration between the DPW, local civic organizations, and the local school district. Incorporate nature-based mitigation measures and design into municipally/publicly owned lands.
- Install cooling and/or dehumidification at Melican Middle School, the Town's emergency shelter.

[146] "2022 Massachusetts Climate Change Assessment," page RS30.
[147] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[148] Ibid.
[149] Ibid.
[150] Ibid.

4.12 Invasive Species

An invasive species, as defined by the Invasive Species Advisory Committee (ISAC) of the U.S. Department of the Interior, is "a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health."[151] Invasive species are not the same as native pest species, such as beavers and deer. The State of Massachusetts, being heavily forested with relatively new growth forest, as well as having a great deal of its water sourced from open reservoirs, is vulnerable to the threat of both land and aquatic invasive species. Invasive species can damage and disrupt existing ecosystems by outcompeting the native flora and fauna: many invasive aquatic species harm water quality, and many land-borne invasive species increase the risk of wildfires. The effects of invasives are species-dependent, and a challenge for invasive species management is that many municipalities are affected by some invasive species but not others.

Location

Several invasive species affect broad regions of Massachusetts. The Emerald Ash Borer (*Agrilus planipennis*) has been detected in every city and town within the Central Region.[152] However, invasives and their effects can also be very species-dependent and localized, so invasive species hazards can also bear a resemblance to other more localized hazards such as localized flooding. Northborough's suburban development along with is geography lends itself towards being more vulnerable to invasives. Northborough is characterized by its rolling hills interspersed with streams, and vulnerable to intrusion from both land based and aquatic invasives. More than 50% of the Town is vulnerable to invasives, so this hazard has a "large" geographic coverage in town.

Extent

It is difficult for local officials to understand the extent of the impacts that invasive species have on their communities. Factors that lead to a dearth of knowledge about the extent of impacts of invasive species include: the unpredictable nature of invasives, the lack of verified data clearinghouses about invasive species, and the lack of resources and capacity for local conservation officials to track invasives. Often, it is not until the damage caused by invasives is apparent that local officials discover the true extent of the hazard. Still, there are some resources available to the local hazard mitigation planning team. This plan utilizes the Massachusetts Department of Agriculture's Invasive Pest Dashboard;[153] the Center for Invasive Species and Ecosystem Health's Early Detection and Distribution Mapping System (EDDMapS) hosted by the University of Georgia;[154] and the Forest Ecosystem Monitoring Cooperative's Northeastern Forest Health Atlas.[155]

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[151] Definitions Subcommittee of the Invasive Species Advisory Committee (ISAC). "Invasive Species Definition Clarification and Guidance," Doi.gov, United States Department of the Interior, April 27, 2006, https://www.doi.gov/sites/doi.gov/files/uploads/isac_definitions_white_paper_rev.pdf.

[152] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," page 5.1-48.

[153] "MDAR Invasive Pest Dashboard," Experience.arcgis.com, Massachusetts Department of Agricultural Resources, accessed June 10, 2024, https://experience.arcgis.com/experience/a25afa4466a54313b21dd45abc34b62d/page/Page-2/?views=Town-by-Town.

[154] "My EDDMapS," EDDMapS.org, Center for Invasive Species and Ecosystem Health, accessed June 10, 2024, https://www.eddmaps.org/tools/query/index.cfm?observationDateStart=06/03/2017&observationDateEnd=06/03/2024&eradicationstatus=1,2&country=926&state=92625000&fipscode=92625027.

[155] "Northeastern Forest Health Atlas," UVM.edu, Forest Ecosystem Monitoring Cooperative, accessed June 10,

In Worcester County from 2017 to 2024, according to EDDMapS analysis of verified invasive species reporting, there have been 378 records of locations with invasive species; In the county, 353 distinct sightings of invasive species ranging from plants to insects have been left unchecked, 2 invasive species are being treated, and a total of 47 acres are considered to be infested with invasive species.[156]

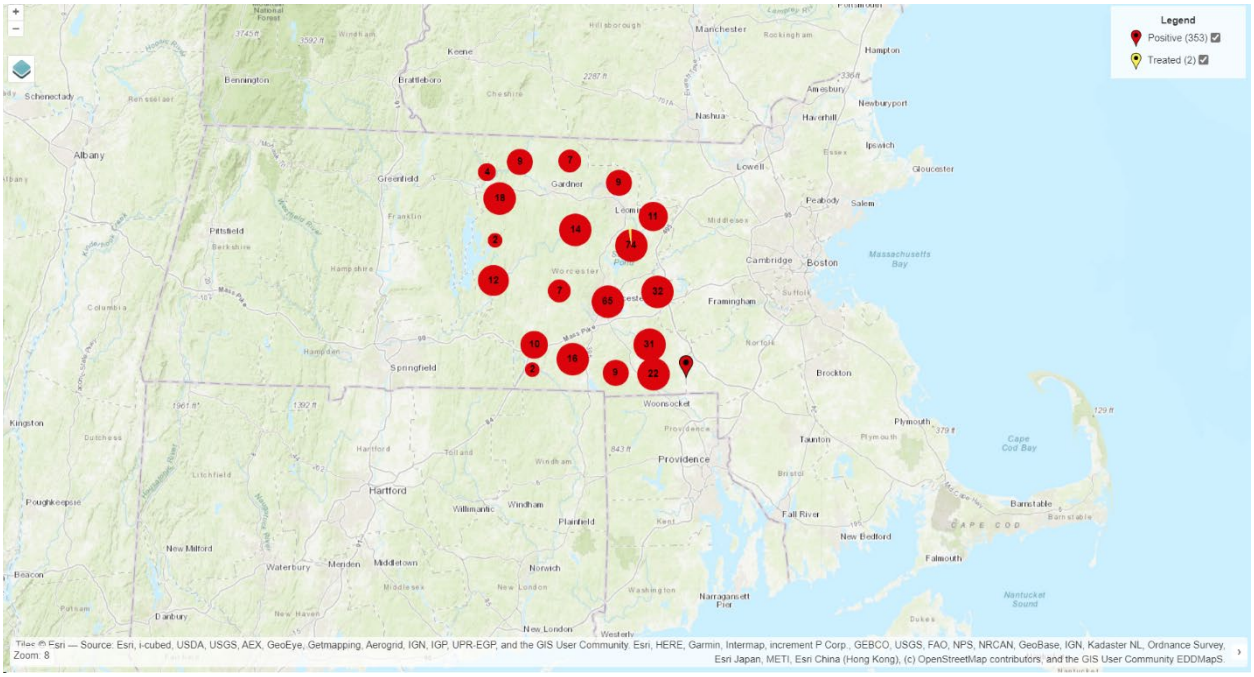

Figure 6: EDDMapS Analysis of Worcester County Invasives 2017-2024

The Massachusetts Department of Agriculture's Invasive Pests Dashboard notes that the Emerald Ash Borer was detected in Northborough in 2020, Mile-A-Minute Vine was detected in town in 2020 at one site (and is currently under eradication from the property owner), Beech Leaf Disease was detected in town in 2024, and an individual Spotted Lanternfly was found in town, but no infestation of this species has occurred in town. Also, as of the time of writing of this plan, the entire state of Massachusetts is under a U.S. Department of Agriculture quarantine to restrict the spread of the Box Tree Moth.[157]

A lack of reporting on invasives may mean that the extent of invasives in Northborough is far greater than these databases report.

Previous Occurrences

According to the Northeast Forest Health Atlas, in the past 20 years of reporting, Massachusetts has experienced tree damage (including defoliation and mortality events) to 43,127,411 acres of forests from a variety of invasive pests; alarmingly, the greatest proportion of this damage has

2024, https://www.uvm.edu/femc/forest-health-atlas.

[156]"My EDDMapS," EDDMapS.org.

[157] "MDAR Invasive Pest Dashboard: Emerald Ash Borer (*Agrilus planipennis*)," Experience.arcgis.com, Massachusetts Department of Agricultural Resources, June 10, 2024, https://experience.arcgis.com/experience/a25afa4466a54313b21dd45abc34b62d/page/Page-2/?views=Emerald-Ash-Borer#data_s=id%3AdataSource_3-17f4202b73c-layer-3%3A87.

occurred in the past 3 years.[158]

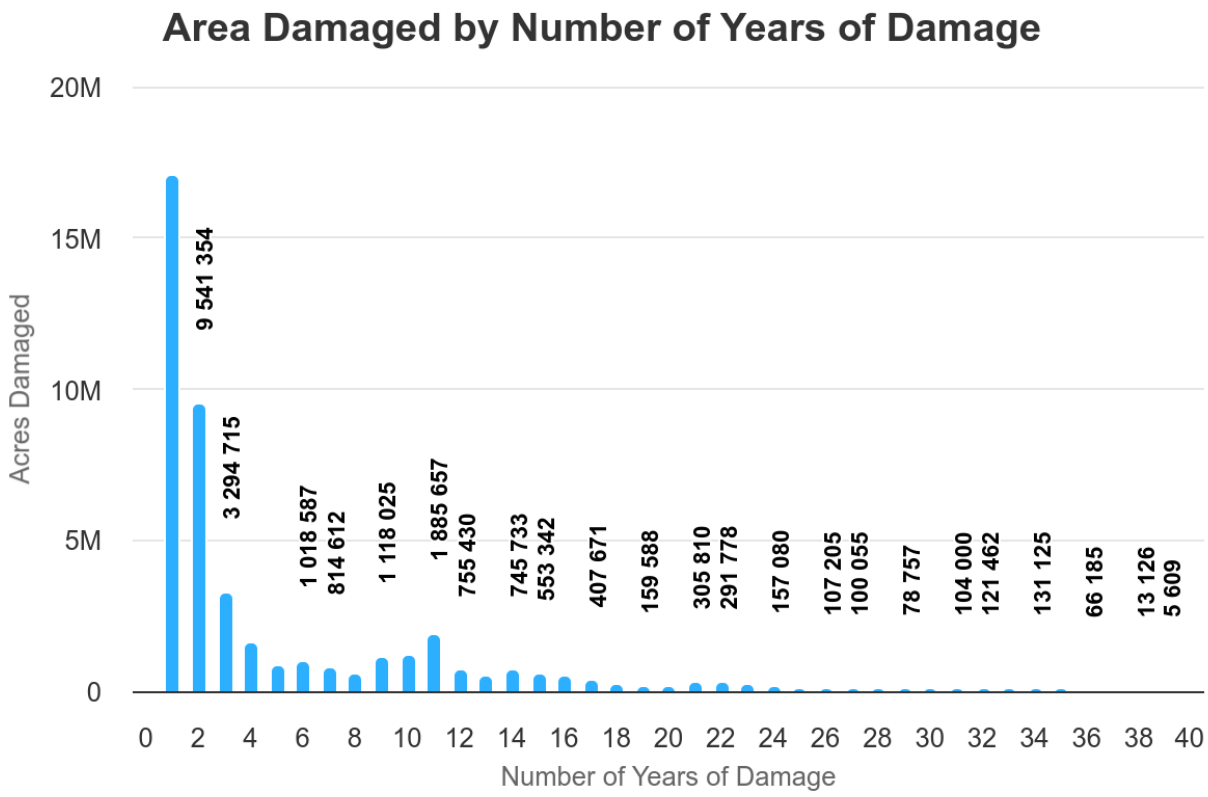

Figure 7: Area Damaged by Spongy Moth, Forest Tent Caterpillar, and Winter Moth from 1979 to 2019

In Worcester County, the vast majority of these invasive pest tree damage events occurred in the southern part of the county. Significant damage events have also occurred in the west and southwest of the county (near the border with Hampshire and Hamden Counties). In addition, localized defoliation events have occurred around the Town of Barre, the Tatnuck neighborhood of Worcester, and other communities. Tree mortality correlated with invasive species has been concentrated in the southern half of Worcester County.[159] In 2008, an outbreak of Asian long-horned beetles in Worcester destroyed nearly 30,000 trees.[160]

Northborough has experienced invasives-related defoliation events from 1998 through 2020, with significant mortality events occurring in 2018, 2019, and 2020. Based on trends identified in the Atlas, there is no reason to assume that invasive forest species hazards have lessened in more recent years.

Probability of Future Events

The 2023 ResilientMass Plan notes that increased globalization of trade has created new paths for invasive species to spread. Climate change is also an aggravating factor in the spread of invasives, as natural ecosystems become strained by increased temperatures and shifting precipitation

[158] "Northeastern Forest Health Atlas - Defoliation: Years of Damage," UVM.edu, Forest Ecosystem Monitoring Cooperative, accessed June 10, 2024, https://www.uvm.edu/femc/forest-health-atlas?premade=All_Defo.
[159] Ibid.
[160] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

patterns; Climate change therefore creates more opportunities for invasives to disrupt an already fragile ecology. Based on the previously identified occurrences and trends, the probability of an invasive species event occurring in Northborough is very high, with a 70% to 100% probability of occurrence in the next year.

Impact

Specific impacts of invasive species in Northborough may vary, depending on the type of invasive, the habitat that it is supplanting within the native ecosystem, and other factors. Invasive species' direct impact on the natural ecology has many notable secondary impacts. The 2023 ResilientMass plan identifies that invasive species can introduce new diseases to a region[161] (such as the 2005 Chikungunya Epidemic, spread in part by a viral mutation that allowed for the virus to be more commonly present in the *Aedes albopictus* mosquito, an invasive subspecies).[162] Invasives are also one of the costliest natural hazards in terms of control efforts, costing the United States and estimated $21 billion per year.[163] Given what information is known about the extent of invasive species within Northborough, the local HMP planning team estimates a "critical" impact on the Town from invasive species, with between 25% and 50% of property in the areas affected by this hazard being damaged or destroyed.

Exposure

Certain features within Northborough's infrastructure, society, and environment may face more exposure to invasive species, or be disproportionately impacted by them, relative to the rest of the community. Some of these features may be documented in the list of critical facilities and vulnerable populations in Section 3. These features include:

- People with compromised immune systems or preexisting health conditions, children under the age of five, and people over 65 years old who might be particularly vulnerable to new diseases or aggravated health problems caused by invasives;
- Roadways, as Japanese Knotweed, an invasive known to cause streambank destabilization, can contribute to flood damages and can affect sightlines along roadways, potentially causing roadway hazards;
- Local government, as invasive species may pose a management cost burden that exceeds local financial capacity, especially for departments tasked with their management and for departments tasked with the maintenance of facilities that are impacted by invasives;
- The local ecology, as invasive species can also change the local ecology to make it more fire prone, either by damaging the native plants or by being prone to fire themselves.

Potential Climate Change Effects

According to the 2023 ResilientMass Plan, climate change is predicted to increase the spread of invasive species and expand their range.[164] Already fragile ecosystems, if left unmanaged, will

[161] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[162] Konstantin A. Tsetsarkin et al., "A single mutation in chikungunya virus affects vector specificity and epidemic potential," *PLOS Pathogens* 3, no. 12 (December 7, 2007): e201, https://doi.org/10.1371/journal.ppat.0030201.
[163] Kerry Sheridan, "Invasive species cost the US $21 billion per year, study finds," WUSF.org, WUSF Public Media, January 4, 2022, https://www.wusf.org/local-state/2022-01-04/invasive-species-cost-the-us-21-billion-per-year-study-finds.
[164] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

suffer the worst effects of invasive species; native flora and fauna species could be supplanted by invasive species that outperform or outright damage them. The vast majority of invasive species introductions are caused by human activity, either accidental or intentional.

Both changes in precipitation patterns and temperature may increase chances of successful invasion of ecosystems by non-native species.

1. Precipitation
    a. Elevated atmospheric CO2 concentrations could reduce the ability of ecosystems to recover from climate shocks; this can create an opportunity for invasive species, which can often rapidly establish themselves following a disturbance, to successfully propagate.
2. Temperature
    a. Climate-driven temperature changes exacerbate the impacts of invasive species by altering ecosystem conditions in ways that enhance their ability to reproduce, spread, and in some cases outcompete native species.
    b. As warmer temperatures place stress on native cold-weather species in the region, invasive species accustomed to higher temperatures are able to more easily fill native species' niches and therefore expand their habitat ranges northward.

Secondary hazard impacts from invasive species include increased temperatures, damage to agricultural crops, and increased wildfire risk; as described in previous sections, all of these hazard impacts have associated potential societal implications through population shifts and changes in land use and development.

Vulnerability

Based on the above assessment, Northborough has a hazard index rating of "3 – medium risk" from invasive species.

Mitigation Strategies

The Town of Northborough is currently able to effectively respond to invasive species through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, there are numerous opportunities for the Town to expand upon its existing capabilities to mitigate and respond to invasive species. The local HMP planning team identified the following strategies that could be used to reduce the threat of invasive species in Northborough:

- Seek out best practices and funding available to mitigate roadside invasive vegetation species
- Enhance education and outreach on tick and mosquito-borne diseases and evaluate the management of disease carrying insects.
- Educate residents about invasive species using existing and new resources. Provide the community with tools to manage invasive species.

4.13 Other Hazards

In addition to the hazards identified in previous sections, the Northborough Hazard Mitigation Planning Team reviewed the other hazards listed in the Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP). Hazards from the SHMCAP deemed irrelevant to Northborough due to the Town's location are coastal hazards, atmospheric hazards, ice jams, coastal erosion, sea level rise, and tsunamis. Coastal hazards, coastal erosion, sea level rise, and tsunamis are recognized to affect coastal jurisdictions in Massachusetts and other New England states but have been deemed irrelevant to Northborough due to the Town being around 30 miles from the nearest coastline.

Although landslides have been recognized as affecting communities in Central Massachusetts, the HMP team in Northborough did not identify them as affecting the Town; therefore, they were omitted from having a full section in this plan. A brief overview of this hazard is included below.

Landslides

Landslides occur in all U.S. states and territories. During a landslide, masses of rock, earth, or debris move down a slope. Landslides may be small or large, slow or rapid. They are generally activated by:

- Storms,
- Earthquakes,
- Volcanic eruptions,
- Fires,
- Alternate freezing and thawing, and/or
- Steepening of slopes caused by natural erosion or human modification.

Debris and mud flows (landslides) are rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground during heavy rainfall or rapid snowmelt, changing the earth into a flowing river of mud or "slurry." They can flow rapidly, striking with little or no warning at avalanche speeds. They also can travel several miles from their source, growing in size as they pick up trees, boulders, cars, and other materials. Vulnerabilities in the Central Massachusetts region to landslides could include damage to structures, damage to transportation and other infrastructure, and localized road closures. Injuries and casualties, while possible, would be unlikely given the low extent and impact of landslides in the region.

Landslides are therefore considered low frequency events that may occur once in 50 to 100 years (with a 1% to 2% chance of occurring per year) in Central Massachusetts.

There are no documented previous occurrences of significant landslides in Northborough. The Town is relatively flat and most of its rivers are slow moving, are frequently dammed, and/or are lined with riprap, which can minimize landslide risk. Roadways in town are not generally built close to river channels; this reduces undercutting risk from stormwater-induced bank erosion. CMRPC's data review and the local HMP planning team both noted no specific concerns relating to landslides in town.

5.0 EXISTING PROTECTION

Sections 5.0 and 5.1 help meet the following FEMA local mitigation plan requirements:

- *A4. "Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information?" (Requirement 44 CFR § 201.6(b)(3));*
- *B2. "Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods?" (Requirement 44 CFR § 201.6(c)(2)(ii));*
- *C1. "Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs?" (Requirement 44 CFR § 201.6(c)(3)); and*
- *C2. "Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate?" (Requirement 44 CFR § 201.6(c)(3)(ii))*

The Town of Northborough currently makes use of most available locally controlled tools, including zoning regulations, planning, and physical improvements, to help mitigate the consequences of natural hazards. The Town participates in federal StormReady certification, but the Town does not participate in federal Firewise community certification. The Town utilizes CodeRed for emergency notifications. The Town plans to research the utility of public awareness and education programs as a result of this planning process.

Northborough has most no-cost or low-cost hazard mitigation capabilities in place. These include land use, zoning, and subdivision regulations as well as an array of specific policies and regulations that include hazard mitigation best practices, such as limitations on development in floodplains, tree maintenance, and other practices. Northborough also has appropriate staff dedicated to hazard mitigation-related work for a community of its size, including a Town Administrator, an Emergency Management Director/Fire Chief, a Town Planner, a professionally run Department of Public Works, a Building Inspector, and a Tree Warden. Northborough has several plans relevant to hazard mitigation in place, including a Comprehensive Emergency Management Plan (2020), an Open Space and Recreation Plan (2020), and a Master Plan (2020). Not only does Northborough have these capabilities in place, but they are also deployed for hazard mitigation as is appropriate. The Town also has very committed and dedicated volunteers who serve on boards, commissions, and committees as well as in other volunteer positions. The Town collaborates closely with surrounding communities through its Local Emergency Planning Committee (LEPC) and has opted into fire protection and DPW mutual aid agreements through MEMA. Northborough is also an active member community of the Central Massachusetts Regional Planning Commission (CMRPC) and can take advantage of no cost local planning assistance provided by the professional planning staff at CMRPC as is needed.

The table below describes existing hazard mitigation protections in Northborough. It includes a brief description of each activity, a subjective evaluation of each activity's effectiveness, and a description of any recommendations for improvement for each activity.

5.1 Existing Protection Matrix

Table 38: Existing Protection Matrix

Existing Measure	Description	Action	Effectiveness & Recommendations
Participation in National Flood Insurance Program (NFIP)	The NFIP provides flood insurance for structures located in flood-prone areas. Also, communities participating in the NFIP have adopted and enforce ordinances, bylaws, and regulations that meet or exceed FEMA requirements to reduce the risk of flooding.	Northborough has participated in the National Flood Insurance Program since November 15th, 1979. As of July 2nd, 2024, there are approximately 16 homeowners in town with flood insurance policies.[165] There are no repetitive loss properties in Northborough. The Town's building inspector is the appointed designee who implements the addressed commitments and requirements of the NFIP in town, and the Town monitors building activity within the flood plain to ensure compliance with provisions of state building code. The Town has adopted the Flood Insurance Rate Map (FIRM) dated from July 16th, 2014;[166] this information is noted	Effective Northborough should seek to further limit development in the 1% flood zone. It should work to score in the Community Rating System (CRS) under NFIP to enable its residents to obtain lower flood insurance rates. Northborough should also educate its residents about the NFIP. The Town is working on improving its process for carrying out the substantial improvement/substantial damage (SI/SD) provisions of its floodplain regulations, along with substantial damage claims. In the future, the Town will collaborate with Flood Hazard Management Program staff at the state level to ensure a post-disaster plan is put in place to employ SI/SD provisions.

[165] "Community Overview: Northborough, Town of," NFIP Community Information System.

[166] "NORTHBOROUGH, TOWN OF," Msc.fema.gov, Federal Emergency Management Agency, accessed June 26, 2024, https://map1.msc.fema.gov/firm?id=25027C0629F, https://map1.msc.fema.gov/firm?id=25027C0631F, https://map1.msc.fema.gov/firm?id=25027C0632F, https://map1.msc.fema.gov/firm?id=25027C0633F, https://map1.msc.fema.gov/firm?id=25027C0634F, https://map1.msc.fema.gov/firm?id=25027C0641F,

Existing Measure	Description	Action	Effectiveness & Recommendations
Participation in National Flood Insurance Program (NFIP) (cont.)		in the Floodplain Overlay District section of chapter 7-07 of Northborough's Zoning Bylaw.[167] The Town's Floodplain Overlay District, described in this same section of the Zoning Bylaw, includes all special flood hazard areas (SFHAs) designated as Zone A, AE, AH, or AO in town and regulates and permits development within these areas. Northborough currently administers the substantial improvement/substantial damage (SI/SD) provisions of its floodplain management regulations in compliance with the NFIP (CFR Title 44, Parts 59 through 65) and the Massachusetts State Building Code (780 CMR).	

https://map1.msc.fema.gov/firm?id=25027C0642F, https://map1.msc.fema.gov/firm?id=25027C0643F, https://map1.msc.fema.gov/firm?id=25027C0651F, https://map1.msc.fema.gov/firm?id=25027C0653F, https://map1.msc.fema.gov/firm?id=25027C0654F, https://map1.msc.fema.gov/firm?id=25027C0661F, https://map1.msc.fema.gov/firm?id=25027C0662F.

[167]"Part 7: Zoning - Chapter 7-07: Overlay Districts," Ecode360.com, the Town of Northborough, accessed June 26, 2024, https://ecode360.com/41981579.

Existing Measure	Description	Action	Effectiveness & Recommendations
Stormwater Management Policy and Regulations	The Town's Planning Board and Conservation Commission review projects for consistency with MA DEP standards. This helps ensure adequate on-site retention and recharge.	Northborough has enacted Stormwater Management Regulations which are included in the Town's General Bylaws. Northborough also participates in the Central Mass Stormwater Coalition. The Town's new Stormwater Bylaw, which was updated in August of 2021, restricts development in flood zones, has led to improved operations and maintenance, and protects isolated wetlands not covered by state regulations.	Very effective No changes recommended

Existing Measure	Description	Action	Effectiveness & Recommendations
Local Open Space and Recreation Plan	This local plan identifies significant natural resources to ensure their protection. Following Massachusetts Department of Conservation and Recreation guidance for the development of OSRPs, this document does not focus on specific hazards. Open Space Plans can provide many tools. The Town must commit to making the land acquisitions and regulatory changes which are included in this plan's action items. It also must give increased attention to preserving undeveloped flood-prone areas and associated lands.	Northborough's Open Space and Recreation Plan was recently updated in 2020, was approved by the Massachusetts Division of Conservation Services in 2022, and is valid through January 2028. It included recommendations to include hazard mitigation considerations in the Town's future actions.	Effective / Very effective

Existing Measure	Description	Action	Effectiveness & Recommendations
Separated Stormwater and Sewer Collection Systems	Stormwater and municipal sewer systems remain separate to eliminate CSO's (combined sewer overflows) and SSOs (sanitary sewer overflows), which compromise water quality and can increase flood risk during heavy storm events.	Approximately 70% of Northborough is on private septic systems. The Town completed a Comprehensive Wastewater Management Planning Process in 2007, which is a 30-year sewer master plan to determine where there are needs for sewer and to determine the best way to meet these needs.	Very effective No changes recommended
Drainage System Maintenance and Repair Program	This program keeps municipal drainage facilities (storm drains, culverts, etc.) in good order.	Northborough performs street sweeping and catch basin cleaning from April to November. The Town also provides stormwater public outreach and education in accordance with MS4 requirements.	Effective The Town should continue to sweep streets and clean stormwater structures and basins at least once per year to increase stormwater management capacity and properly capture and dispose of debris.
Tree Trimming Program	This program consists of the routine maintenance of trees and reduces the likelihood of vegetative debris problems during and after storm events.	Northborough conducts roadside mowing from April to November to remove juvenile trees. Tree trimming (take-downs and clearing dead branches) is completed as is needed by the DPW as well as by National Grid, whom Northborough has a positive relationship with.	Effective Northborough should continue to partner with its utility for local tree trimming measures as well as the removal of dead and dying trees and should enhance this partnership.

Existing Measure	Description	Action	Effectiveness & Recommendations
Culvert Maintenance and Replacement Program	This program consists of regular maintenance of existing culverts and (in some cases) beaver controls as well as replacing and expanding culverts where needed to allow for adequate stormwater flow.	The Town has historically maintained and replaced problem culverts when needed and as funding allows.	Somewhat effective Current efforts in town are limited by available resources. Culvert failures are repaired and replaced as warranted. A townwide culvert inventory completed in 2019 provides the location, size, and condition of the culverts in town.
Mount Pisgah Conservation Area Forest Management Plan	This plan includes preservation, forest management, invasive plant management, and hazard mitigation aspects.	The Mount Pisgah Conservation Area Forest Management Plan was completed in July of 2022. The Northborough Conservation Commission intends to update this plan to comply with the new MA Climate Resiliency Program (this update is anticipated to be completed in Fiscal Year 2025).	Effective Implementing this plan will be key. The town's Conservation Commission has approved a contract to hire a professional forester to evaluate and implement a Harvest Plan. This plan will lead to the evaluation and removal of standing dead and dangerous trees in town and will therefore significantly reduce wildfire hazards.

Existing Measure	Description	Action	Effectiveness & Recommendations
Edmund Hill Conservation Area Forest Management Plan	This plan includes preservation, forest management, invasive plant management, and hazard mitigation aspects.	The Edmund Hill Conservation Area Forest Management Plan was completed in July of 2022. The Northborough Conservation Commission intends to update this plan to comply with the new MA Climate Resiliency Program to improve carbon sequestration and forest resiliency (this update is anticipated to be completed in Fiscal Year 2025).	Effective Implementing this plan will be key. The town's Conservation Commission has approved a contract to hire a professional forester to evaluate and implement a Harvest Plan. This plan will lead to the evaluation and removal of standing dead and dangerous trees in town and will therefore significantly reduce wildfire hazards.
SAFE and Senior SAFE Disaster Training Programs	These state grant programs help local fire departments teach fire safety to children in schools and seniors, respectively.	Northborough has participated in these programs for many years. As part of the SAFE program, children in Northborough schools are taught how to respond in the case of an emergency. As part of the Senior SAFE program, seniors in town are taught how to replace smoke alarms and reduce tripping and falling hazards.	Effective

Existing Measure	Description	Action	Effectiveness & Recommendations
Master Plan	The Master Plan serves as a policy guide as well as the Town's future vision of itself. It compiles a comprehensive analysis of all aspects of community development and is designed to be a resource for the Town over the next 10 to 20-year time period.	The Northborough Master Plan was adopted in 2020. The Town has a very active Master Plan Implementation Committee. In 2024, the Town has been monitoring progress of the Master Plan. Developers of new developments in town must provide a statement stating that each new development is in compliance with the Master Plan.	Very Effective In the future, the Town should review the implementation of the Master Plan on a biannual basis instead of every four years. The Town should continue to consider hazard mitigation concerns in Master Plan implementation.
Municipal Vulnerability Preparedness (MVP) Plan	This plan is a guide for climate resiliency implementation projects in town. It includes a vulnerability assessment and an action-oriented resiliency plan. This plan makes the town eligible for MVP Action Grant funding.	The Northborough Municipal Vulnerability Preparedness Plan was adopted in 2018. The Town has acted on some recommendations of this plan through other means, but it has not been successful with MVP Action Grant proposals. The town has not referred to this plan as a roadmap for future plans and actions.	Somewhat effective The Town should incorporate its MVP Plan recommendations into its broader planning goals and objectives.

Existing Measure	Description	Action	Effectiveness & Recommendations
Floodplain Bylaw	The Town's Floodplain Bylaw is part of the Town's Zoning Bylaw, and it includes regulations relating to the Town's Floodplain Overlay District and subdivisions within floodplains in town.	Northborough's Floodplain Bylaw was updated in 2022 to match with the new FEMA flood zones for the Town.	Effective The Town would like to further discourage building in flood zones.
Downtown Revitalization Plan	This plan guides future development patterns in Northborough's downtown and promotes adaptive reuse of buildings as well as downtown walkability.	This plan will be updated in 2024, and it will recommend utilizing green infrastructure and street trees to mitigate flood impacts caused in part by climate change in the town center.	Effective The Town approved its MBTA Communities / Multi-Family Development Overlay District bylaw in the Spring of 2024. The Town has also bought planters and has completed sign bylaw changes.

Existing Measure	Description	Action	Effectiveness & Recommendations
Compliance with the state building code, AAB codes, and ADA codes	Compliance with the state building code means that buildings in town meet the minimum established requirements for structural strength, sanitation, and efficiency and are safe for regular use as well as during hazard events and other emergency situations. Compliance with the AAB and ADA codes means that buildings and facilities are accessible to and safe for use by people with disabilities.	The Town's Planning Board, Zoning Board of Appeals, and Building Inspector work to implement compliance with these codes. In 2023, the Town completed its ADA Self-Evaluation and Transition Plan. The new update to the state building code (the 10th Edition of the Base Building Code (Massachusetts Amendments)) became effective on October 11th, 2024 and will be concurrent with the previous edition through June 30th, 2025.	Very Effective
Zoning Bylaw	This part of the Town Charter establishes zoning districts and overlay districts in town as well as defines use regulations, density and dimensional requirements, nonconforming uses and structures, development regulations, and special regulations in town.	The Town's current zoning bylaw was adopted at the April 2009 Town meeting and has been amended several times since.	Very Effective

Existing Measure	Description	Action	Effectiveness & Recommendations
Water Division Emergency Action Plan	This plan provides standard warnings for natural hazard and malevolent threat emergencies and procedures that the Water Department personnel adopt to "be ready". While some emergencies occur with little or no warning, other emergencies are preceded by signs or signals that allow emergency responders time to prepare for an emergency. Preparation can minimize response time and the consequences of an emergency.	This plan was completed in December 2021 by The Town of Northborough and Woodard Curran.	Very Effective

Existing Measure	Description	Action	Effectiveness & Recommendations
Water and Sewer Divisions' Risk and Resiliency Plan	This plan considers both qualitative and quantitative risks. The qualitative assessment considers asset categories with respect to the generalized threat categories of malevolent acts and natural hazards. The qualitative risk assessment was completed based on the critical asset-threat. The quantitative risk assessment associates a monetized risk, dollars per year, with a critical asset-threat pair. This plan is confidential.	This plan was completed in June 2021 by The Town of Northborough and Woodard Curran.	Very Effective

6.0 Status of Mitigation Measures From 2018 Plan

Section 6.0 helps meet the following FEMA local mitigation plan requirements:

- *E2. "Was the plan revised to reflect changes in priorities and progress in local mitigation efforts?" (Requirement 44 CFR § 201.6(d)(3))*

During this hazard mitigation plan update process, the local HMP team in Northborough provided updates on the status of mitigation measures from the Town's 2018 Hazard Mitigation Plan. Certain measures were incomplete as of 2025 and were deemed as still being relevant; These relevant measures were re-incorporated in the 2025 Hazard Mitigation Plan action strategy if they are anticipated to be effective. The changes in the Town's priorities from the 2018 plan to this plan are noted in the **bolded** passages from the "2025 Notes" column in the table below. These changes in community priorities have resulted from reassessments of specific hazards-related challenges described in the 2018 plan.

Table 39: Status of Mitigation Measures from 2018 Plan

Structure & Infrastructure Strategies			
2018 Task	**2025 Status**	**2025 Notes**	**Include in 2025 Plan?**
Dredge fire ponds which are too shallow and dry out during the summer months. This would also help with stormwater collection and help prevent flooding in the area of the ponds.	In Progress	The Town has assigned a senior fire fighter to ascertain the conditions of the fire ponds twice a year. Dredging has not occurred because of the high cost of the water permits required for it. A fire pond was used extensively in April 2023 to fight a fire on Mount Pisgah.	YES
Expand the capacity of the DPW; increase the number of cisterns and fire ponds; increase staff to clear poison ivy from draft sites and dry hydrants, and to constantly clear the drain at Rte. 9 & Rte. 20 which causes flooding.	In Progress	The current number of cisterns and fire ponds works for the Town, and a town fire fighter makes sure that cisterns are working each year. The State has addressed the Route 9/20 drainage issue as best as they can.	YES
Develop a back-up strategy for the town's fuel island. Purchase a generator for the fuel island ensuring the town has access to fuel in the event of an emergency.	In Progress	FEMA rejected a grant application the Town submitted for a generator. The Town does have a backup generator which can give power to fuel island, but it is not a 100% connection. A dedicated stationary generator is still needed.	YES

2018 Task	2025 Status	2025 Notes	Include in 2025 Plan?
Repair Bartlett Pond Dam.	No movement on this action yet	This dam is low hazard. The Town's Conservation Commission just signed a contract for completing invasive plant management at the dam from 2024-2026 using local Community Preservation Act (CPA) funding, **but no structural work is proposed under this contract.**	YES
Maintain fire roads in the Mount Pisgah area and ensure proper functioning of dry hydrants around Town, especially near Crawford St, Little Chauncy Pond, and I-290	In Progress	The fire roads in town are in very good condition because of improvements made to many of them after the April 2023 Mount Pisgah wildfire. Difficulty of access to this infrastructure, a lack of accurate maps, and poor coordination with the Massachusetts DFW are still issues for the Town.	YES
Purchase a Utility Vehicle (UTV) for the purpose of monitoring forested areas with limited accessibility.	Completed	The Town has purchased a utility vehicle to help town staff access areas of limited accessibility.	NO

Preparedness, Coordination & Response Action Strategies			
2018 Task	**2025 Status**	**2025 Notes**	**Include in 2025 Plan?**
Implement steps from each dam's action/evaluation plan (i.e. Repair Plan), specifically Bartlett Pond Dam. Possible funding through Capital Improvement Plan.	No movement on this action yet	Bartlett Pond Dam is low hazard.	NO
Maintain high-degree of participation with National Grid through their First Responder App.	In Progress	Town staff now have this app on their phones and iPads and have received instructions on how to use it; most of Town's contact with National Grid is still via phone calls though.	YES
Maintain and expand on vegetative debris program (e.g. by acquiring additional equipment), and thereby mitigate risks of stormwater flooding, riverine flooding, winter storm damage, etc.., such as through the Central Massachusetts Mosquito Control Project. Possible funding through Capital Improvement Plan.	In Progress	The Town has a debris processing/composting facility on its capital plan that has not been funded yet. The Town would like to create a town Debris Management Plan as an appendix to the Town's Comprehensive Emergency Management Plan.	YES
Continue to sweep streets at least once per year to increase stormwater management capacity; capture and dispose of properly (currently budgeted).	Ongoing	The Town's DPW staff sweeps streets in accordance with MS4 permits, starting in the fall of each year.	YES
Continue to properly clean, at least annually, or more often as required, all stormwater structures and basins (currently budgeted).	Ongoing	The Town's DPW completed an inventory of stormwater basins in 2023 and is drafting standard operating procedures for preparing stormwater basins.	YES

2018 Task	2025 Status	2025 Notes	Include in 2025 Plan?
Continue building a strong relationship with utilities, i.e. National Grid. NE Operations Center on Barefoot Rd. Currently very responsive, including sending appropriate resources to downed poles and wires through picture messages. Build off recently adopted Stretch Code and apply for Green Communities designation.	In Progress	Northborough recently achieved Green Communities status.	YES
Continue to utilize hazard warning systems and notifications: social media, town webpages, Code Red, Warning Siren, and other communication methods. Interns are currently taking senior citizen information to sign them up for CodeRed. Post generator safety and use info on social media. Health Dept. to put out a brochure on 72-hr kits through Town-wide mailing, school children take-home, etc. Maintain internal instant messaging system, allowing for rapid response of emergency personnel.	In Progress		YES
Actively enforce and comply with the state building codes, promote successful working relationship between Fire Marshall and Building Inspector	In Progress	Compliance with state building codes (which were last updated in 2021) for the Town is on target, and the Town has a revised energy code for residential and commercial buildings. On January 1st, 2023, the Massachusetts DOER promulgated their own building code guidelines which the Town is working to comply with.	YES

2018 Task	2025 Status	2025 Notes	Include in 2025 Plan?
Actively enforce and comply with the Massachusetts Wetlands Protection Act, and enforce local wetlands bylaw.	In Progress	Northborough has a new land disturbance and stormwater management bylaw under the jurisdiction of the Town's Conservation Commission.	YES
Continue to engage with OARS (Organization for the Sudbury, Assabet, and Concord Rivers) and the Mass Association of Conservation Commissions to support wetlands protection, river corridor acquisition, etc.	Ongoing	The Town is actively engaged in OARS.	YES
Continue to engage with the Local Emergency Planning Committee (LEPC) and Central Region Homeland Security Advisory Council (CRHSAC) for increased communication and coordination between local, regional, state, and federal agencies regarding disasters and emergencies.	Ongoing	LEPC meetings are held twice a year.	YES

Education & Awareness Strategies			
2018 Task	**2025 Status**	**2025 Notes**	**Include in 2025 Plan?**
Educate all segments of the community about hazard mitigation and the impacts that disasters can have on the community through social media, brochures, and mailings. Also, educate on water conservation methods.	Ongoing	The Northborough Fire Department consistently makes posts on its social media accounts promoting awareness of hazard mitigation and high fire danger. They provide information such as "this is what red flag days mean." The Town releases a water conservation report once a year, and the Town has not been under water use restrictions yet. The Town tries to reach as many audiences as possible in its hazard mitigation outreach. **As a response to COVID, the Northborough Health Department recently put together a very comprehensive resource guide that can help people find assistance and includes the contact information of emergency personnel; continued outreach relating to this guide should be added to this strategy.**	YES
Promote available educational material (state/federal) especially to students, regarding disasters at measures they can take to limit risks.	In Progress		YES
Pursue educational opportunities in regards to grant writing. Hold regional workshop about Hazard Mitigation Grant Writing.	No movement on this action yet	The Town applied for hazard mitigation grant for a generator at the Town's fuel island but was unsuccessful due to FEMA not funding generators at the time; the Town will be applying for this generator again and has otherwise been fairly successful in receiving grants. **This strategy should be reoriented towards town staff writing hazard mitigation grants.**	YES

2018 Task	2025 Status	2025 Notes	Include in 2025 Plan?
Fund mailings for Fire Safety	No movement on this action yet	The Town has not sent out any mailings yet relating to fire safety. **The state SAFE and Senior SAFE programs, which, respectively, promote fires safety in schools and to seniors, were recently launched in town; this strategy should be reoriented towards these programs.** The Town wants to provide more education through SAFE grant funding in the future.	YES
Develop educational materials for residents about protecting wetlands	Ongoing	The Town has provided education about protecting wetlands through the process of meeting its MS4 requirements.	YES

Local Plan & Regulation Strategies			
2018 Task	**2025 Status**	**2025 Notes**	**Include in 2025 Plan?**
Continue to share information at Local Emergency Planning Committee meetings, and Central Mass Regional Homeland Security Council meetings, about successful hazard mitigation planning and programs. Create a feedback loop to improve predisaster planning by establishing a formal post-disaster assessment process.	Ongoing	This action has been ongoing.	YES
Expand the use of the Capital Improvement Program for vegetation removal equipment, paving, and dam repair. Encourage new Committee to look at hazard mitigation in their long term planning for improvements.	In Progress	Vegetation removal equipment, paving, and dam repair have been funded through the Capital Improvement Program.	YES
Enforce underground utility requirements in local subdivision regulations and retrofitting of existing infrastructure.	In Progress	The Town recently updated its site plan review requirements so that underground utilities are now required for new subdivisions and retrofits.	YES
Integrate hazard mitigation into subdivision, site plan review, 40B review, and other zoning reviews. In particular, require the consideration of downstream flooding impacts caused by new projects. Enforce the reduction of impervious surface (pavement) and reserve parking for recharge and retention of stormwater. Enforce groundwater protection in overlay district.	In Progress	**Northborough has been required to rezone certain parcels because it is an MBTA community**, and the Town is continuing 40b review of parcels. It has many wetlands and wellhead protection areas. The Town adopted a new Stormwater Management and Land Disturbance Bylaw in August 2021 which considers stormwater runoff treatment/mitigation, downstream flooding impact assessment, impervious area recharge, and groundwater protection. The Town also needs to update its subdivision regulations as well as complete a zoning bylaw review. The Town's FEMA maps have been redrawn.	YES

2018 Task	2025 Status	2025 Notes	Include in 2025 Plan?
Maintain Unified Incident Command program, continue training local officials in ICS	In Progress	Northborough town department heads are encouraged to get minimum Unified Incident Command training. The Town implemented an ICS structure in July 2023.	YES
Continue to inventory shelter supplies and emergency resources, identify resources that are available at any shelters and if the shelters would be impacted by an emergency. This would help ensure suitable shelters are available for different types of natural hazards. Plan and administer walkthroughs so emergency management knows shelter layouts. Overnight shelters should be inspected by the State Building Department for compliance.	Ongoing	This action has been ongoing. The Town has a trailer that holds all shelter supplies, and the Town's shelter manager makes sure that the supplies are available when they are needed. The Town updated its memorandums of understanding with its emergency shelters in July 2023. The Town does not currently have a pet friendly shelter, and the only overnight shelter in town is at the middle school. The Town's warming center is the Senior Center because this building is mostly (but not 100%) powered by a generator.	YES
Study the possibility of creating a regional shelter with a neighboring town. This would help limit the expense of maintaining separate shelters when towns have a limited budget.	In Progress	The Town has extensively discussed the potential for a regional shelter with officials in Shrewsbury.	YES
Create a Road Bylaw, ensuring new development will have roads able to handle emergency vehicles and proper drainage infrastructure is built	In Progress	The Town has a common driveway bylaw and has adopted a Complete Streets Prioritization Plan.	NO
Continue to actively enforce and comply with State Building Code Requirements, ensure proper certification for inspectors	Ongoing	This action has been ongoing.	YES

2018 Task	2025 Status	2025 Notes	Include in 2025 Plan?
Enforce the Local Wetlands Bylaw	Completed	This action has been completed, as the Local Wetlands Bylaw was updated in September 2019 to include hazard mitigation consideration. **The Town's 2021 stormwater bylaw also needs to be actively enforced.**	NO
Update your Hazard Mitigation Plan every five years, and monitor implementation	Ongoing	This action has been ongoing.	YES
Incorporate hazard mitigation into local and regional plans such as, Master Plan, land use, transportation, Open Space and Recreation Plan and Capital Improvement Plans	Ongoing	Hazard mitigation considerations have been incorporated into the Town's recent Master Plan and Open Space and Recreation Plan (OSRP) updates as well as the Town's Municipal Vulnerability Preparedness (MVP) Plan.	YES
Establish Floodplain zoning district and bylaw to require all development to be in compliance with state building code requirements for construction in floodplains.	Completed	The Town's Floodplain Zoning District was updated in 2022 and is compliant with recent changes to the Town's stormwater regulations.	NO

7.0 Mitigation Strategy

The Northborough Hazard Mitigation Planning team developed a list of mitigation strategies (both new and previously identified by local officials) and prioritized them using the criteria described below. This list of factors is broadly derived from FEMA's STAPLE+E feasibility criteria.

7.1 Priority and Impact

Section 7.1 helps meet the following FEMA local mitigation plan requirements:

- *C5. "Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction?" (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))*

Real world considerations were brought into the analysis to inform the priority ranking process for the different mitigation strategies. Factors considered in this step include costs and cost effectiveness (including eligibility and suitability for outside funding), timing, political and public support, and local administrative burden. Each strategy was ranked as being high, medium, or low priority.

- High priority strategies have obvious mitigation impacts that clearly justify their costs and to a large degree can be funded, can be completed in a timely fashion, can be administered effectively, and are locally supported.
- Medium priority strategies have some clear mitigation impacts that generally justify their costs and generally can be funded, can be completed in a timely fashion, can be administered effectively, and are locally supported.
- Low priority strategies have relatively low mitigation impacts that do not necessarily justify their costs and may have difficulty being funded, being completed in a timely fashion, being administered effectively, and garnering local support.

Costs and cost effectiveness – in order to maximize the effect of mitigation efforts using limited funds, priority is given to low-cost strategies. For example, regular tree maintenance is a relatively low-cost operational strategy that can significantly reduce the length of time of power outages during a winter storm. Strategies that have clear and viable potential funding streams, such as FEMA's Hazard Mitigation Grant Program (HMGP), are also given higher priority.

Time required for completion – Projects that are faster to implement, either due to short work duration, current or near-term availability of funds, and/or ease of permitting or other regulatory procedures, are given higher priority.

Political and public support – Strategies are given higher priority if they have political and/or public support which is shown through public feedback, prioritization in previous regional and local plans, initiatives that were locally initiated or adopted, and/or prioritization in the Municipal Vulnerability Preparedness Program Community Resilience Building workshop process.

Administrative burden – Strategies that are realistically within the administrative capacity of the Town and its available support network (CMRPC, local non-profit organizations, regional collaborative associations etc.) are prioritized. Grant application requirements, grant administrative requirements (including audit requirements), procurement, and staff time to oversee projects are all considered when figuring out the administrative burden of a strategy.

Impact – The HMP Core Team's consideration of each strategy included an analysis of the mitigation impact each can provide, regardless of cost, political support, funding availability, and other constraints. The intent of this step is to separately evaluate the theoretical potential benefit of each

strategy to answer the question: if cost were no object, what strategies have the most benefit? Factors considered in this analysis include the number of hazards each strategy helps mitigate (more hazards equals higher impact), the estimated benefit of the strategy in reducing loss of life and property (more benefit equals higher impact), and the geographic extent of each strategy's benefits (other factors being equal, a larger area equals higher impact).

- High impact actions help mitigate several hazards, substantially reduce loss of life and property (including loss of critical facilities and infrastructure), and/or aid a relatively large portion of the community.
- Medium impact actions help mitigate multiple hazards, somewhat reduce loss of life and property (including loss of critical facilities and infrastructure), and/or aid a sizeable portion of the community.
- Low impact actions help mitigate a single hazard, lead to little or no reduction in loss of life and property (including loss of critical facilities and infrastructure), and/or aid a highly localized area.

7.2 Estimated Cost

Each implementation strategy is provided with a rough cost estimate based on available third party or internal estimates and past experience with similar projects. Each cost estimate includes hard costs (construction and materials), soft costs (engineering design, permitting, etc.), and, where appropriate, Town staff time (valued at appx. $25/hour for grant applications, administration, etc.). Strategies that already have secured funding are noted. Detailed and current cost estimates for strategies were generally not available, so costs are summarized within the following ranges:

- Low – less than $50,000
- Medium – between $50,000 – $100,000
- High – over $100,000

7.3 Expected Timeline

Section 7.3 helps meet the following FEMA local mitigation plan requirements:

- *C5. "Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction?" (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))*

Each strategy is provided with an estimated length of time it will take for implementation. For strategies for which funding has been secured, a specific future timeline is provided for when completion is expected. However, most strategies do not currently have funding, and thus it is difficult to know exactly when they will be completed. For these projects, an estimate is provided for the amount of time it will take to complete the project once funding becomes available. Each strategy has a timeframe of either a specified period of less than 5 years, a 5+ year timeframe, or an ongoing timeframe.

7.4 Strategy Types

Mitigation strategies included in this plan are subdivided into the following four broad categories which can help facilitate local implementation discussions, especially regarding budget considerations and staff roles/responsibilities:

Structure and Infrastructure Projects relate to constructing "brick & mortar" infrastructure and

building improvements in order to eliminate or reduce hazard threats or in order to mitigate the impacts of hazards. Examples of this type of project include drainage system improvement, dam repair, and generator installation. Structure and infrastructure improvements tend to have the greatest level of support at the local level but are highly constrained by funding limits.

Preparedness, Coordination and Response Actions ensure that a framework exists to facilitate and coordinate the administration, enforcement and collaboration activities described in this plan. They integrate disaster prevention/mitigation and preparedness into every relevant aspect of town operations, including the operations of the Police Department, Fire Department, EMD, EMS, DPW, Planning Board, Conservation Commission and Select Board; they also help the Town coordinate with neighboring communities where appropriate. Recommendations in this category often help standardize generally practiced activities.

Education and Awareness Programs help raise awareness of overall or hazard-specific risk and generate support for individual or community-wide efforts to reduce risk. Education and awareness seek to affect broad patterns of behavior. Awareness-building activity tends to have a fairly slow effect, although in the end it can provide extraordinary benefits with relatively little cash outlay.

Local Plans and Regulations propose updates to or formally update or establish local bylaws, ordinances and other regulations to protect vulnerable resources and prevent future natural hazard impacts on these resources. Local plans can also review the effectiveness of past mitigation projects, programs, procedures, and policies so that strategies for making them more effective in the future can be formed. An example of a project which fits under this category is incorporating mitigation planning into master plans, open space plans, capital improvement plans, facility plans, and other town plans.

Planning and regulatory activity tends to provide extraordinary benefits to towns with relatively little cash outlay. However, in smaller communities where planning activities are largely the purview of volunteers, outside assistance from the state or regional levels may be required to maximize the benefits of planning. Political support may be difficult to achieve for some planning and regulatory measures, especially those that place new constraints on land use.

In addition to describing action items in each of these categories, the row for each strategy also identifies what hazard(s) the strategy is intended to address. Each row also identifies the lead organizations who serve as the primary points of contact for coordinating efforts associated with the corresponding strategy and identify potential funding sources for implementing the strategy.

7.5 Strategy Goals

Section 7.5 helps meet the following FEMA local mitigation plan requirements:

- *C3. "Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards?" (Requirement 44 CFR § 201.6(c)(3)(i))*

For each of the strategy types included above, there is an associated mitigation goal. The goals are as follows:

Structure and Infrastructure Projects – Harden and adapt the Town's current infrastructure to withstand hazards in the near-term and the long-term, incorporating nature-based strategies whenever feasible and desirable to build a more resilient municipality.

Preparedness, Coordination and Response Actions – Improve the Town's emergency and municipal service capabilities to effectively respond to and recover from natural disasters, as well as to build and establish relationships with stakeholders to ensure the continuation of essential services in the event of a disaster.

Education and Awareness Programs – Educate and inform the public about the threats of natural hazards and climate change; provide the resources for individual and community preparedness and foster a whole community response to natural hazards and climate change.

Local Plans and Regulations – Adopt and approve plans and legislation that prioritize climate resiliency and hazard mitigation; incorporate principles of resiliency within local and regional planning and legislative actions.

7.6 Town of Northborough 2025 Hazard Mitigation Strategies

Section 7.6 helps meet the following FEMA local mitigation plan requirements:

- *C3. "Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards?" (Requirement 44 CFR § 201.6(c)(3)(i));*
- *C4. "Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?" (Requirement 44 CFR § 201.6(c)(3)(ii));*
- *C5. "Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction?" (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii)); and*
- *D2. "Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)?" (Requirement 44 CFR § 201.6(c)(4)(i))*

The Town has decided to prioritize the following mitigation strategies. The columns of the table below reflect the criteria described above. In the "Who (Agencies Involved)" column, the lead agency for each strategy is **bolded**.

OVERALL GOAL: The overall goal of these mitigation strategies is to facilitate activity within the Town of Northborough that reduces the loss of people's lives, property in town, and environmental resources in town as well of the risk of these losses in the case of natural hazard occurrences. Please view section 8.4, Potential Federal and State Funding sources, for more information on the funding sources listed below.

Table 40: Town of Northborough 2025 Hazard Mitigation Strategies

Structure & Infrastructure Strategies							
Actions	**Hazards Addressed**	**Agencies Involved**	**Potential Funding Sources**	**Priority**	**Impact**	**Estimated Cost**	**Expected Timeline**
Dredge fire ponds which are too shallow and dry out during the summer months. This helps with stormwater collection and helps prevent flooding in the area of the ponds.	WF, FL, ST	**Fire**, DPW, CC	Federal (FEMA Assistance to Firefighters Grant, other FEMA Grants), State (EEA grants), Local (fire department, DPW, and conservation operating budgets)	Low	Medium	High	2-3 years

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Expand the capacity of the DPW. Maintain the number of cisterns and fire ponds. Enhance the clearing of poison ivy from draft sites and dry hydrants, and consistently clear the drain at Route 9 and Route 20 which causes flooding.	WF, DR, FL	State, **DPW**, Fire	State (EEA grants), Local (DPW and fire department operating budgets)	Medium	Medium	Medium	3-5 years, then ongoing maintenance
Develop a back-up strategy for the town's DPW building, including the fuel island. Purchase a dedicated stationary generator for the DPW building, including the fuel island, to ensure that the town has access to fuel in the event of an emergency.	All	**DPW**	State (MassWorks) Federal (FEMA BRIC Grant, USDA Community Facilities Direct Loan & Grant Program), Local (DPW operating budget)	Low	Medium	High	2-3 years
Repair Bartlett Pond Dam to mitigate / remove invasive species (a contract has been signed for completing invasive plant management at the dam from 2024-2026 using local Community Preservation Act (CPA) funding).	DF, ST, FL, IS	**CC**	Local (conservation operating budget, CPA), State (MVP Action Grant), State / Federal (National Dam Safety Program)	Low	Medium	High	2-3 years
Map and maintain fire roads in conservation areas.	WF	GIS, DPW, **Fire**, Trails Committee, CC	Local (fire department, DPW, MIS/GIS department, and conservation operating budgets), State (MA DCR Forest Stewardship Program (Climate Stewardship Incentive Program), DLTA, LPA)	High	High	Medium / High	1-2 years, then ongoing maintenance

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Ensure proper functioning of dry hydrants around Town, especially near Crawford Street, Little Chauncy Pond, and I-290.	WF	DPW, **Fire**, CC	Local (fire department, DPW, and conservation operating budgets), State (EEA grants)	Medium	Medium	Medium	1-2 years
Incorporate energy efficiency measures as part of municipal building projects.	All	**All town departments**, Schools	Local (town appropriations), State (DEP funding, MVP Action Grant, DOER grants), Federal (FEMA BRIC Grant)	High	High	High	As new municipal building projects occur, ongoing
Incorporate low-impact development (LID) measures to reduce heat island impacts in town and deal with stormwater mitigation issues.	FL, XT	**All town departments**	Local (town appropriations), State (DEP funding, MVP Action Grant, DOER grants), Federal (BRIC, FMA Grants)	Medium	Medium	Medium	2-5 years, then ongoing
Explore options for working with MassDOT to construct water retention structures / swales at the RT-9 - RT-20 Interchange.	FL	**DPW**, MassDOT, CC	Local (town appropriations), State (MVP Action Grant, MassWorks), Federal (FEMA BRIC, FMA grants)	High	High	High	2-5 years
Explore establishing a redundant MWRA connection, as recommended by MassDEP, to ensure a reliable water supply for the Town.	DR, XT	**DPW**	State (Statewide Water Management Act Grant)	High	High	High	4 years

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Remove dams and restore streams, prioritizing continuing work on the removal of Northborough Reservoir Dam. Explore options for acquiring and removing other significant and high hazard dams within town. Massachusetts DCR Dam and Seawall Grant, local water enterprise fund, and state earmark funding has been secured to use for the partial removal of the Northborough Reservoir Dam.	FL, DF	**DPW**, CC	Local (water enterprise fund), State (MA DCR Dam and Seawall Grant, earmark funding, EEA and DER grants), Federal (FEMA grants (incl. National Dam Safety Program, High Hazard Potential Dams Grant))	High	High	High	1-5 years then ongoing, 1-2 years for the North-borough Reservoir Dam
Provide critical municipal facilities (such as the town hall, senior center, and library) with backup power to provide heating and cooling in extreme conditions.	All	**DPW**, Select Board, Council on Aging, Library	Local (town appropriations), Federal (FEMA BRIC Grant)	High	High	Medium / High	1-2 years
Install cooling and/or dehumidification at Melican Middle School, the Town's emergency shelter.	DR, XT	**DPW**, School Committee	Local (town appropriations), Federal (FEMA BRIC Grant)	Medium	Medium	Low / Medium	1-2 years
Establish alternative energy sources in town, such as rooftop solar panels, to provide energy resiliency for the community. Look into other resiliency projects relating to green energy such as municipal power grids.	All	**Planning Department**, Select Board	Local (town appropriations) State (EEA and DOER grants), Federal (EPA grants)	Medium	Medium	High	1-2 years
Protect underground utilities like gas, water, and sewer by implementing redundancies to these systems.	All	**DPW**, National Grid	Local (town appropriations), National Grid funding	Medium	Medium	High	1-2 years

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Complete drainage improvements at Church Street.	FL	**DPW**	Local (town appropriations), State (EEA and DER grants (the latter includes the Culvert Replacement Municipal Assistance Grant Program)), Federal (National Culvert Removal, Replacement, and Restoration Grant, FEMA BRIC, FMA Grants)	High	Medium	High	2-5 years
Install air filters at emergency shelter locations to increase the Town's resiliency to wildfire hazards.	WF	DPW, **Fire**, Select Board	Local (town appropriations)	Low	Low / Medium	Low	0-1 years
Strive for new public building projects in town to receive gold or platinum LEED certifications. These certifications can be achieved through daylighting, solar panel installations, green roofs, rain gardens, tree planting, and electric charging stations.	All	**Planning Department**, Select Board	Local (town appropriations), State (Green Communities Grants, MVP Action Grant), Federal (HUD Grants)	Medium	High	High	As new public building projects occur, ongoing
Protect additional open space for hazard mitigation purposes through acquisition or conservation restriction, especially floodplains, riverfront areas, wetlands, and steep slopes.	All, especially FL	**Open Space Committee**, CC, Metacomet Land Trust, MA DCR, Community Preservation Committee	Local (CPA), State (DCS LAND Grant, DFW grants, EEA grants), Federal (FEMA BRIC, FMA Grants)	Medium	Medium	High	2-5 years, then ongoing

Preparedness, Coordination & Response Action Strategies							
Actions	**Hazards Addressed**	**Agencies Involved**	**Potential Funding Sources**	**Priority**	**Impact**	**Estimated Cost**	**Expected Timeline**
Enhance the Town's participation with National Grid through their First Responder App.	All	Fire, Police, **DPW**	Local (DPW, fire department, and police department operating budgets)	Medium	Medium	Low	0-1 years, then ongoing
Expand on and maintain the Town's vegetative debris program (e.g. by acquiring additional equipment); thereby mitigate risks in town of stormwater flooding, riverine flooding, and winter storm damage. Collaborate with organizations such as the Central Massachusetts Mosquito Control Project on this strategy. Possible funding for this effort could be included in the Town's Capital Improvement Plan. Create a town debris management plan as an appendix to the Comprehensive Emergency Management Plan and have it approved by FEMA.	ST, SS, FL	**DPW**	State (EEA grants, DEP funding, MEMA Grants), Local (capital funding)	Low / Medium	High	Low	3-5 years, with maintenance of the vegetative debris program ongoing

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Enhance the Town's strong relationship with utilities, including National Grid, who has their New England Operations Center on Barefoot Road in town. National Grid is currently very responsive in town; National Grid and the Town's DPW send appropriate resources to downed poles and wires after the National Grid, the Town's DPW, the Fire Department, and/or the Police Department send picture messages of them. Build off recently adopted Stretch Code and utilize Green Communities designation.	All	**All town departments,** State, Utilities	State (Green Communities grant funding), Local (operating budgets for all town departments)	Medium	High	Low	0-3 years, then ongoing
Enhance the utilization of hazard warning systems and notifications, including by using social media, town webpages, Code Red, and other communication methods. Interns are currently taking senior citizen information to sign them up for CodeRed. Post generator safety and use information on social media. The Health Department is going to put out a brochure on 72-hour kits through Town-wide mailing, school take-home packets, and other communication methods. Enhance and maintain the Town's internal instant messaging system to allow for the rapid response of emergency personnel.	All	Fire, Police, **Emergency Manage-ment**, Health Department	Local (emergency management, fire department, police department, and health department operating budgets)	High	High	Low	0-1 years, then ongoing

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Actively enforce and comply with the 2021 update of the state building code and promote a successful working relationship between the Fire Marshall and the Building Inspector.	All	**Building Department,** Fire, PB, CC, ZBA	Local (building department, fire department, planning department, and conservation operating budgets)	High	High	Low	0-1 years, then ongoing
Enhance the Town's engagement with the Watershed Organization for the Sudbury, Assabet, and Concord Rivers (OARS) and the Massachusetts Association of Conservation Commissions to support wetlands protection, river corridor acquisition, etc.	FL, ST	**CC**	Local (conservation operating budget)	Medium	Medium	Low	2-5 years, then ongoing
Enhance the engagement of the Local Emergency Planning Committee (LEPC) in the Central Region Homeland Security Advisory Council (CRHSAC) for increased communication and coordination between local, regional, state, and federal agencies regarding disasters and emergencies.	All	**All town departments**	Federal Homeland Security grant funding through MEMA and CRHSAC, Local (operating budgets for all town departments)	High	High	Medium	0-1 years, then ongoing

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Plan for and actively manage forests owned by the Northborough Conservation Commission to reduce wildfire risks and prevent damage from invasive species.	WF, IS	**CC**, Trails Committee	State (MA DCR Forest Stewardship Program (Community Forest Stewardship Implementation Grant, Climate Stewardship Incentive Program)), Local (CPA, capital expenditure, town meeting, conservation operating budget)	Medium	Low / Medium	Medium	2 years
Partner with utilities to coordinate a more systematic tree trimming program.	WF, IS, XT	**DPW**, National Grid	National Grid, Local (DPW operating budget)	Medium	Medium	Low	1-4 years, then ongoing
Encourage tree planting on public lands through collaboration between the DPW, local civic organizations, and the local school district. Incorporate nature-based mitigation measures and design into municipally/publicly owned lands.	WF, IS, XT	**DPW**, Schools, Civic Organiza-tions	National Grid, State (MVP Action Grant), Federal (EPA grant funding), Local (CPA), Arbor Day Foundation	Medium	High	Low	2-5 years, then ongoing
Seek out best practices and funding available to mitigate roadside invasive vegetation species.	IS	**DPW**	Local (DPW operating budget)	Medium	Medium	Medium	2-3 years

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Communicate with the Office of Dam Safety on the condition of Smith Pond Dam / Otis Street Dam.	DF	**DPW**, DCR ODS, MEMA	Local (DPW operating budget)	Low	Medium	High	0-1 years, then ongoing
Evaluate and rank projects impacting flood prone streets/areas.	FL	**Planning Department**, DPW, CC	Local (planning department, DPW, and conservation operating budgets)	High	Medium	Low	0-1 years
Improve and maintain emergency services for vulnerable populations such as seniors, which could require increasing emergency transportation options (rideshare options), diversifying communications, expanding planning, and ensuring reliable power.	All	Fire, **Council on Aging**, Planning Department, Select Board, Police, DPW	Local (fire department, senior center, planning department, police department, town administration, and DPW operating budgets, town appropriations), State (DLTA, Support and Incentive Grant, Green Communities Grants MassWorks), Federal (FEMA BRIC Grant, USDA Community Facilities Direct Loan & Grant Program), Federal Homeland Security grant funding through MEMA and CRHSAC	High	High	High	0-3 years, then ongoing
Evaluate climate change's impacts on private drinking water wells.	DR, XT, FL	**BOH**, Planning Department	Local (health department and planning department operating budgets)	Low / Medium	Low / Medium	Low	1-2 years, then ongoing

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Protect municipal buildings and services against flooding and provide adequate staffing and training.	FL	**DPW**, Fire	Local (DPW and fire department operating budgets, town appropriations), State (EEA grants, DER grants), Federal (FEMA BRIC, FMA Grants)	High	High	High	0-3 years, then ongoing
Prepare a communications plan. Spread knowledge of evacuation routes and services. Practice emergency protocols to ensure that there is adequate staffing and equipment. Stock the materials needed to sustain evacuated residents in the case of a hazard occurrence.	All	**All town departments**	Local (operating budgets for all town departments, town appropriations), State (MEMA grants), Federal Homeland Security funding through CRHSAC and MEMA	High	High	Medium	2-3 years
Add language options to the CodeRed system.	All	**Fire**	Local (fire department operating budget), State (LPA, MEMA grants), Federal (FEMA grants)	Medium	Medium / High	Low / Medium	0-1 years

Education & Awareness Strategies							
Actions	**Hazards Addressed**	**Agencies Involved**	**Potential Funding Sources**	**Priority**	**Impact**	**Estimated Cost**	**Expected Timeline**
Educate all segments of the community about hazard mitigation and the impacts that disasters can have on the community through social media, brochures, the town website, and mailings. Educate all segments of the community about water conservation methods. Continue outreach of the health department resource guide.	All	**EMD**, DPW, Fire, Police	Local (fire department, DPW, and police department operating budgets), State (DLTA, LPA, MEMA grants), Federal (FEMA grants)	Medium	High	Low	Yearly
Promote available (state/federal) educational materials, especially to students, regarding disasters and measures people can take to limit risks.	All	**Fire**, Police, Schools	Local (fire department, police department, and school operating budgets), State (DLTA, LPA, MEMA grants), Federal (FEMA grants)	Medium	High	Low	Yearly
Enhance the provision of fire safety education through the SAFE and Senior SAFE programs, social media, the town website, and in-person outreach.	WF, DR	**Fire**	Local (fire department operating budget), State (SAFE and Senior SAFE, MEMA grants), Federal (FEMA grants)	Low	Low	Low	0-1 years, then ongoing
Enhance the development and distribution of educational materials for residents about protecting wetlands, preventing flooding, and stormwater mitigation.	DR, WF, ST, HU	**CC**	Local (conservation operating budget)	Low	Low	Low	0-5 years, then ongoing

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Support local public health initiatives and evaluate the management of public health related concerns.	IS, XT, DR	**BOH**	Local (health department operating budget)	Medium / High	Medium	Low	0-2 years, then ongoing
Utilize partners such as schools, the healthcare system, churches, community cable access TV, etc. to communicate to vulnerable populations and broader audiences.	All	**All town departments**	Local (operating budgets for all town departments)	Low	Medium	Low	1-5 years, then ongoing
Enhance education and outreach on tick and mosquito-borne diseases and evaluate the management of disease carrying insects.	IS	**BOH**	Local (health department operating budget)	Medium	Medium	Low	0-3 years, then ongoing
Educate residents about invasive species using existing and new resources. Provide the community with tools to manage invasive species.	IS	**CC**	Local (conservation operating budget)	Low	Low / Medium	Low	1-5 years, then ongoing
Educate the public about strategies for preventing basement flooding, such as with rain gardens or other nature-based and small-scale mitigation strategies.	FL	**DPW**	Local (DPW operating budget)	Low	Low	Low	1-5 years, then ongoing
Add links to online sustainability resources (such as Think Blue) to the town website.	All	**Planning Department**	Local (planning department operating budget)	Low	Low / Medium	Low	0-1 years

Local Plan & Regulation Strategies							
Actions	**Hazards Addressed**	**Agencies Involved**	**Potential Funding Sources**	**Priority**	**Impact**	**Estimated Cost**	**Expected Timeline**
Enhance information sharing about successful hazard mitigation planning and programs at Local Emergency Planning Committee meetings and Central Region Homeland Security Advisory Council meetings. Create a feedback loop to improve pre-disaster planning by establishing a formal post-disaster assessment process.	All	**EMD**, LEPC, State	Local (fire department operating budget), State (MEMA Grants), Federal Homeland Security grant funding via MEMA and CRHSAC	Medium	Low	Low	1-2 years, then ongoing
Expand the use of the Town's Capital Improvement Program for vegetation removal equipment, paving, and dam repair.	All	**Capital Improvement Committee**	Local (capital funding), State (MassWorks, EEA grants), Federal (FEMA grants (BRIC Grant, National Dam Safety Program, Rehabilitation of High Hazard Potential Dam Program))	High	High	Medium	0-3 years, then ongoing
Write Hazard Mitigation grants.	All	Fire, Police, DPW, **Planning Department**	Local (planning department, fire department, police department, and DPW operating budgets)	Medium	Medium / High	Medium	0-3 years, then ongoing
Enforce underground utility requirements in local subdivision regulations and the Town's zoning bylaw.	All	**Planning Department**	Local (planning department operating budget), State (EEA Planning Assistance Grant)	Medium	Medium	Low	1 year, then ongoing

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Update subdivision regulations to incorporate current construction practices and stormwater mitigation measures. Create homeowners' associations to permanently maintain stormwater basins and fire protection systems (such as cisterns). Update the common driveway bylaw.	FL	**Planning Department,** DPW	Local (capital funding)	High	Medium	Low	1 year
Integrate hazard mitigation into subdivision, site plan review, 40B review, and other zoning reviews; In particular, require the consideration of downstream flooding impacts caused by new projects. Enforce the reduction of impervious surface (pavement) and reserve parking so that stormwater can be recharged and retained. Enforce groundwater protection in overlay district.	FL, ST	Building Department, **Planning Department,** DPW, Fire, CC	Local (planning department, building department, DPW, fire department, and conservation operating budgets), State (EEA Planning Assistance Grant)	Medium	Medium	Low	0-1 years, then ongoing
Enhance and maintain the Unified Incident Command program and continue training local officials in ICS/NIMS.	All	**All Town Departments**	Local (operating budgets for all town departments), State (MEMA Grants), Federal Homeland Security funding via MEMA and CRHSAC	Medium	Medium	Low	0-2 years, then ongoing
Evaluate, update, and maintain public safety communications system infrastructure.	All	Police, **Fire,** IT, DPW	Local (capital funding), State (Support and Incentive Grant), Federal (ARPA)	High	High	High	0-3 years

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Enhance and maintain the Town's inventory of shelter supplies and emergency resources. Identify resources that are available at shelters and identify if the shelters would be impacted by an emergency. This would help in planning to ensure that suitable shelters are available for different types of natural hazards. Plan and administer walkthroughs so that emergency management staff know the shelter layouts. Overnight shelters should be inspected by the State Building Department for compliance.	All	EMD, **Shelter Coordinator,** State Building Department	Local (fire department operating budget), State (MEMA Grants), Federal Homeland Security funding via MEMA and CRHSAC	Low	Low	Low	0-5 years, then ongoing
Study the possibility of creating a regional shelter with a neighboring town. This would help limit the expense of maintaining separate shelters when towns have limited budgets.	All	**EMD,** neighboring towns	Local (fire department operating budget), State (MEMA Grants), Federal Homeland Security funding via MEMA and CRHSAC	Medium	Medium	Low	1-2 years
Enhance the active enforcement of and compliance with State Building Code Requirements. Ensure proper certification for inspectors.	All	**Building Department**	Local (building department operating budget)	High	Medium	Low	0-1 years, then ongoing
Actively enforce and comply with the stormwater management bylaw under the jurisdiction of the Conservation Commission.	FL, ST	**CC**	Local (conservation operating budget)	High	High	Low	0-1 years, then ongoing

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Actively enforce and comply with the Massachusetts Wetlands Protection Act and enforce the local wetlands bylaw.	FL, ST	**CC**	Local (conservation operating budget)	High	High	Low	0-1 years, then ongoing
Update the Hazard Mitigation Plan every five years and monitor the implementation of this plan by meeting to review mitigation strategies annually.	All	Fire, Police, DPW, EMS, Planning, CC, **EMD**	Local (fire department, police department, DPW, planning department, and conservation operating budgets), State (DLTA via CMRPC)	High	Medium	Low	Yearly, plan update every 5 years
Enhance the incorporation of hazard mitigation into local and regional plans such as the Town's Master Plan, land use plans, transportation plans, the Town's Open Space and Recreation Plan, and the Town's Capital Improvement Plans.	All	**All Town Departments**, LEPC	Local (operating budgets for all town departments), State (EEA Planning Assistance Grant), Federal (FEMA BRIC Grant)	Medium	Medium	Low	0-5 years, then ongoing
Inventory unreinforced masonry and brick buildings in town which may be vulnerable to earthquakes. Conduct a study which identifies ways that these buildings can meet the Massachusetts State Building Code's seismic standards.	EQ	**Building Department**, Planning Department	Local (building department and planning department operating budgets), State (MEMA Grants), Federal (FEMA Grants (National Earthquake Hazards Reduction Program's State Assistance Program))	Low	Medium	Low	0-3 years, then ongoing
Consider beaver removal strategies. Complete a beaver management plan.	FL, DF	**DPW**, CC	State (EEA grants), Local (DPW and conservation operating budgets, town appropriations)	Low	Low	Low / Medium	3 years

'Hazards Addressed' abbreviations:

DF	Dam Failure	DR	Drought
EQ	Earthquakes	FL	Flooding
HU	Hurricanes	IS	Invasive Species
OT	Other	SS	Severe Snowstorms / Ice Storms / Nor'easters
ST	Severe Thunderstorms / Wind / Tornado es	WF	Wildfire
XT	Extreme Temperatures		

'Agencies Involved' abbreviations:

CMRPC	Central Mass. Regional Planning Commission	CC	Conservation Commission
DPW	Department of Public Works	EMD	Emergency Management Director
PB	Planning Board	LEPC	Local Emergency Planning Committee
ZBA	Zoning Board of Appeals		

8.0 Plan Adoption, Implementation, and Maintenance

8.1 Plan Adoption

A public meeting was held on July 15th, 2024 as part of the Select Board's meeting in order to detail the Northborough Hazard Mitigation Plan update process to that date and to solicit comments and feedback from the public and the Select Board on the draft plan which was then being developed. The draft plan was provided to the Town for distribution and was posted on the Town's website for two weeks starting on July 15th, 2024 for public review and input. The Plan was then submitted to the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency (FEMA) for their review. Upon receiving conditional approval of the plan by FEMA, the final plan was adopted by vote of the Northborough Select Board and certified on August 4th, 2025.

8.2 Plan Implementation

Section 8.2 helps meet the following FEMA local mitigation plan requirements:

- *A4. "Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information?" (Requirement 44 CFR § 201.6(b)(3)); and*
- *E2. "Was the plan revised to reflect changes in priorities and progress in local mitigation efforts?" (Requirement 44 CFR § 201.6(d)(3)).*

The Town of Northborough has taken steps to implement findings from its 2018 Hazard Mitigation Plan into the following plans: the 2020 Northborough Municipal Vulnerability Preparedness Plan, the 2020 Northborough Master Plan, the 2020 Northborough Open Space and Recreation Plan, and the 2020 Northborough Comprehensive Emergency Management Plan; Findings from the 2025 Northborough Hazard Mitigation Plan update, including the data, ideas, and strategies incorporated into the plan, may be integrated into future iterations of all of these plans as well as into zoning updates for the town, plans completed as part of the implementation of the Town's Master Plan, and other planning mechanisms and documents.

The implementation of this 2025 plan update began upon its formal adoption by the Select Board and approval by MEMA and FEMA. Town departments and boards responsible for ensuring the development of policies, ordinance revisions, and programs as described in Sections 6 and 7 of this plan will be notified of their responsibilities immediately following this plan's approval. The local Hazard Mitigation Team in town will oversee the implementation of this plan.

Incorporation with Other Planning Documents

Findings from the 2018 Northborough Hazard Mitigation Plan were incorporated into other planning mechanisms and policies in town besides this plan update, including the Town's 2020 Master Plan, 2020 Open Space and Recreation Plan, 2018 Municipal Vulnerability Preparedness Plan, and 2020 Comprehensive Emergency Management Plan. Existing plans, studies, reports, and municipal documents completed by and/or relating to the Town were also incorporated throughout this planning process. The following key documents were reviewed as part of the planning process, and information from these documents was incorporated into this plan update:

- ***Northborough Comprehensive Emergency Management Plan*** (particularly the critical infrastructure section) – The critical infrastructure section of this plan was used to help identify infrastructure components in town that have been identified as crucial to the function of the Town; this resource was also used to identify potentially vulnerable populations and potential emergency response shortcomings.

- ***Regional Evacuation Plan*** – Funded by United States Department of Homeland Security via the Commonwealth of Massachusetts and the Central Region Homeland Security Advisory Council, this regional evacuation plan prepared by CMRPC was used to identify evacuation routes and emergency shelters. This plan will soon be updated by CMRPC.
- ***Northborough Open Space and Recreation Plan*** – This Plan was used to identify the natural context within which mitigation planning takes place; it proved useful for this planning process insofar as it identified water bodies, rivers, streams, infrastructure components (i.e., water and sewer, or the lack thereof), and population trends. This information was incorporated into this plan to ensure that the Town's mitigation efforts would be sensitive to the surrounding environment.[168]
- ***Northborough Zoning Bylaw*** – The Zoning Bylaw was used in this planning process to identify the actions that the Town is already taking (such as implementing and enforcing floodplain regulations) that reduce the potential impacts of a natural hazard and to make sure that this plan's mitigation strategies do not duplicate existing successful efforts.[169]
- ***Northborough Master Plan*** – This plan was used to identify the main priorities for the Town so that the Hazard Mitigation Plan's strategies can align with these priorities.[170]
- ***Northborough Municipal Vulnerability Preparedness Plan –*** Recommendations from this plan deemed important to hazard mitigation by the planning team in town were incorporated into the Hazard Mitigation Plan's mitigation strategies.[171]
- ***ResilientMass State Hazard Mitigation and Climate Adaptation Plan*** - This plan was used to ensure that the town's HMP data and priorities are consistent with the State's data and priorities.[172]
- ***2022 Massachusetts Climate Change Assessment*** - This plan was used to ensure that the town's HMP data and priorities, especially in the hazards section of the plan, are consistent with the State's data and priorities.[173]
- ***2025 Massachusetts Statewide Comprehensive Housing Plan*** - This plan was used to ensure that the town's HMP data and priorities, especially in the development trends section of the plan, are consistent with the State's data and priorities.[174]

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[168] Town of Northborough Open Space Committee et al., "Town of Northborough Open Space and Recreation Plan – 2020," Town.northborough.ma.us, The Town of Northborough, accessed June 21, 2024, https://www.town.northborough.ma.us/sites/g/files/vyhlif12221/f/news/northborough_open_space_and_recreation_plan_approved_12_2_22.pdf.

[169] "Town of Northborough, MA Municipal Code - Part 7: Zoning," Ecode360.com, The Town of Northborough, accessed June 21, 2024, https://ecode360.com/41986945#41986945.

[170] VHB in association with Landwise, "Town of Northborough 2020 Master Plan," Town.northborough.ma.us, The Town of Northborough, June 2020, https://www.town.northborough.ma.us/sites/g/files/vyhlif12221/f/pages/northborough_master_plan_-_complete_document.pdf.

[171] Weston & Sampson, "Community Resilience Building Workshop Summary of Findings," Town.northborough.ma.us, The Town of Northborough, January 2020, https://www.town.northborough.ma.us/sites/g/files/vyhlif12221/f/news/mvp_planning_report_final_2020.pdf.

[172] "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

[173] "2022 Massachusetts Climate Change Assessment"

[174] HOUSING ADVISORY COUNCIL, "A HOME FOR EVERYONE: A Comprehensive Housing Plan for Massachusetts 2025 – 2029," Mass.gov, Executive Office of Housing and Livable Communities, 2025, https://www.mass.gov/doc/a-home-for-everyone/download.

Additionally, this plan incorporated information from the 2014 FIRM maps for Northborough and the 2023 Worcester County Flood Insurance Study.

After this plan has been approved by both FEMA and the Northborough Select Board, a link to the plan will be emailed to all Town staff, boards, and committees; along with this link, the Town staff, boards, and committees will be sent a reminder to review the plan periodically and work to incorporate its contents, especially the action plan, into other town planning processes and/or documents. In addition, during annual monitoring meetings for the Hazard Mitigation Plan implementation process, the local Hazard Mitigation Team will review whether any of these plans are in the process of being updated. If so, the Hazard Mitigation Team will remind people working on these plans and/or documents of the Hazard Mitigation Plan and will encourage them to incorporate information and strategies from the Hazard Mitigation Plan into their efforts. The Hazard Mitigation Team will also review current town programs and policies to ensure that they are consistent with the mitigation strategies described in this plan. Information from the Hazard Mitigation Plan will also be incorporated into updates of the Town's Comprehensive Emergency Management Plan.

8.3 Plan Monitoring and Evaluation

Section 8.3 helps meet the following FEMA local mitigation plan requirements:

- *D1. "Is there discussion of how each community will continue public participation in the plan maintenance process?" (Requirement 44 CFR § 201.6(c)(4)(iii));*
- *D2. "Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)?" (Requirement 44 CFR § 201.6(c)(4)(i)); and*
- *D3. "Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?" (Requirement 44 CFR § 201.6(c)(4)(ii))*

The Town will review and update the Hazard Mitigation Plan every five years through forming a HMP planning team and working with a contractor to complete the update. The Town's Emergency Management Director will also call meetings of all responsible parties to review, track, and monitor the progress of the Hazard Mitigation Plan on a yearly basis and/or as is needed based on the occurrence of hazard events. Any substantial revisions made to the plan will be made open for public comment and/or will be presented on at a Select Board meeting which is open to the public. Parties identified as responsible for specific mitigation actions will be asked to submit their reports relating to these actions in advance of town hazard mitigation planning meetings.

Town hazard mitigation planning meetings will involve evaluation, assessment, tracking, and monitoring of the most recent HMP plan update. Responsible parties will review the plan's effectiveness at achieving its goals and stated purpose at these meetings. The following questions will serve as the criteria that are used to evaluate the plan:

Plan Mission and Goal

- Is the Plan's stated goal and mission still accurate and up to date, reflecting any changes to local hazard mitigation activities?
- Are there any changes or improvements that can be made to the goal and mission?

Hazard Identification and Risk Assessment

- Have there been any new occurrences of hazard events since the plan was last reviewed? If so, these hazards should be incorporated into the Hazard Identification and Risk Assessment.
- Have any new occurrences of hazards varied from previous occurrences in terms of their extent or impact? If so, the stated impact, extent, probability of future occurrence, or overall assessment of risk and vulnerability should be edited to reflect these changes.
- Is there any new data available from local, state, or federal sources relating to the impact of previous hazard events or the probability of future hazard occurrences? If so, this information should be incorporated into the plan.
- How will progressing climate change impact the risk of each natural hazard? What impacts do hotter, wetter, and more variable weather have on each natural hazard?

Existing Mitigation Strategies

- Are the current strategies effectively mitigating the effects of any recent hazard events?

- Has there been any damage to property caused by natural hazards since the plan was last reviewed?
- How could the existing mitigation strategies be improved to reduce the impacts of recent occurrences of hazards? If there are improvements which should be made, these should be incorporated into the plan.

Proposed Mitigation Strategies

- What progress has been accomplished for each of the previously identified proposed mitigation strategies?
- How have any recently completed mitigation strategies affected the level of impact in town of hazards that have occurred since these strategies were completed?
- Should the criteria for prioritizing the mitigation strategies in the plan be altered in any way?
- Should the priority given to individual mitigation strategies be changed, based on any recent changes to financial and staffing resources and/or recent hazard events?

Review of the Plan and Integration with Other Planning Documents

- Is the current process for reviewing the Hazard Mitigation Plan effective? Could it be improved?
- Are there any town plans in the process of being updated that should have the content of this Hazard Mitigation Plan incorporated into them?
- How can the current Hazard Mitigation Plan be better integrated with other Town planning tools and operational procedures, including the zoning bylaw, the Comprehensive Emergency Management Plan, and the Capital Improvement Plan?

Plan tracking and monitoring will be accomplished by a group of town stakeholders led by the Town's Emergency Management Director who have similar to if not the same credentials as the local HMP planning team for this plan update. When this team meets, they will review the mitigation strategies table from this plan update, will update it with any progress on the strategies which has been made since the plan update was adopted, and will discuss priorities for mitigation strategies which have not yet been implemented. They will also discuss how the data, ideas, and strategies from this plan update will be incorporated into other planning mechanisms and documents actively being worked on in town, including but not limited to updates to the Town's Master Plan, Open Space and Recreation Plan, Comprehensive Emergency Management Plan, and zoning bylaw as well as Municipal Vulnerability Preparedness program efforts in town. Following these meetings, it is anticipated that the HMP planning team in town may decide to reassign the roles and responsibilities for implementing mitigation strategies to different Town departments and/or revise the goals and objectives contained in the most recent plan update. The Town also has the option to work with a contractor to help facilitate the tracking and monitoring of the plan.

Public participation will be a critical component of the Hazard Mitigation Plan maintenance process. Any substantial revisions to the plan will be made open for public comment and/or will be presented on at a Select Board meeting which is open to the public. Plan implementation will be approved through standard capital planning, Town Meeting, and/or other publicly accessible local approval processes. The public will be notified of any changes to the Plan via the meeting notices board at Town Hall, and copies of the revised Plan will be made available to the public at Town Hall.

8.4 Potential Federal and State Funding Sources

8.4.1 Federal Funding Sources

The following is a summary of the programs which are the primary sources for federal funding of hazard mitigation projects and activities in Massachusetts:

Table 41: Federal Hazard Mitigation Funding Sources

Program	Type of Assistance	Availability	Managing Agency	Funding Source
National Flood Insurance Program (NFIP)	Pre-disaster insurance	Any time (pre & post disaster)	DCR Flood Hazard Management Program	Property Owner, FEMA
Community Rating System (CRS) (Part of the NFIP)	Flood insurance discounts	Any time (pre & post disaster)	DCR Flood Hazard Management Program	Property Owner
Hazard Mitigation Grant Program (HMGP)	Post-disaster cost-share grants	Post disaster program	MEMA	75% FEMA / 25% non- federal
Building Resilient Infrastructure and Communities (BRIC)	National, competitive cost-share grant program for projects & planning	Annual, pre-disaster mitigation program	MEMA	75% FEMA / 25% non- federal
Flood Mitigation Assistance (FMA) Program	Cost share grants for pre-disaster planning & projects	Annual pre-disaster grant program	MEMA	75% FEMA / 25% non- federal
Public Assistance	Post-disaster aid to state & local governments	Post Disaster	MEMA	FEMA, plus a non-federal share
Small Business Administration (SBA) Mitigation Loans	Pre- & Post- disaster loans to qualified applicants	Ongoing	MEMA	Small Business Administration
Emergency Management Performance Grant (EMPG)	Pre- & post-disaster management and implementation grants	Annual	MEMA	50% FEMA / 50% non-federal match
Homeland Security Grant Program (HSGP)	Funding to prevent, respond to, and recover from acts of terrorism	Annual	MEMA	FEMA

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Hazard Mitigation Grant Program Post-Fire (HMGP-PF)	Cost-share post-wildfire disaster mitigation measures	Annual, within six months after a Fire Management Assistance Grant declaration	FEMA	75% FEMA / 25% non-federal
Assistance to Firefighters Grants (AFG)	Training & equipment for wildfire-related hazards	Annual	FEMA	FEMA
Fire Prevention & Safety Grant Program (AFG) (FP&S)	Cost-share funding to support projects that protect people from fire-related hazards	Annual	FEMA	95% FEMA / 5% non-federal
Fire Management Assistance Grants (FMAG)	Cost-share funding to mitigate & manage major disasters caused by fire	Any time (pre- & post disaster)	FEMA	75% FEMA / 25% non-federal
National Dam Safety Program (State Assistance Grant Program) (NDSP)	Funding to improve dam safety & state dam safety programs	Annual	FEMA	FEMA, Bipartisan Infrastructure Law
Rehabilitation of High Hazard Potential Dam Program (State Dam Safety Divisions) (HHPD)	Cost-share funding to plan and rehabilitate high hazard potential dams	Annual	FEMA	65% FEMA / 35% non-federal
National Earthquake Hazards Reduction Program's State Assistance Program (NEHRP)	Cost-share funding for pre-earthquake risk management	Annual	FEMA	75% FEMA / 25% non-federal
Emergency Food and Shelter Program (EFSP)	Grant funding for supplemental food & shelter for those experiencing / at risk of experiencing homelessness	Annual	FEMA	FEMA

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Public Health Crisis Response Cooperative Agreement (PHCRCA)	Funding to support surge needs of existing public health programs responding to public health emergencies	Annual for approved by unfunded (ABU) roster	CDC	Varies
Army Corp of Engineers Planning Assistance	Water supply, conservation, wetlands, & dam safety funding	Any time (pre & post disaster)	U.S. Army Corps of Engineers	50% Federal / 50% non-federal
Forest Service Community Wildfire Defense Grant (USDA-FSCWDG)	Grant funding to plan for and reduce wildfire risk	Annual	USDA-FS	75% USDA / 25% non-federal
Emergency Watershed Protection Program (EWP)	Technical assistance and funding for helping communities mitigate natural disaster risks which affect watersheds	Ongoing	USDA-NRCS	75% USDA / 25% non-federal (90% USDA / 10% non-federal in limited resource areas)
Agricultural Management Assistance (Drought Mitigation Funding Program) (AMA)	Technical assistance for agricultural producers to manage financial risks	Ongoing	USDA-NRCS	75% USDA / 25% non-federal
USDA Community Facilities Direct Loan & Grant Program (Rural Development) (CFDLGP)	Funding for improving essential community facilities	Annual	USDA-RD	Varies
National Culvert Removal, Replacement, & Restoration Grant (NCRRRG)	Competitive grant funding to replace, remove, and repair culverts or weirs	Annual	US DOT	Varies
Bridge Investment Program (BIP)	Competitive grant program for improving the conditions of existing bridges	Annual	US DOT	80% FHWA / 20% other

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT)	Discretionary program which includes Competitive Resilience Improvement Grants and planning grants	Annual	US DOT	Varies (generally, up to 80% federal share)

This FEMA web page describes several funding opportunities: FEMA Grants | FEMA.gov. The programs listed in the above table are described in more detail below.

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) AND COMMUNITY RATING SYSTEM (CRS) (PART OF THE NFIP)

The National Flood Insurance Program (NFIP) provides insurance to communities required to manage and adopt mitigation practices for high flood-risk areas. The Community Rating System (CRS) incentivizes communities to incorporate flood management practices and mitigation strategies through discounted flood insurance rates; Incentives are available on a voluntary and participatory basis to encourage communities to meet the minimum requirements of the NFIP. In encouraging communities to meet NFIP's minimum requirements, CRS can extend the availability of funding to homeowners, businesses, and renters for whom flood insurance may not be accessible. CRS allocates insurance discount rates according to a community's demonstrated efforts to implement the program's three goals:

- Reduce flood damage to insurable properties;
- Strengthen and support NFIP; and
- Incentivize proactive floodplain management.

Communities can earn CRS points based on their implementation of various flood mitigation initiatives, including but not limited to: (1) restricting development on flood prone areas, (2) extending public risk communication with flood warning systems, and (3) enhancing infrastructural resilience to flood damage. Please refer to | The National Flood Insurance Program (floodsmart.gov) and Community Rating System | FEMA.gov for more information.

HAZARD MITIGATION ASSISTANCE (HMA)

The Hazard Mitigation Assistance (HMA) grant programs provide funding opportunities for pre- and post-disaster mitigation. While the statutory origins of these programs differ, all share the common goal of reducing the risk of loss of life and property from natural hazards. Brief descriptions of the HMA grant programs can be found below. For more information on the individual programs, or to see information related to a specific fiscal year, please click on one of the program links.

Hazard Mitigation Grant Program (HMGP)

The Hazard Mitigation Grant Program (HMGP) assists in implementing long-term hazard mitigation measures following Presidential disaster declarations. Funding is available under this program to implement projects in accordance with state, tribal, and local priorities. Please refer to Hazard Mitigation Assistance Grants | FEMA.gov for additional information.

HMGP funds may be used to fund projects that will reduce or eliminate the losses from future disasters. Projects completed under this program must provide a long-term solution to a problem; for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight a flood. In addition, a project's potential savings must be more than the cost of implementing the project. Funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. Examples of eligible HMGP projects include, but are not limited to:

- Acquisition of real property from willing sellers and demolition or relocation of buildings to convert this property to open space use;
- Retrofitting structures and facilities to minimize damages from high winds, earthquakes, flooding, wildfires, or other natural hazards;
- Elevation of flood prone structures;
- Development and initial implementation of vegetative management programs;
- Minor flood control projects that do not duplicate the flood prevention activities of other federal agencies;
- Localized flood control projects, such as certain ring levees and floodwall systems, that are designed specifically to protect critical facilities; and
- Post-disaster building code related activities that support building code officials during the reconstruction process.

Hazard Mitigation Grant Program Post-Fire (HMGP-PF)

The Hazard Mitigation Grant Program Post-Fire (HMGP-PF) is a program aimed at providing financial funding to localities to reduce risk of damage from future fires after a given area has experienced a fire. Funds are determined through benefit-cost analysis software. For more information, please refer to: Hazard Mitigation Grant Program Post Fire | FEMA.gov.

Building Resilient Infrastructure and Communities (BRIC)

The Building Resilient Infrastructure and Communities (BRIC) program aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience. Examples of BRIC projects are projects that demonstrate innovative approaches to partnerships, such as shared funding mechanisms, and/or project design. For example, an innovative BRIC project may bring multiple funding sources or in-kind resources from a range of private and public sector partners. Or an innovative project may offer multiple benefits to a community in addition to the benefit of risk reduction. The BRIC program has replaced the Pre-Disaster Mitigation (PDM) grant program. More information on the BRIC program can be found here: Building Resilient Infrastructure and Communities | FEMA.gov.

The Massachusetts Emergency Management Agency (MEMA) coordinates BRIC applications for municipalities within the Commonwealth. Links to MEMA resources and BRIC application materials can be found here: Building Resilient Infrastructure and Communities (BRIC) & Flood Mitigation Assistance (FMA) Grant Programs | Mass.gov.

FLOOD MITIGATION ASSISTANCE (FMA)

Flood Mitigation Assistance (FMA) provides funds on an annual basis so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the National Flood Insurance Program. Please refer to the FMA website: Flood Mitigation Assistance Grant Program | FEMA.gov.

The following types of FMA grants are available to states and communities:

- **Project Scoping Grants** are designed to develop mitigation strategies and obtain data to prioritize, select, and develop complete applications in a timely manner that result in either an improvement in the capability to identify appropriate mitigation projects or in the development of an application-ready mitigation project for FMA or another program.
- **Planning Grants** to prepare flood mitigation plans; Only NFIP-participating communities with approved flood mitigation plans can apply for FMA project grants.
- **Technical Assistance Grants** are awards of up to $50,000 federal cost share for recipients to which FEMA obligated at least $1 million federal share the previous FMA cycle.
- **Project Grants** to implement measures to reduce flood losses, such as the elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties (structures with 2 or more losses each with a claim of at least $1,000 within any ten-year period since 1978).

MEMA coordinates FMA applications for municipalities within the Commonwealth. Links to MEMA resources and FMA application materials can be found here: Building Resilient Infrastructure and Communities (BRIC) & Flood Mitigation Assistance (FMA) Grant Programs | Mass.gov.

DISASTER ASSISTANCE

Disaster Assistance is money or direct assistance to individuals, families, and businesses whose property has been damaged or destroyed and whose losses are not covered by insurance. It is meant to help with critical expenses that cannot be covered in other ways. This assistance is not intended to restore damaged property to its condition before the disaster. While some housing assistance funds are available through FEMA's Individuals and Households Program, most disaster assistance from the Federal government is in the form of loans administered by the Small Business Administration.

Disaster Assistance Available from FEMA

Assistance from FEMA in the event of a disaster declaration is grouped into the following 3 categories:

A. Housing Needs

- **Temporary Housing** (a place to live for a limited period of time): Money is made available to rent a different place to live, or a government-provided housing unit when rental properties are not available.
- **Repair**: Money is available to homeowners to repair damage from the disaster to their primary residence that is not covered by insurance. The goal is to make the damaged home safe, sanitary, and functional.
- **Replacement**: Money is available to homeowners to replace their home destroyed in the disaster that is not covered by insurance. The goal is to help the homeowner with the cost of replacing their destroyed home.
- **Permanent Housing Construction**: Direct assistance or money is made available for the construction of a home. This type of help occurs only in insular areas or remote locations specified by FEMA, where no other type of housing assistance is possible.

B. Other than Housing Needs

- Money is available for necessary expenses and serious needs caused by a disaster, including:
    - Disaster-related medical and dental costs;
    - Disaster-related funeral and burial costs;
    - Clothing;
    - Household items (room furnishings, appliances);
    - Tools (specialized tools or protective clothing and equipment) required for people's jobs;
    - Necessary educational materials (computers, schoolbooks, supplies);
    - Fuels for primary heat source (heating oil, gas);
    - Clean-up items (wet/dry vacuums, dehumidifiers);
    - Expenses relating to disaster-damaged vehicles;
    - Moving and storage expenses related to the disaster (moving and storing property to avoid additional disaster damage while disaster-related repairs are being made to the home);
    - Other necessary expenses or serious needs as determined by FEMA; and
    - Other expenses that are authorized by law.

C. Additional Services

- Crisis Counseling
- Disaster Unemployment Assistance
- Legal Services
- Special Tax Considerations

For additional information, please refer to: Get Assistance After a Disaster | FEMA.gov.

DISASTER LOANS AVAILABLE FROM THE U.S. SMALL BUSINESS ADMINISTRATION

The U.S. Small Business Administration (SBA) can make federally subsidized loans to repair or replace homes, personal property, or businesses that sustained damages not covered by insurance. The Small Business Administration can provide the following three types of disaster loans to qualified homeowners and businesses:

- Physical damage loans: Loans to cover repairs and replacement of physical assets damaged in a declared disaster.
- Mitigation assistance: Funding to cover small business operating expenses after a declared disaster.
- Economic injury disaster loans: Loans which provide economic relief to small businesses and nonprofit organizations that have suffered damage to their home or personal property.
- Military reservist loans: Loans to help eligible small businesses with operating expenses to

make up for employees on active duty leave.

For many individuals, the SBA disaster loan program is the primary form of disaster assistance. Please find more information about this loan program here: Disaster assistance | U.S. Small Business Administration (sba.gov).

DISASTER ASSISTANCE FROM OTHER ORGANIZATIONS AND ENTITIES

Home | disasterassistance.gov is a secure, user-friendly U.S. Government web portal that consolidates disaster assistance information in one place. If individuals need assistance following a Presidentially declared disaster which has been designated for individual assistance, they can now go to DisasterAssistance.gov to register for receiving assistance online. Local resource information to help keep citizens safe during an emergency is also available. Currently, 17 U.S. Government agencies, which sponsor almost 70 forms of assistance, contribute to the portal.

DisasterAssistance.gov speeds up the application process by feeding common data to multiple online applications. Application information is shared only with those agencies individuals identify and is protected by the highest levels of security. DisasterAssistance.gov will continue to expand to include forms of assistance available at federal, state, tribal, regional, and local levels.

EMERGENCY MANAGEMENT PERFORMANCE GRANT (EMPG)

The Emergency Management Performance Grant (EMPG) provides resources for state, local, tribal, and territorial emergency response organizations required for the National Preparedness System. EMPG supports efforts in building and strengthening capabilities in areas related to protection, mitigation, prevention, response and recovery. In fiscal year 2024, this grant had a total available funding of $319.55 million. Please find more information about this grant program at the link here: Emergency Management Performance Grant | FEMA.gov.

HOMELAND SECURITY GRANT PROGRAM (HSGP)

The Homeland Security Grant Program (HSGP) provides a suite of grant opportunities in support of efforts in the mitigation of, prevention of, protection from, and recovery from terrorist and other threats at the state, local, tribal, and territorial levels. As of the 2024 fiscal year, the program, including its three separate grants, had $1.008 billion in funding. The three grants available under this program are:

- The State Homeland Security Program (SHSP);
- The Urban Area Security Initiative (UASI); and
- Operation Stonegarden (OPSG).

Please find more about this program at the link here: Homeland Security Grant Program | FEMA.gov.

ASSISTANCE TO FIREFIGHTERS GRANTS (AFG) AND FIRE PREVENTION & SAFETY GRANT PROGRAM (FP&S)

The FEMA Assistance to Firefighters Grants (AFG) program provides funds to equip and train emergency personnel to recognized standards, enhance operations efficiencies, foster interoperability, and support community resilience. Under AFG, funds may be available for equipment, vehicles, and/or training that can be used to mitigate and/or respond to wildfire-related hazards. AFG also has a Fire Prevention and Safety (FPS) component which funds public outreach programs and prevention activities, which can emphasize wildfire mitigation. More about

these programs can be found at these links: Assistance to Firefighters Grants Program | FEMA.gov, Fire Prevention and Safety (FP&S) | FEMA.gov.

FIRE MANAGEMENT ASSISTANCE GRANTS (F-MAG)

The Fire Management Assistance Grants (F-MAG) Program supports firefighting efforts in cases of fire-related disasters impacting public and private forests as well as grasslands at the state, local and tribal levels. For more information on this program, please refer to: Fire Management Assistance Grants | FEMA.gov.

NATIONAL DAM SAFETY PROGRAM (STATE ASSISTANCE GRANT PROGRAM) (NDSP)

The National Dam Safety Program (NDSP) provides financial assistance to strengthen the individual dam safety programs of states and territories. In the 2024 fiscal year, this program distributed $24.2 million among 49 states and Puerto Rico. For more information on this program, please refer to: Grant Assistance to States | FEMA.gov.

REHABILITATION OF HIGH HAZARD POTENTIAL DAM PROGRAM (STATE DAM SAFTEY DIVISIONS) (HHPD)

The Rehabilitation of High Hazard Potential Dams Program (HHPD) provides technical, planning, design, and construction assistance in the form of grants for the rehabilitation of high hazard potential dams in eligible states and territories. For more information, please refer to: Rehabilitation Of High Hazard Potential Dam (HHPD) Grant Program | FEMA.gov.

NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM'S STATE ASSISTANCE PROGRAM (NEHRP)

The National Earthquake Hazards Reduction Program's State Assistance Program (NEHRP) provides funding to localities for the reduction of risk associated with earthquakes. This is done through two grants:

- Individual State Earthquake Assistance (ISEA) and
- Multi-State National Earthquake Assistance (MSNEA).

More information about this program can be found at this link: National Earthquake Hazards Reduction Program's State Assistance Program | FEMA.gov.

EMERGENCY FOOD AND SHELTER PROGRAM (EFSP)

The Emergency Food and Shelter Program (EFSP) assists and expands upon the work of local nonprofit and governmental social service organizations to provide shelter, food, and other services to people experiencing or at risk of hunger and/or homelessness. For more information, please refer to: Emergency Food and Shelter Program | FEMA.gov.

PUBLIC HEALTH CRISIS RESPONSE COOPERATIVE AGREEMENT (PHCRCA)

The Center for Disease Control and Prevention's Public Health Crisis Response Cooperative Agreement (PHCRCA) allows for opportunities for state, local, and tribal government to receive funding in response to public health emergencies. For more information, please refer to: The Centers for Disease Control and Prevention's Public Health Crisis Response Cooperative Agreement Program Awards (hhs.gov).

ARMY CORP OF ENGINEER PLANNING ASSISTANCE

Under the authority provided by Section 22 of the Water Resources Development Act of 1974 (PL 93-251), as amended, the U.S. Army Corps of Engineers can provide states, local governments, other non-federal entities, as well as eligible Native American Indian tribes, assistance in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources. Typical studies funded under this program are only at the planning level of detail; they do not include detailed engineering designs intended for project construction. The program can encompass many types of planning studies which address water resources issues. Types of studies conducted in recent years under the program include the following: water supply/demand, water conservation, water quality, environmental/conservation, wetlands evaluation/restoration, dam safety/failure, flood damage reduction, coastal zone protection, and harbor planning. For more information, please refer to: Planning Assistance to States, U.S. Army Corps of Engineers, New England District.

FOREST SERVICE COMMUNITY WILDFIRE DEFENSE GRANT (USDA-FSCWDG)

The Forest Service Community Wildfire Defense Grant Program (USDA-FSCWG) provides funding and assistance to at-risk local communities and tribes to reduce wildfire risk. Funding and assistance under this program are primarily used to revise and develop community wildfire protection plans and to assist in implementing new projects described in said plans. For more information on this program, please refer to: Community Wildfire Defense Grant Program | US Forest Service (usda.gov).

EMERGENCY WATERSHED PROTECTION PROGRAM (EWP)

The Emergency Watershed Protection Program (EWP) provides technical and financial assistance to localities in response to imminent life- and property-threatening natural disasters which negatively impact local watersheds. For more information about this program, please refer to: Emergency Watershed Protection | Natural Resources Conservation Service (usda.gov).

AGRICULTURAL MANAGEMENT ASSISTANCE (DROUGHT MITIGATION FUNDING PROGRAM) (AMA)

Agricultural Management Assistance (AMA) is a program to help farmers build on and diversify their agricultural practices. The program is available in 16 states that have had historically low rates of participation in the Federal Crop Insurance Program. AMA covers up to 75% of funds needed to install conservation practices on farms, with a cap of $50,000 per individual participant in a given fiscal year. For more information, please refer to: Agricultural Management Assistance | Natural Resources Conservation Service (usda.gov).

USDA COMMUNITY FACILITIES DIRECT LOAN & GRANT PROGRAM

The UDSA Community Facilities Direct Loan & Grant program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area, and does not include private, commercial or business undertakings. Rural areas including cities, villages, and townships and towns, including Federally Recognized Tribal Lands, with no more than 20,000 residents according to the latest U.S. Census Data are eligible for this program. Program funds can be used to purchase, construct, and / or

improve essential community facilities, purchase equipment, and pay related project expenses. For more information on this program, please refer to: Community Facilities Direct Loan & Grant Program | Rural Development (usda.gov).

NATIONAL CULVERT REMOVAL, REPLACEMENT, & RESTORATION GRANT (NCRRRG)

The National Culvert Removal, Replacement, and Restoration Grant Program (NCRRRG) (Culvert Aquatic Organism Passage (AOP) Program) assists eligible tribes, states and local governments in issues related to culverts and weirs to improve and/or restore passage for anadromous fish in freshwater waterways. Anadromous fish are those that spawn in freshwater but live most of their lives in saltwater. More information about this program can be found at this link: Aquatic Organism Passage - Culvert Hydraulics - Hydraulics - Bridges & Structures - Federal Highway Administration (dot.gov).

BRIDGE INVESTMENT PROGRAM (BIP)

The Bridge Investment Program (BIP) provides the opportunity for governments at all levels to receive funding to repair and restore aging bridge infrastructure. BIP grant applications have a maximum grant award of 80% of the total eligible bridge project costs. For more information regarding this program, please refer to: BIP - Funding Programs - Management and Preservation - Bridges & Structures - Federal Highway Administration (dot.gov).

PROMOTING RESILIENT OPERATIONS FOR TRANSFORMATIVE, EFFICIENT, AND COST-SAVING TRANSPORTATION PROGRAM (PROTECT)

The Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (Protect) Program is a program established by the Bipartisan Infrastructure Law (BIL) which funds resilience-building activities for surface transportation, such as plans (including evacuation plans) and infrastructure improvements, which increase reliance to natural hazards and climate change. For more information regarding this program, please refer to: Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT) | US Department of Transportation and Bipartisan Infrastructure Law - Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program Fact Sheet | Federal Highway Administration (dot.gov).

8.4.2 State Funding Sources

The following is a summary of state funding opportunities for hazard mitigation projects and activities in Massachusetts:

Table 42: State Hazard Mitigation Funding Sources

Program	Type of Assistance	Availability	Managing Agency	Funding Source
604b Water Quality Management Planning Grant Program	Grants focused on nonpoint source pollution assessment and watershed planning	Annual	Mass DEP	State funding (match not required but recommended)
Section 319 Nonpoint Source Competitive Grants Program	Competitive grant program funding projects that address the prevention, control, and abatement of nonpoint source (NPS) pollution	Annual	Mass DEP	State funding
Water Quality Monitoring Grant Program	Reimbursement funding for monitoring and/or data collection efforts that support water quality assessments	Annual	Mass DEP	State funding
Statewide Water Management Act Grant	Reimbursement grant funding for projects to help public water suppliers plan and manage water use	Annual	Mass DEP	Reimbursement grant
Massachusetts Gap Energy Grant Program (Gap III)	Program providing grant assistance (up to $200,000 per community) for implementing energy efficiency and clean energy generation projects at water and wastewater plants	Annual (likely)	Mass DEP	State funding
State Revolving Fund	Low-interest loans	Annual	Mass DEP	Municipal funding with state loan

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Municipal Vulnerability Preparedness (MVP) Action Grants	Competitive climate adaptation grants	Annual	EEA	75% EEA / 25% non-state match
Planning Assistance Grants (EEA PAG)	Competitive grants that support efforts to plan, regulate (zone), and act to conserve and develop land consistent with the Massachusetts Sustainable Development Principles	Annual	EEA	75% EEA / 25% non-state match
Dam and Seawall Repair or Removal Program	Competitive grants for dam and seawall repair and removal, as well as construction loans	Annual	EEA	State funding
Massachusetts Land & Water Conservation Fund Grant Program (LWCF)	Federal grant program to help improve access to and protection for public lands and waters	Annual	DCS	Federal program that funds up to 50% of total costs for acquisition, development, and renovation
Local Acquisitions for Natural Diversity (LAND)	Financial assistance to municipalities for the acquisition of conservation land	Annual	DCS	Reimbursement grant, the reimbursement rate varies per town
Drinking Water Supply Protection Grant (DWSP)	Competitive grants for protection of drinking water supplies	Annual	DCS	State funding
Land and Recreation Grants and Loans	Varies, though primarily grant funding for conservation and recreation projects	Varies, generally annually	DCS	Varies

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Land Conservation Assistance Grant Program	Financial assistance for permanently protecting land	Annual (Likely)	DCS	90% state reimbursement / 10% other
Forest Legacy Grant Program (USDA-FS) (FLGP)	Grant funding to protect environmentally important forestland from conversion	Annual	DCR	75% USDA FS / 25% non-federal
Culvert Replacement Municipal Assistance Grant Program	Competitive grants for replacing an undersized, perched, and/or degraded culvert located in an area of high ecological value	Annual	DER	State funding
Division of Ecological Restoration Priority Project Program	State competitive grant program that funds projects that restore and protect the state's rivers, wetlands, and watersheds (priority projects may differ each year)	Annual	DER	State funding
Mass Wildlife Habitat Management Grant Program (MWHMGP)	Reimbursement grant funding to assist municipalities in enhancing wildlife habitat and increasing recreational opportunities on protected lands	Annual	DFW	USDA NRCS
Agricultural Climate Resiliency and Efficiencies Program (ACRE)	Competitive reimbursement grant funding that supports practices that mitigate the agricultural sector's vulnerability to climate change	Annually through Climate Smart Agriculture Program (CSAP)	MDAR	MDAR

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Agricultural Preservation Restriction Program (APR)	Financial assistance in exchange for permanent deed restriction to protect lands' agricultural viability	Any time for owners of at least 5 acres of farmland	MDAR	MDAR
Hazard Mitigation Grant Program (State) (HMGP)	Sub-grant programs for the Hazard Mitigation Grant Program	Annual	MEMA	State funding
Community Development Block Grants (CDBG)	Competitive community development grants	Annual	EOHLC	US Department of Housing and Urban Development
Emergency Solutions Grant (ESG)	Competitive grant funding designed to support services that assist those experiencing / at risk of experiencing homelessness	Annual	EOHLC	MA EOHLC
Mass Works	Competitive infrastructure grants	Annual	EOED	State funding
Community Preservation Act (CPA)	Establishes a local community preservation fund through tax surcharge to support a variety of project related to conservation and housing	Ongoing	Department of Revenue (DOR)	Statewide Community Preservation Trust Fund / Local Community Preservation Fund
Special appropriations and legislative earmarks	Varies	Infrequent, after natural disasters or legislature vote	Massachusetts General Legislature	State funding
District Local Technical Assistance (DLTA)	Funding to support planning and technical assistance for housing, economic growth, and regional projects	Varies, generally annually	Massachusetts General Legislature, CMRPC	State funding

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Local Planning Assistance (LPA)	Planning and technical assistance	Annual	CMRPC	Planning assistance hours
Support and Incentive Grant	Reimbursement grant funding designed to assist in providing enhanced 911 service	Annual	MA EOPSS	MA EOPSS
Municipal Small Bridge Program	Competitive grants for small bridge replacement, preservation, and rehabilitation projects	Annual	MassDOT	State funding
Chapter 90 Program (Transportation Capital Improvement Projects) (Chpt. 90)	Reimbursable grants to support capital improvements on local public ways	Ongoing	MassDOT	State funding
State Transportation Improvement Program (STIP)	Competitive funding opportunity for transportation projects along federal-aid roadways	Annually updated five-year programming document	MassDOT	MassDOT
Complete Streets (CS)	Reimbursement grant funding to provide safe and accessible options for all travel modes	Annually available to municipalities that adopt a Complete Streets Policy	MassDOT	State funding

The Community Grant Funder web page includes the municipal grant programs listed above, as well as other funding opportunities: Community Grant Finder | Mass.gov. The programs listed in the above table are described in more detail below.

604B WATER QUALITY MANAGEMENT PLANNING GRANT PROGRAM

The 604B Water Quality Management Planning Grant Program provides funding opportunities to regional planning agencies, councils of governments, conservation districts, counties, cities and towns, federally and state recognized tribes, and other substate public planning agencies and interstate agencies to determine and correct water quality issues in Massachusetts. For more information on this program, please refer to: Grants & Financial Assistance: Watersheds & Water Quality | Mass.gov.

SECTION 319 NONPOINT SOURCE COMPETITIVE GRANTS PROGRAM

Section 319 of the Clean Water Act provides funding opportunities for the prevention, control, and

abatement of nonpoint source (NPS) pollution. These grants are available to eligible Massachusetts public or private organizations, including: state and federally recognized tribes, regional planning agencies, councils of governments, counties, conservation districts, cities and towns, other substate public planning agencies, and interstate agencies. To be eligible for this program, these entities' projects must: include measures that address the prevention, control, and abatement of NPS pollution, target major sources of NPS pollution within a watershed, contain an appropriate method for evaluating the project results, and address activities in the current Massachusetts NPS Management Program Plan. For more information on this program, please refer to: Grants & Financial Assistance: Watersheds & Water Quality | Mass.gov.

WATER QUALITY MONITORING GRANT PROGRAM

The Water Quality Monitoring Grant Program provides funding opportunities to eligible entities and organizations to increase the amount of data on water quality in Massachusetts. For more information, please refer to: Grants & Financial Assistance: Watersheds & Water Quality | Mass.gov.

STATEWIDE WATER MANAGEMENT ACT GRANT

The Statewide Water Management Act Grant provides grant funding for projects which improve the ecological conditions of specific watersheds and projects aimed at reducing water demand. Specifically, projects funded under this program must: improve or increase instream flow, keep wastewater local, relate to stormwater management, reduce impervious cover and/or improve water quality, relate to water supply operational improvements, improve habitat, reduce wastewater inflow and infiltration, and/or be another type of project which can be demonstrated to mitigate the impacts of water withdrawals. This program awards approximately 10 grants a year and has a reimbursement rate of 80%. Grants are awarded to eligible public water suppliers and municipalities with Water Management Act permits. For more information, please refer to: Water Management Act Grant Programs for Public Water Suppliers | Mass.gov.

MASSACHUSETTS GAP ENERGY GRANT PROGRAM (GAP III)

Through a partnership between the Massachusetts Department of Energy Resources (DOER) and the Massachusetts Clean Energy Center (MassCEC), the Massachusetts Gap Energy Grant Program (Gap III) provides funding to fill the last financial "gap" needed for clean energy projects spearheaded by a variety of organizations to promote clean and efficient energy projects. In 2022, the GAP III program awarded a total of $8.1 million in grants. For more information about this program, please refer to: Massachusetts' Gap Energy Grant Program | Mass.gov.

PLANNING ASSISTANCE GRANTS (EEA PAG)

Executive Office of Energy and Environmental Affairs Planning Assistance Grant (EEA PAG) program grants are available to municipalities and regional planning agencies acting on their behalf to financially support efforts to conserve and develop land consistent with the Massachusetts Sustainable Development Principles. Top priorities of the program include: zoning for sustainable housing production, mitigation of climate change through zoning and other regulatory actions, and zoning that results in permanent land conservation. For more information about these grants, please refer to: Planning Assistance Grants | Mass.gov.

STATE REVOLVING FUND

This statewide loan program through the Massachusetts Department of Environmental Protection assists communities in funding local drinking water, wastewater, and stormwater infrastructure

improvements.

MUNICIPAL VULNERABILITY PREPAREDNESS ACTION GRANT PROGRAM

The Municipal Vulnerability Preparedness (MVP) Action Grant program offers financial resources to municipalities that are seeking to advance priority climate adaptation actions to address impacts resulting from extreme weather, sea level rise, inland and coastal flooding, severe heat, and other climate change-related events. Towns are eligible for this competitive grant program after successfully completing an MVP planning grant. A variety of project types are eligible for funding under this program, but projects must address local vulnerabilities to climate change and incorporate MVP Core Principles. Grant application information can be found here: MVP Action Grant | Mass.gov. The MVP Core Principles can be found here: https://www.mass.gov/doc/mvp-core-principles/download.

DAM AND SEAWALL REPAIR OR REMOVAL PROGRAM

The EEA funds projects for the repair and removal of dams, levees, seawalls, and other forms of inland and coastal flood control under the Dam and Seawall Repair or Removal Program. For additional information, please refer to Dam and Seawall Repair or Removal Program Grants and Funds | Mass.gov.

LAND & WATER CONSERVATION FUND GRANT PROGRAM (LWCF)

The Land & Water Conservation Fund Grant Program (LCWF) provides up to 50% of total project funding to eligible municipalities, tribes, and state agencies for park, trail and conservation area related projects. For more information, please refer to: Massachusetts Land and Water Conservation Fund Grant Program | Mass.gov.

LOCAL ACQUISITIONS FOR NATURAL DIVERSITY (LAND)

The Local Acquisitions for Natural Diversity (LAND) grant program assists cities and towns in acquiring new lands for conservation and passive recreation purposes. Grants are awarded at a maximum of $500,000 with reimbursement rates ranging from 52% to 70%. For more information, please refer to: Local Acquisitions for Natural Diversity (LAND) Grant Program | Mass.gov.

DRINKING WATER SUPPLY PROTECTION GRANT (DWSP)

The Drinking Water Supply Grant (DWSP) program provides financial assistance to public water systems and municipal water departments for the purchase of land or interests in land for the following purposes: 1) protection of existing DEP-approved public drinking water supplies; 2) protection of planned future public drinking water supplies; or 3) groundwater recharge. This is a reimbursement program. For more information, please refer to Drinking Water Supply Protection Grant Program | Mass.gov.

LAND AND RECREATION GRANTS AND LOANS

The Massachusetts Division of Conservation Services (DCS) manages several grant and loan programs that enable land preservation, natural resources conservation, and public recreation. Municipalities with an active Open Space and Recreation Plan are generally eligible to apply for these programs. Preserving natural open space can buffer natural systems from development impacts, protect open spaces from future development, and maintain ecosystem services like natural flood mitigation. The full list of DCS grant programs can be found here: Land and Recreation Grants & Loans | Mass.gov.

LAND CONSERVATION ASSISTANCE GRANT PROGRAM

The Land Conservation Assistance Grant Program from the Massachusetts Division of Conservation Services (DCS) provides reimbursement funding to municipalities, qualified 501(c)(3) land trusts, tribal governments, and other public entities for the permanent protection of land as well as to Regional Planning Agencies (RPAs) and qualified 501(c)(3) land trusts which assist these entities in this goal. Eligible activities under this program include preparing grant applications for permanently protecting land, completing other tasks which progress transactions which permanently protect land, developing or updating municipal Open Space and Recreation Plans, and planning for developing and/or renovating a park to help with a grant application to DCS. For more information on this program, please refer to: Apply to the Land Conservation Assistance Grant Program | Mass.gov.

FOREST LEGACY GRANT PROGRAM (USDA-FS) (FLGP)

The Forest Legacy Grant Program (FLGP) is a voluntary grant funding opportunity for private landowners to either sell their land outright or to sell a conservation restriction on their land. A conservation restriction is a legally binding agreement which limits the types of land use on a property, in this case restricting land to forestry, recreation, or another conservation-related use. For more information about this program, please refer to: Forest Legacy Program | Mass.gov.

CULVERT REPLACEMENT MUNICIPAL ASSISTANCE GRANT PROGRAM

The Culvert Replacement Municipal Assistance Grant program provides a funding opportunity for local governments to replace undersized, perched, and/or degraded culverts in areas of high ecological value. For more information on this program, please refer to: Culvert Replacement Municipal Assistance Grant Program | Mass.gov.

DER PRIORITY PROJECTS

The Priority Project Program is an opportunity under the Division of Ecological Restoration (DER) for organizations to receive technical assistance, consulting, and/or direct grant funding for wetland and river restoration projects through a state-wide, competitive process. DER chooses high-priority projects that bring significant ecological and community benefits to the Commonwealth. DER's most recent call for applications solicited projects that focus on cranberry bog wetland restoration, dam removal and river restoration, coastal wetland restoration projects, or a combination of these topics. More information on the Priority Projects program can be found here: Become a DER Priority Project | Mass.gov. This program can be used to remove significant or high hazard dams that communities no longer want to maintain; the removal of these dams may improve the health and resilience of aquatic systems.

MASS WILDLIFE HABITAT MANAGEMENT GRANT PROGRAM (MWHMGP)

The Mass Wildlife Habitat Management Grant Program (MWHMGP) is a program dedicated to the protection and restoration of wildlife habitat. MWHMGP awards grants ranging from $10,000 to $75,000 to private landowners for habitat restoration projects. The program places emphasis on the protection of endangered species, the expansion of outdoor recreation opportunities, and the enhancement of ecological communities disproportionally susceptible to climate change. For more information about this program, please refer to: MassWildlife Habitat Management Grant Program | Mass.gov.

AGRICULTURAL CLIMATE RESILIENCY AND EFFICIENCIES PROGRAM (ACRE)

The Agricultural Climate Resiliency and Efficiencies Program (ACRE) is a competitive grant program available to eligible farmers that funds materials and labor to improve climate and economic resilience and forwards the goals of the Massachusetts Local Food Action Plan. For more about this program, please refer to: Agricultural Climate Resiliency & Efficiencies (ACRE) Program | Mass.gov.

AGRICULTURAL PRESERVATION RESTRICTION PROGRAM (APR)

The Agricultural Preservation Restriction (APR) program is a voluntary program that allows farmers to be paid the difference between the "fair market value" and the "agricultural value" of their farms in exchange for a permanent deed restriction by the state. This restriction is meant to prevent any use of the property that will negatively impact the land's future agricultural viability. To qualify for this program, a farm must be at least 5 acres in size, must have been actively devoted to agriculture for at least the past 2 tax years, and must produce at least $500 in gross sales per year for the first five acres plus $5 for each additional acre or 50 cents per each additional acre of woodland and/or wetland; there are various other considered criteria which farms must meet to qualify for this program. For more information on this program, please refer to: Agricultural Preservation Restriction (APR) Program Details | Mass.gov.

HAZARD MITIGATION GRANT PROGRAM (STATE) (HMGP)

The Hazard Mitigation Grant Program (HMGP) provides funds to areas after a natural disaster with the purpose of lowering the risk of damage and loss of life from future natural disasters. This grant program seeks to reduce the reliance on taxpayer-funded federal assistance for disaster recovery. For more information about this program, please refer to: Hazard Mitigation Grant Program (HMGP) | Mass.gov.

COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG)

The Community Development Block Grant (CDBG) program remains the principal source of revenue for many communities to use in identifying solutions to address physical, economic, and social deterioration in lower-income neighborhoods and communities. CDBG is primarily a housing and community development program administered through the Executive Office of Housing and Livable Communities (EOHLC). The program can fund certain critical infrastructure projects, and necessary housing improvements that benefit populations who may be more vulnerable to certain natural hazards. The program can also fund the rehabilitation of municipal buildings serving low- and moderate-income populations, which in many cases also serve as Emergency Operations Centers for their communities. For more information, please refer to: Community Development Block Grant (CDBG) | Mass.gov.

EMERGENCY SOLUTIONS GRANT (EFG)

The Emergency Solutions Grant (EFG) program funds necessary services to help house/rehouse those who are homeless or at risk of homelessness and to provide shelter for those in need of emergency shelter. For more information on this program, please refer to: Emergency Solutions Grant Program (ESG) | Mass.gov.

MASSWORKS INFRASTRUCTURE PROGRAM

The MassWorks Infrastructure Program provides a one-stop shop for municipalities and other eligible public entities seeking public infrastructure funding to support economic development and job creation. Although this program is not specific to natural hazards per se, infrastructure

enhancements under MassWorks can address identified hazard mitigation needs. The MassWorks Infrastructure Program is administered by the Executive Office of Housing and Economic Development, in cooperation with the Department of Transportation and Executive Office for Administration & Finance. For additional information on this program, please refer to MassWorks Infrastructure Program | Mass.gov.

COMMUNITY PRESERVATION ACT (CPA)

The Community Preservation Act (CPA) is a smart growth tool that helps communities preserve open space and historic sites, create affordable housing, and develop outdoor recreational facilities. CPA also helps strengthen the state and local economies by expanding housing opportunities and construction jobs for the commonwealth's workforce and by supporting the tourism industry through preservation of the commonwealth's historic and natural resources. All communities in Massachusetts pay into statewide Community Preservation Trust fund through a real estate excise tax. However, communities must set up a local Community Preservation Fund and governing committee to utilize the trust fund. CPA projects can build local resilience by protecting open spaces and/or creating affordable housing; these types of projects can benefit residents who may be the most vulnerable to natural hazards. More information on the CPA program can be found here: CPA: An Overview | Community Preservation Coalition.

SPECIAL APPROPRIATIONS AND LEGISLATIVE EARMARKS

Although there is no separate state disaster relief fund in Massachusetts, the state legislature may enact special appropriations for those communities sustaining damages following a natural disaster that are not large enough for a Presidential disaster declaration. Since 2011, Massachusetts has issued 12 state of emergency declarations. Additionally, individual legislators may seek specific project funding for projects through the legislative budgeting and appropriations process.

DISTRICT LOCAL TECHNICAL ASSISTANCE

District Local Technical Assistance (DLTA) is funding allocated by the Massachusetts General Assembly (Legislature) to the Central Massachusetts Regional Planning Commission (CMRPC) to provide technical assistance to member communities on eligible projects. DLTA planning dollars help cities and towns take on necessary projects that they don't have the staff capacity to address on their own and partner with neighboring communities to tackle shared projects with reduced administrative burden.

According to the most recent guidelines of the Commonwealth's DLTA program, a proposed project must fall into one of the following four (4) general priority categories to be considered eligible for technical assistance:

1. Planning Ahead for Housing;
2. Planning Ahead for Growth;
3. Technical Assistance to support Community Compact Cabinet Activities including Regionalization; and
4. Supporting the Housing Choice Initiative

The goal of the DLTA Fund is to direct funds to projects and activities that result in change in the municipality/municipalities receiving DLTA Fund services, whether in law, regulation, program management, or practice, that serve to further the objectives listed above. Community Compact Cabinet (CCC) best practices should include both those that the Commonwealth of Massachusetts is seeking to fund as part of the CCC program as a first priority and best practices that explicitly

align with CCC best practices but are not best practices identified in a signed CCC agreement. COVID-19 relief / recovery activities that fall under the above priority categories are eligible. For more information, please refer to 2024 District Local Technical Assistance (DLTA) Call for Concepts - CMRPC.

LOCAL PLANNING ASSISTANCE

The Local Planning Assistance (LPA) program was initiated to improve the direct services of CMRPC to its member communities. Under the LPA program, each CMRPC community annually receives a set number of hours of technical assistance to be used in any reasonable planning project authorized by the community's CMRPC commissioner.

SUPPORT AND INCENTIVE GRANT

The Support and Incentive Grant provides opportunity funding to public safety answering points (PSAPs) and regional emergency communication centers (RECCs) in providing enhanced 9-1-1 service. Entities eligible for the Support Grant include: primary or regional public safety answering points, regional secondary public safety answering points, and regional emergency communication centers. To be eligible for the Incentive Grant, a regional public safety answering point or regional emergency communication center must be expanding. For more on this program, please refer to: Apply for the Support & Incentive Grant | Mass.gov.

MUNICIPAL SMALL BRIDGE PROGRAM

The Municipal Small Bridge Program offers funding opportunities to Massachusetts municipalities for small bridge replacement, preservation, and rehabilitation projects. For more information about this program, please refer to: Municipal Small Bridge Program | Mass.gov.

CHAPTER 90 FUNDS

The statewide Chapter 90 program reimburses communities for roadway improvement projects, such as projects relating to resurfacing and related work, preliminary engineering (including State Aid/Consultant Design Agreements), right-of-way acquisition, shoulders, side road approaches, landscaping and tree planting, roadside drainage, structures (including bridges), sidewalks, traffic control and service facilities, and street lighting (excluding operating costs), as well as for such other purposes specifically authorized. Maintaining and upgrading critical infrastructure and evacuation routes is an important component of hazard mitigation. For more information, please refer to Chapter 90 Program | Mass.gov.

STATE TRANSPORTATION IMPROVEMENT PROGRAM (STIP)

The State Transportation Improvement Program (STIP) is an annual list of transportation infrastructure projects funded and planned through the combined effort of MassDOT and other state agencies. For more information on this program, please refer to: State Transportation Improvement Program (STIP) | Mass.gov.

COMPLETE STREETS (CS)

The Complete Streets (CS) Funding Program provides grants to municipalities in Massachusetts for projects that improve safety and accessibility for all modes of transportation. To qualify for the program, municipalities must pass a Complete Streets Policy and develop a Prioritization Plan. After these requirements have been met, municipalities can apply for up to $500,000 in construction funding. For more information about this program, please refer to: Complete Streets Public Overview (site.com).

APPENDIX A

Maps

Hazard Mitigation Plan
Map 1
Critical Infrastructure and Facilities
Town of Northborough, Massachusetts
September 2024

Inset Map: Downtown Northborough

Legend

- Assisted Living
- Clinics
- Elderly Housing
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Courts
- Airports
- Town Halls
- Local Police
- Fire Station
- Schools (Pre-K through High School)
- Aqueducts
- Active Rail Line

MA Environmental Justice Populations 2020
- Minority
- Minority and Income

- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Dams (2/2012)
- High Hazard
- Significant Hazard
- Low Hazard
- N/A

Locally Defined
- Critical Infrastructure
- Critical Infrastructure
- Critical Infrastructure

N W E S

0.45 0.225 0 0.45 0.9 Miles

Data provided by participating municipalities, CMRPC, massDOT, MassGIS, FEMA and NOAA.
Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution intrepreting positional accuracy.

Produced by the Central Massachusetts Regional Planning Commission.
One Mercantile St. Suite 520, Worcester, MA 01608

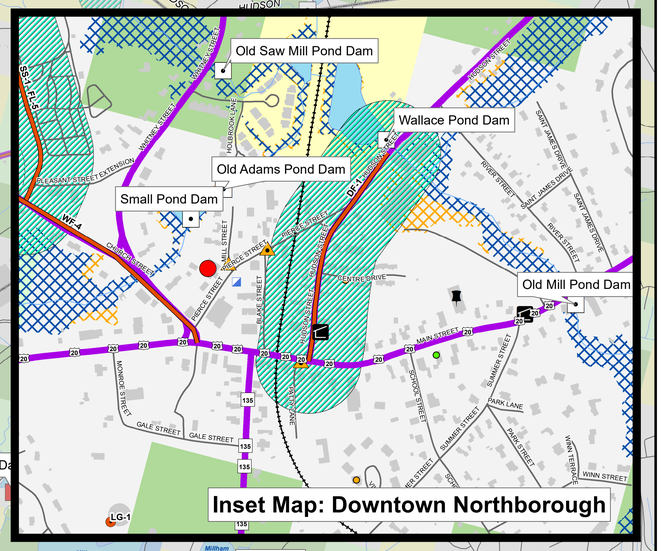
CMRPC Central Massachusetts Regional Planning Commission

Date: 9/16/2024 Document Path: H:\Projects\HLS_GIS\subprojects\hmp\HMP_01_Local_Cls_Map_36x44.mxd

Hazard Mitigation Plan

Map 2
Hazards
Town of Northborough, Massachusetts

September 2024



Legend

- Assisted Living
- Clinics
- Elderly Housing
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Courts
- Water Treatment Plant
- Waste Water Treatment Plant
- Airports
- Town Halls
- Local Police
- Fire Station
- Schools (Pre-K through High School)
- Aqueducts
- Active Rail Line

- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Hazards

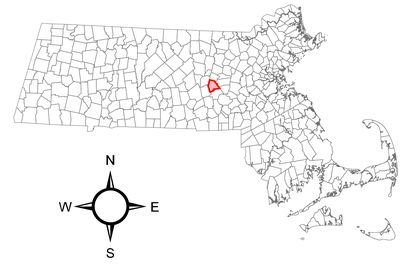
Dams (2/2012)
- High Hazard
- N/A

FEMA DFIRM Flood Zones
- 1% Annual Chance Flood Hazard or Regulatory Floodway Area
- 0.2% Annual Chance Flood Hazard Area
- Repetitive Loss Property Areas
- NOAA Historic Hurricane Tracks (1842-2022)

USDA Wildfire Hazard Potential, Version 2023
- 1: Very Low
- 2: Low
- 3: Moderate
- 4: High
- 5: Very High
- 6: Non-burnable
- 7: Water

Locally Defined Hazards

- Hazard
- Hazard
- Possible Flood Area
- Hazard



0.45 0.225 0 0.45 0.9 Miles

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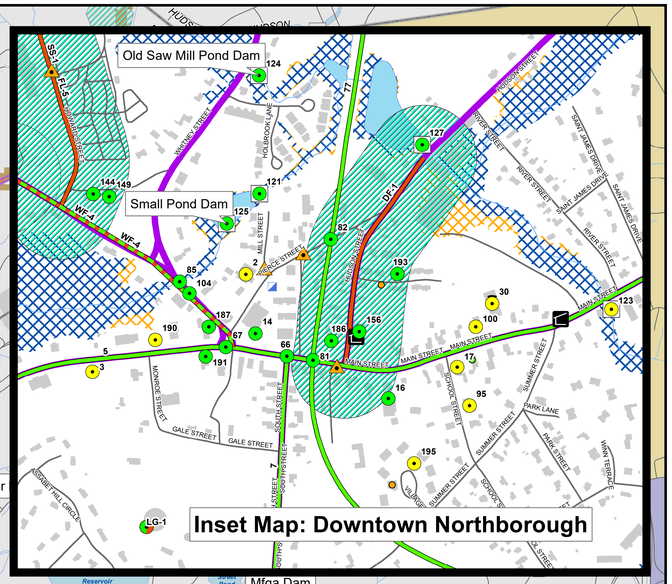
Hazard Mitigation Plan
Map 3
Vulnerable Critical Infrastructure and Facilities
Town of Northborough, Massachusetts
September 2024



Legend

- Assisted Living
- Clinics
- Elderly Housing
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Courts
- Airports
- Town Halls
- Local Police
- Fire Station
- Schools (Pre-K through High School)
- Aqueducts
- Active Rail Line

MA Environmental Justice Populations 2020
- Minority
- Minority and Income

- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Hazards

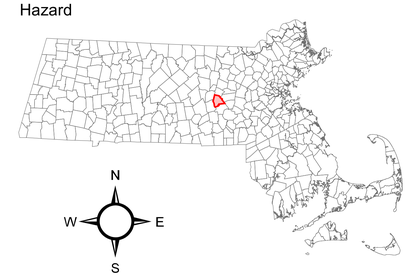
Dams (2/2012)
- High Hazard
- Significant Hazard
- Low Hazard
- N/A

FEMA DFIRM Flood Zones
- 1% Annual Chance Flood Hazard or Regulatory Floodway Area
- 0.2% Annual Chance Flood Hazard Area

- High Slope (15% and above)
- Repetitive Loss Property Areas
- NOAA Tornado Tracks (as of 9/2021)
- IBTrACS Historical Hurricane Tracks (1842-2020)

Locally Defined

- Hazard
- Vulnerable Critical Infrastructure
- Vulnerable Critical Infrastructure/ Hazard
- Non-vulnerable Critical Infrastructure
- Non-vulnerable Critical Infrastructure/ Hazard
- Hazard
- Vulnerable Critical Infrastructure
- Vulnerable Critical Infrastructure/ Hazard
- Non-vulnerable Critical Infrastructure
- Possible Flood Area
- Hazard
- Vulnerable Critical Infrastructure
- Non-vulnerable Critical Infrastructure



0.45 0.225 0 0.45 0.9 Miles

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Key to Locally Identified Critical Infrastructure and Hazards

Name	Type	Map ID	Vuln. – Town	Vuln. – GIS
Police Department	CI	1	Y	
Fire Department	CI	2		
New Municipal Fire Station	CI	3		
Evacuation Route – Belmont Street	CI	4		Y
Evacuation Route – Main Street at Marlborough border to Southwest Cutoff	CI	5		Y
Evacuation Route – 520 Main Street to Shrewsbury border	CI	6		Y
Evacuation Route – 12 South Street to Westborough border	CI	7		Y
Evacuation Route – I-290 Interchange	CI	8		Y
Evacuation Route – I-290 Interchange (2)	CI	9		Y
Evacuation Route – Route 9 Interchange	CI	10	Y	Y
Evacuation Route – Crawford Street Bridge	CI	11		Y
Urgent Care – Pedi–Q	CI	12		Y
Urgent Care – Carewell	CI	13		Y
Urgent Care – CVS	CI	14		
Town Facilities – Northborough Senior Center - wastewater pump station present	CI	15		Y
Town Facilities – Northborough Free Library	CI	16		Y
Town Facilities – Northborough Historical Society	CI	17		
Communications – Police Department and Fire Department Receiver, Fire Department repeater	CI	18		
Communications – Voter - Radio, Ball Street	CI	19		Y
Communications – Voter, 300 West Main Street	CI	20		
Communications – Cell Site, 211 Main Street, at Police Station	CI	21		
Communications – Roof Top Communications Tower, on extra storage	CI	22		
Communications – Cell Tower - 386 West Main Street, Fox Meadow Crossing	CI	23		
Communications – Cell Tower, Bearfoot Road	CI	24		Y
Communications – Cable Access TV	CI	25		
Communications – Verizon	CI	26		
Communications – Cell Tower, Southwest Cutoff (Crown Castle)	CI	27		Y
Communications – Boylston Emergency Management Cell Tower	CI	28		Y
Communications – Tower - 119 Colburn Street	CI	29		Y
Town Hall (wastewater pumping station and generator on site)	CI	30		
Department of Public Works – Northborough DPW Water Barn	CI	31		
Department of Public Works – Northborough DPW Barn	CI	32		
Department of Public Works – Highway Garage	CI	33		
Department of Public Works – Massachusetts Highway Depot #039	CI	34		
Water Supply – Edmunds Hill 1MG Water Storage Tank	CI	35		Y
Water Supply – Massachusetts Water Resources Authority (MWRA) Connection	CI	36		
Water Supply – Hudson Street Public Water Supply, Former MWRA Connection	CI	37		
Water Supply– Well - Public Brigham Street / Water/Sewer Department Building	CI	38		

Water Supply – Well - Public Crawford Street	CI	39		
Water Supply – Well - Public Howard Street	CI	40		Y
Water Supply – Well - Public Lyman Street	CI	41		
Water Supply – Cistern - Moore Lane	CI	42		
Water Supply – Cistern - Old Colonial Road	CI	43		
Water Supply – Draft Site - Colburn Street	CI	44		
Water Supply – Draft Site - Green Street	CI	45		Y
Water Supply – Draft Site - Hillside Road	CI	46		
Water Supply – Draft Site - Howard Street	CI	47		Y
Water Supply – Draft Site - Howard Street (2)	CI	48		
Water Supply – Draft Site - Howe Lane	CI	49		
Water Supply – Draft Site - Maynard Street	CI	50		Y
Water Supply – Draft Site - Newton Street	CI	51		
Water Supply – Draft Site - Tomblin Hill Road	CI	52		Y
Water Supply – Draft Site - West Street (1)	CI	53		
Water Supply – Draft Site - Smith Road	CI	54		Y
Water Supply – Draft Site - Fisher Street	CI	55		Y
Water Supply – Draft Site - Ball Street	CI	56		Y
Water Supply – Draft Site - Bearfoot Road	CI	57		
Water Supply – Draft Site - West Street (2)	CI	58		Y
Water Supply – Draft Site - West Street (3)	CI	59		
Water Supply – Aqueduct - Wachusett - Hultman	CI	60		Y
Water Supply – Aqueduct - Wachusett - Cosgrove	CI	61		
Important Intersections – Church Street and I–290	CI	62		Y
Important Roads – Hudson Street and Marlborough Boundary	CI	63		Y
Important Intersections – Hudson Street and Solomon Pond Road	CI	64		
Important Road – Route 20 and Marlborough Boundary	CI	65	Y	Y
Important Intersection – Route 135 and West Main Street	CI	66		Y
Important Intersection – Route 20 / West Main Street and Church Street	CI	67	Y	Y
Important Intersection – Route 9 and Route 20	CI	68	Y	Y
Important Road – Route 135 and Westborough Boundary	CI	69		Y
Important Intersection – Solomon Pond Road and I-290	CI	70		
Important Intersection – West Main Street and US Route 20	CI	71		Y
Important Road – West Main Street and Shrewsbury Boundary	CI	72		
Important Road – 68 Otis Street	CI	73	Y	
Important Road – 290 Overpass at Whitney Street	CI	74		Y
Important Road – Bartlett Street	CI	75		Y
Important Road – Cedar Hill Street	CI	76		
CSX Rail Line	CI	77		Y
Railroad Dock – private, Lyman Street	CI	78		
Railroad Crossing – Bearfoot Road	CI	79		
Railroad Crossing – Brigham Street	CI	80		
Railroad Crossing – Main Street	CI	81		Y
Railroad Crossing – Pierce Street	CI	82		Y
Railroad Crossing – School Street	CI	83		
Bridge – Allen Street	CI	84		Y
Bridge – Church Street	CI	85		Y
Bridge – CSX Rail Line (Lyman Street)	CI	86		Y

Bridge – CSX Rail Line (Rice Ave)	CI	87		
Bridge – CSX Rail Line (Whitney Street)	CI	88		
Bridge – Davis Street	CI	89		Y
Bridge – I-290 Overpass	CI	90		Y
Bridge – Crawford Street Stone Bridge	CI	91		Y
Culvert – Route 135	CI	92		Y
Bridge – Route 20	CI	93		Y
Utilities – Crown Castle Northborough	CI	94		Y
Utilities – Verizon Communication Center	CI	95		
Utilities – National Grid Northeast Service Center	CI	96		
Utilities – National Grid Woodside (Hudson Street)	CI	97		
Services – Central MA Mosquito Project	CI	98		
Services – TeamWorks, Inc.	CI	99		
Services – The Bridge of Central MA	CI	100		
Services – Juniper Hill Golf Course, Inc.	CI	101		
Beamont/Whitney Place	CI	102		
Coleman House	CI	103		
Sewer – Wastewater Pump Station - Church Street	CI	104		Y
Sewer – Wastewater Pumping Station - Forbes Road (has generator)	CI	105		
Sewer – Wastewater Pump Station - Hudson Street	CI	106		Y
Sewer – Wastewater Pump Station - Lincoln Street (has generator)	CI	107		
Sewer – Wastewater Pump Station - Otis Street	CI	108		
Sewer – Wastewater Pump Station - Southwest Cutoff	CI	109		Y
Sewer – Wastewater Pump Station - Wesson Terrace	CI	110		
Sewer – Water Booster Pump Station - Church Street at Autumn Lane	CI	111		Y
Sewer – Water Booster Pump Station - Southwest Cutoff at Shops Way	CI	112		Y
Sewer – Wastewater Pump Station - West Main Street	CI	113		
U.S. Gov Post Office	CI	114		
Dam – Assabet River	CI	115		Y
Dam – Bartlett Pond	CI	116		Y
Dam – Cider Mill Pond	CI	117		Y
Dam – Cold Harbor Brook	CI	118	Y	
Dam – Ellis Pond	CI	119		Y
Dam – Farm Pond	CI	120		
Dam – Old Adams Pond	CI	121		Y
Dam – Old Mill Pond (SW)	CI	122		
Dam – Old Mill Pond	CI	123		
Dam – Old Saw Mill Pond	CI	124		Y
Dam – Small Pond	CI	125		Y
Dam – Storage Pond	CI	126		Y
Dam – Wallace Pond	CI	127		Y
Dam – West Meadow Country Club Pond	CI	128		Y
Dam – Hop Brook	CI	129		Y
School – Robert E Melican Middle School, Emergency Shelter	CI	130		Y
School – Algonquin Regional High School (communications voter and tower, wastewater pump station, Tiny Tomahawks daycare, and point of distribution site)	CI	131		

School – Fitzgerald Institute	CI	132		
School – Lincoln Street Elementary School (Northborough Extended Day Program on site)	CI	133		
School – Peaslee Elementary School	CI	134		
School – Proctor Elementary School (Northborough Extended Day Program on site)	CI	135		
School – St. Bernadette School	CI	136		
School – Marion E Zeh Elementary School	CI	137		Y
School – Cornerstone Academy	CI	138		
School – Goddard School	CI	139		Y
Special Education – Amego, Inc.	CI	140		
Daycare / Children's Program – Skribbles Learning Center	CI	141		
Daycare / Children's Program – Skribbles Learning Center	CI	142		
Daycare / Children's Program – Aprende Spanish Immersion Daycare	CI	143		
Daycare / Children's Program – Nashoba Montessori School, Inc.	CI	144		Y
Apartments – Avalon Bay Apartments	CI	145		
Apartments – Northborough Manor	CI	146		
Faith Institution – Church of Christ	CI	147		
Faith Institution – Church of the Nativity and Nursery School	CI	148		Y
Faith Institution – First Parish Unitarian Church	CI	149		Y
Faith Institution – Jehovah Witness Church	CI	150		
Faith Institution – Rice Memorial Baptist Church	CI	151		
Faith Institution – Seventh Day Adventist Church	CI	152		
Faith Institution – Shri Gurusthan Sai Temple	CI	153		
Faith Institution – St. Bernadette's Church	CI	154		
Faith Institution – St. Rose of Lima Church	CI	155		
Faith Institution – Trinity Church	CI	156		Y
Bartlett Crossing – 292 Main Street	CI	157		
Cold Harbor Mall – 369 West Main Street	CI	158		Y
Northborough Shopping Plaza – 247 West Main Street	CI	159		
Post Road Marketplace – 318 Main Street	CI	160		
Shopping Center – 308 Main Street, Veenas	CI	161		
Shopping Center (2) – 276 West Main Street, Picklehouse	CI	162		
Times Square Plaza – 299 West Main Street	CI	163		Y
Iron Mountain	CI	164		
RJ Devereaux Corp.	CI	165		
Advocates, Inc. / Northborough Housing Authority – East Main Street	CI	166		
EconoLodge (is an emergency shelter)	CI	167		Y
Motel 6 Boston–Westborough	CI	168		
Tier II Chemicals User – Natural Gas Line	CI	169		Y
Tier II Chemicals User – Closed Landfill	CI	170		Y
Tier II Chemicals User – A. Duie Pyle Inc.	CI	171		
Tier II Chemicals User – National Grid - New England Distribution	CI	172		
Tier II Chemicals User – FedEx Freight, Inc	CI	173		
Tier II Chemicals User – Aspen Aerogels	CI	174		
Tier II Chemicals User – NewCorr Packaging	CI	175		

Tier II Chemicals User – St. Gobain Research and Development Center	CI	176		
Tier II Chemicals User – Steris AST	CI	177		
Tier II Chemicals User – Trelleborg Sealing Solutions	CI	178		
Tier II Chemicals User – Sanofi Genzyme Northborough Operations Center	CI	179		
Tier II Chemicals User – Walmart	CI	180		
Tier II Chemicals User – Northborough Crossing Mall	CI	181		
Tier II Chemicals User – Bigelow Nurseries, Inc.	CI	182		
Tier II Chemicals User – Lakeside Oil Company	CI	183		
Tier II Chemicals User – Northborough Oil Co., Inc.	CI	184		
Tier II Chemicals User – BJ's Wholesale Club Gas Station	CI	185		
Tier II Chemicals User – Cumberland Farms	CI	186		Y
Tier II Chemicals User – Northborough Center Mobile	CI	187		Y
Tier II Chemicals User – Northborough Sunoco	CI	188		
Tier II Chemicals User – Peterson Northborough	CI	189		
Tier II Chemicals User – Speed Energy	CI	190		
Tier II Chemicals User – Top Energy	CI	191		Y
Tier II Chemicals User – Tradebe Treatment and Recycling	CI	192		
Northborough Housing Authority – Heritage Village	CI	193		Y
Northborough Housing Authority – Rutland Road	CI	194		
Northborough Housing Authority – Colonial Village	CI	195		
Tougas Family Farm Worker Dorm	CI	196		Y
Alcohol / Substance Recovery Center – 144 W Main Street	CI	197		
Alcohol / Substance Recovery Center – 150 W Main Street	CI	198		
Luther Rice Home	CI	199		
Justice Resource Institute Developing Abilities	CI	200		
Community Resources for Justice	CI	201		
Residential Board and Care – Vinfen Group Home	CI	202		Y
Residential Board and Care – Advocates Inc. 178 South Street	CI	203		
Residential Board and Care – Advocates Inc. 29 Thoreau Road	CI	204		
Residential Board and Care – Advocates Inc. 342 Boundary Street	CI	205		
Residential Board and Care – Mentor Neuro Restorative	CI	206		
Residential Board and Care – 8 Saddle Hill Drive	CI	207		Y
Otis Street Adult Daycare	CI	208		
Memory Care Facility	CI	209		Y
Flooding – West Street and Cherry Street	H	FL-1	N/A	N/A
Flooding – Fay Lane and Lower Pleasant Street	H	FL-2	N/A	N/A
Flooding – US-20 at Tomblin Hill Road	H	FL-3	N/A	N/A
Flooding – Boundary Street / Town Line	H	FL-4	N/A	N/A
Flooding – Howard Street	H	FL-5	N/A	N/A
Flooding – Green Street	H	FL-6	N/A	N/A
Flooding – Ball Street	H	FL-7	N/A	N/A
Flooding – West Street	H	FL-8	N/A	N/A
Flooding – Southwest Cutoff	H	FL-9	N/A	N/A

Flooding – Brewer Street	H	FL-10	N/A	N/A
Flooding – Church Street and nearby brook	H	FL-11	N/A	N/A
Severe Snow/Ice – Howard Street old trees, power lines down	H	SS-1	N/A	N/A
Severe Snow/Ice – Ball Street winter hazard	H	SS-2	N/A	N/A
Severe Wind/Rain – Davis Street	H	ST-1	N/A	N/A
Severe Wind/Rain – Northgate Road	H	ST-2	N/A	N/A
Wildfire – Mt. Pisgah	H	WF-1	N/A	N/A
Wildfire – Little Chauncy Pond Fires	H	WF-2	N/A	N/A
Wildfires – I-290 border (I–290 is an evacuation route)	CI/H	WF-3		Y
Wildfire – Church Street (Church Street is an evacuation route)	CI/H	WF-4		Y
Wildfire – Brewer Street	H	WF-5	N/A	N/A
Wildfire – Edmunds Hill	H	WF-6	N/A	N/A
Dam Failure – Wallace Pond Dam on Hudson Street	H	DF-1	N/A	N/A
Dam Failure – Bartlett Pond Dam on Bartlett Street (Bartlett Street is an evacuation route)	CI/H	DF-2		Y
Dam Failure – Northborough Reservoir Dam near Reservoir Street and Castle Road	H	DF-3	N/A	N/A
Dam Failure – Smith Pond Dam	CI/H	DF-4		Y
Lightning Strike – Assabet Hill Communications Tower and 3.5 MG water Storage tank	CI/H	LG-1		Y
Lightning Strike – Davidian Brothers Farm	H	LG-2	N/A	N/A

APPENDIX B

Public Survey

and

Community

Lifelines

Survey

Appendix B helps meet the following FEMA local mitigation plan requirements:

- *A1. "Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction?" (Requirement 44 CFR § 201.6(c)(1))*
- *A2. "Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process?" (Requirement 44 CFR § 201.6(b)(2)); and*
- *A3. "Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval?" (Requirement 44 CFR § 201.6(b)(1))*

Northborough Hazard Mitigation Plan

Survey Responses Needed

The Town of Northborough is in the process of updating its Hazard Mitigation Plan and is requesting input from residents to inform this plan. An updated HMP will help the Town assess and reduce community risk from natural hazards.

CMRPC
Central Massachusetts Regional Planning Commission

You are invited to submit your thoughts on natural hazards, such as flooding, snowstorms, or thunderstorms, in the Northborough Hazard Mitigation Plan Community Survey.

Take our survey using the QR code below.

Tip: Open your phone camera, point at the QR code, and click the pop-up link to take the survey.

Link to the survey: https://www.surveymonkey.com/r/8QWDVCS

CENTRAL MASSACHUSETTS
Regional Planning Commission

Northborough Hazard Mitigation Plan Community Survey

Northborough Hazard Mitigation Plan

In July 2023, the Town of Northborough started the planning process to update its Hazard Mitigation Plan (HMP). An updated HMP will help the Town identify strategies to reduce its vulnerability to hazards like flooding, winter storms, and drought. Climate change may shift the extent and severity of certain natural hazards, including those that already impact Northborough.

By participating in this survey, you will help the Town of Northborough understand the current and future natural hazards that residents are most concerned about. Survey responses will be accepted until January 31st, 2024.

1. Check all that apply.

- [ ] I live in Northborough.
- [ ] I work in Northborough.
- [ ] I frequently visit Northborough.

2. Has your family or property, in Northborough, been impacted by any of the following natural hazards? Select all that apply:

- [ ] I have not been impacted by natural hazards in Northborough
- [ ] Winter Storms / Ice
- [ ] Thunderstorms, Microbursts, and/or Extreme Wind
- [ ] Tornadoes
- [ ] Flooding
- [ ] Extreme Heat / Extreme Cold
- [ ] Drought
- [ ] Wildfire / Brushfire
- [ ] Hurricanes
- [ ] Earthquakes
- [ ] Poor Air Quality
- [ ] Invasive Bug Hazards
- [ ] Invasive Plant Hazards
- [ ] Other (please specify)

3. Where have you observed hazard impacts in Northborough, and what were those impacts?

Examples: flooding on specific roads, drought/effects on water supply, extended power outages, trees down on roads, beaver dams affecting property and septic systems due to flooding from dams.

4. How much do you think the impacts of natural hazards and climate change will threaten your personal health, safety, or property?

- ◯ I think natural hazards and climate change will negatively impact my life.
- ◯ I'm not sure how natural hazards and climate change will impact my life.
- ◯ I don't think that I personally will be impacted by natural hazards and climate change.

5. If you are concerned about impacts to your life from natural hazards and/or climate change, what impacts are you most concerned about?

Examples: basement flooding, wells drying out / contamination of wells, ability to grow food

6. How concerned are you about the impacts that natural hazards and climate change will have on the Town of Northborough (the local infrastructure, economy, environment, and/or town residents)?

- ◯ Very concerned
- ◯ Somewhat concerned
- ◯ Unsure
- ◯ Somewhat unconcerned
- ◯ Not concerned at all

7. What community assets are you most concerned about when you consider the potential impact of natural hazards and climate change on the Town of Northborough? Rank the responses below in order from most concerned about (1) to least concerned about (5).

- ≡ ▲▼ Local natural resources and environments
- ≡ ▲▼ Resident health, safety, and property
- ≡ ▲▼ Local infrastructure
- ≡ ▲▼ Local business and the town economy
- ≡ ▲▼ Local government resources

8. Which of the following aspects of natural hazards and climate change would you like to learn more about? Select all that you are interested in.

- [ ] Impacts on well water quantity / quality
- [ ] Future flood risks
- [ ] Impacts on infrastructure
- [ ] Sustainability initiatives
- [ ] Public health impacts like increased risks of vector-borne disease (ex. Lyme disease, West Nile Virus, EEE - Eastern equine encephalitis)
- [ ] Impacts on town budget and finances
- [ ] Impacts on wildlife
- [ ] Impacts on the health of local forests
- [ ] Impacts on future development
- [ ] Other (please specify)

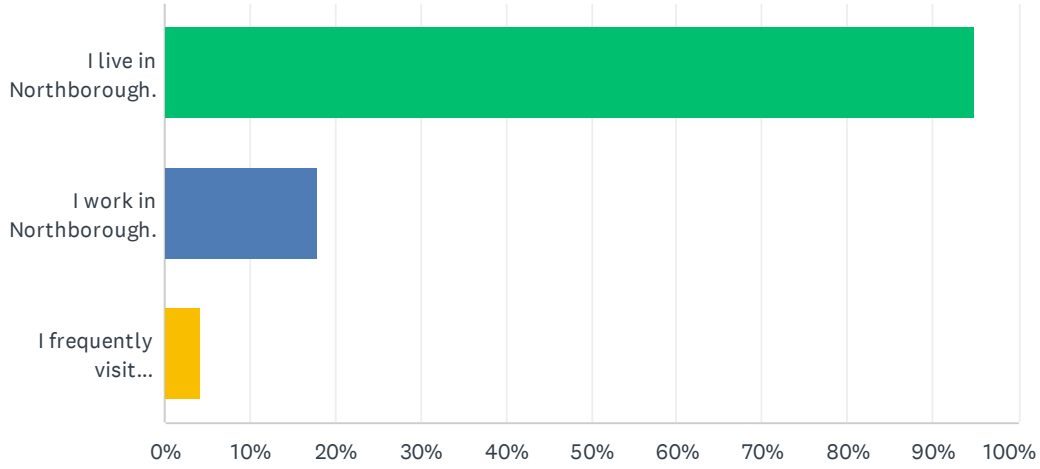
9. What actions should the Town of Northborough take to cultivate local resilience to natural hazards? Select all that you would like to see.

- [ ] Create green infrastructure which improves storm water management
- [ ] Provide more education and outreach about how climate change could impact my life
- [ ] Increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects
- [ ] Encourage planting new trees, especially climate-resilient tree species
- [ ] Encourage cutting/trimming dead trees beside/hanging over roads
- [ ] Continue to implement the Northborough Forest Stewardship Program by editing the Forest Management Plans to incorporate climate adaptation optimization
- [ ] Prepare/implement forest harvest plans and invasive plant control for conservation areas in town in accordance with updated forest management plans
- [ ] Other (please specify)

10. If you would like to stay informed about other opportunities to participate in Northborough's Hazard Mitigation planning process, please enter your E-mail address below.

Q1 Check all that apply.

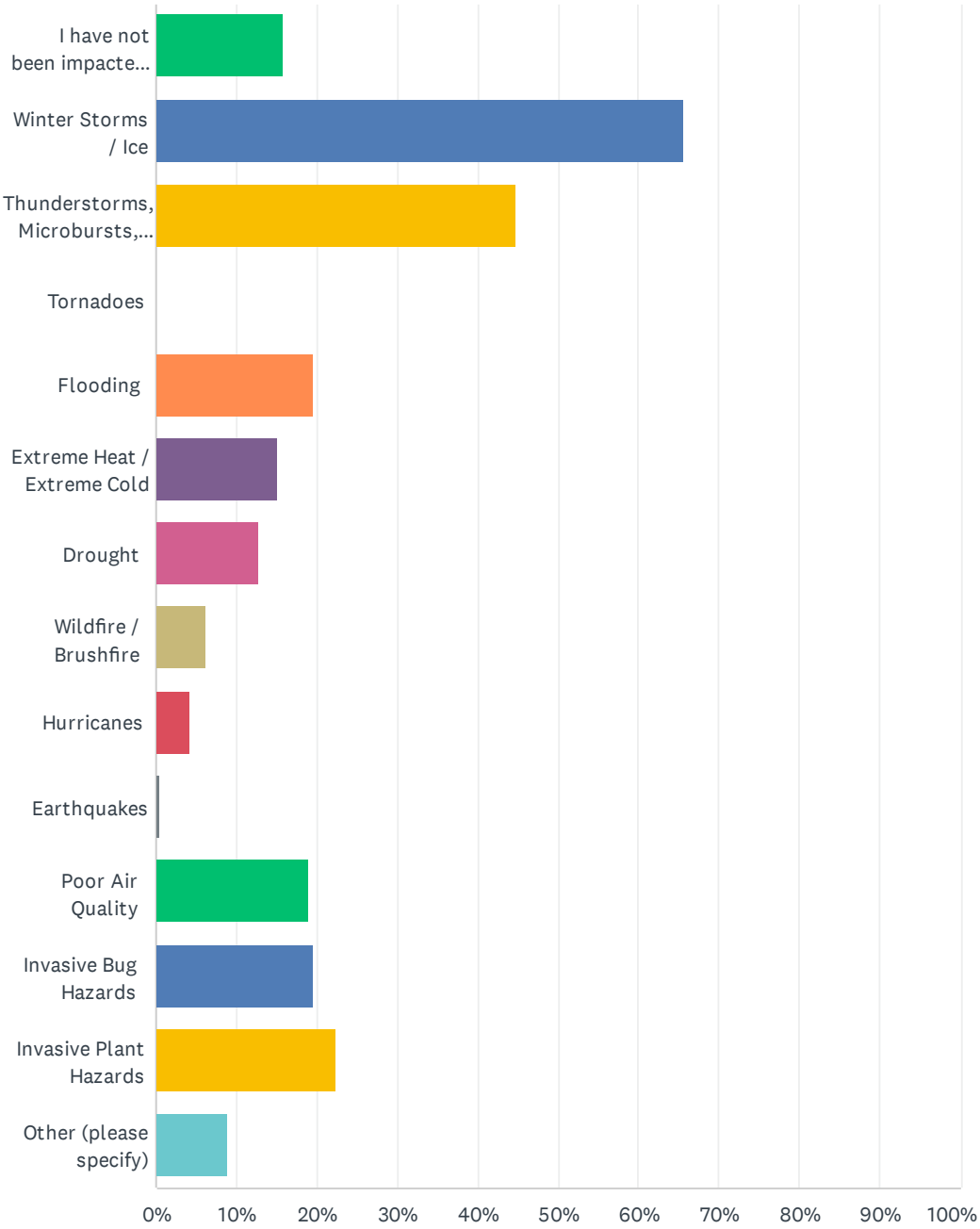
Answered: 212 Skipped: 1



ANSWER CHOICES	RESPONSES	
I live in Northborough.	94.81%	201
I work in Northborough.	17.92%	38
I frequently visit Northborough.	4.25%	9
Total Respondents: 212		

Q2 Has your family or property, in Northborough, been impacted by any of the following natural hazards? Select all that apply:

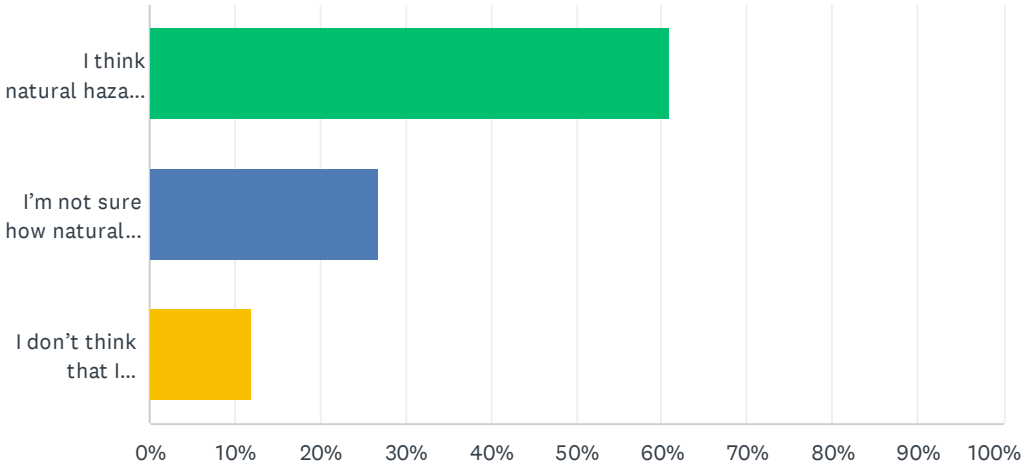
Answered: 210 Skipped: 3



ANSWER CHOICES	RESPONSES	
I have not been impacted by natural hazards in Northborough	15.71%	33
Winter Storms / Ice	65.71%	138
Thunderstorms, Microbursts, and/or Extreme Wind	44.76%	94
Tornadoes	0.00%	0
Flooding	19.52%	41
Extreme Heat / Extreme Cold	15.24%	32
Drought	12.86%	27
Wildfire / Brushfire	6.19%	13
Hurricanes	4.29%	9
Earthquakes	0.48%	1
Poor Air Quality	19.05%	40
Invasive Bug Hazards	19.52%	41
Invasive Plant Hazards	22.38%	47
Other (please specify)	9.05%	19
Total Respondents: 210		

Q4 How much do you think the impacts of natural hazards and climate change will threaten your personal health, safety, or property?

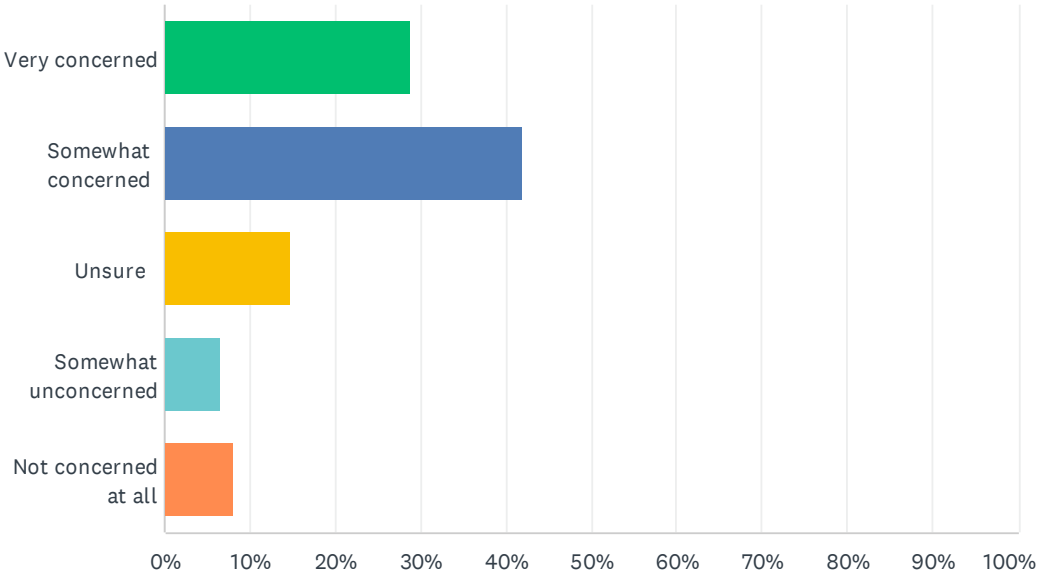
Answered: 208 Skipped: 5



ANSWER CHOICES	RESPONSES	
I think natural hazards and climate change will negatively impact my life.	61.06%	127
I'm not sure how natural hazards and climate change will impact my life.	26.92%	56
I don't think that I personally will be impacted by natural hazards and climate change.	12.02%	25
TOTAL		208

Q6 How concerned are you about the impacts that natural hazards and climate change will have on the Town of Northborough (the local infrastructure, economy, environment, and/or town residents)?

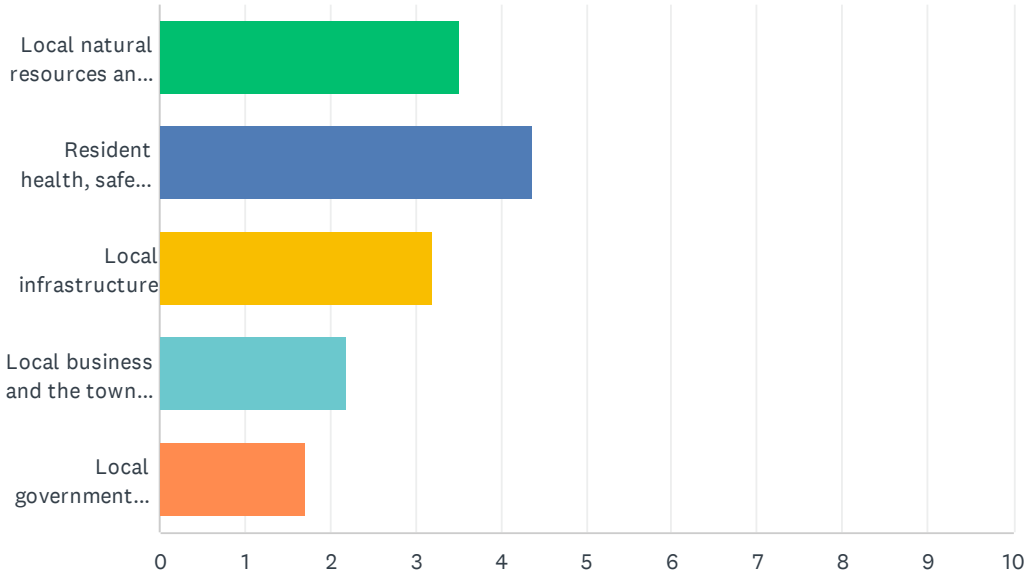
Answered: 212 Skipped: 1



ANSWER CHOICES	RESPONSES	
Very concerned	28.77%	61
Somewhat concerned	41.98%	89
Unsure	14.62%	31
Somewhat unconcerned	6.60%	14
Not concerned at all	8.02%	17
TOTAL		212

Q7 What community assets are you most concerned about when you consider the potential impact of natural hazards and climate change on the Town of Northborough? Rank the responses below in order from most concerned about (1) to least concerned about (5).

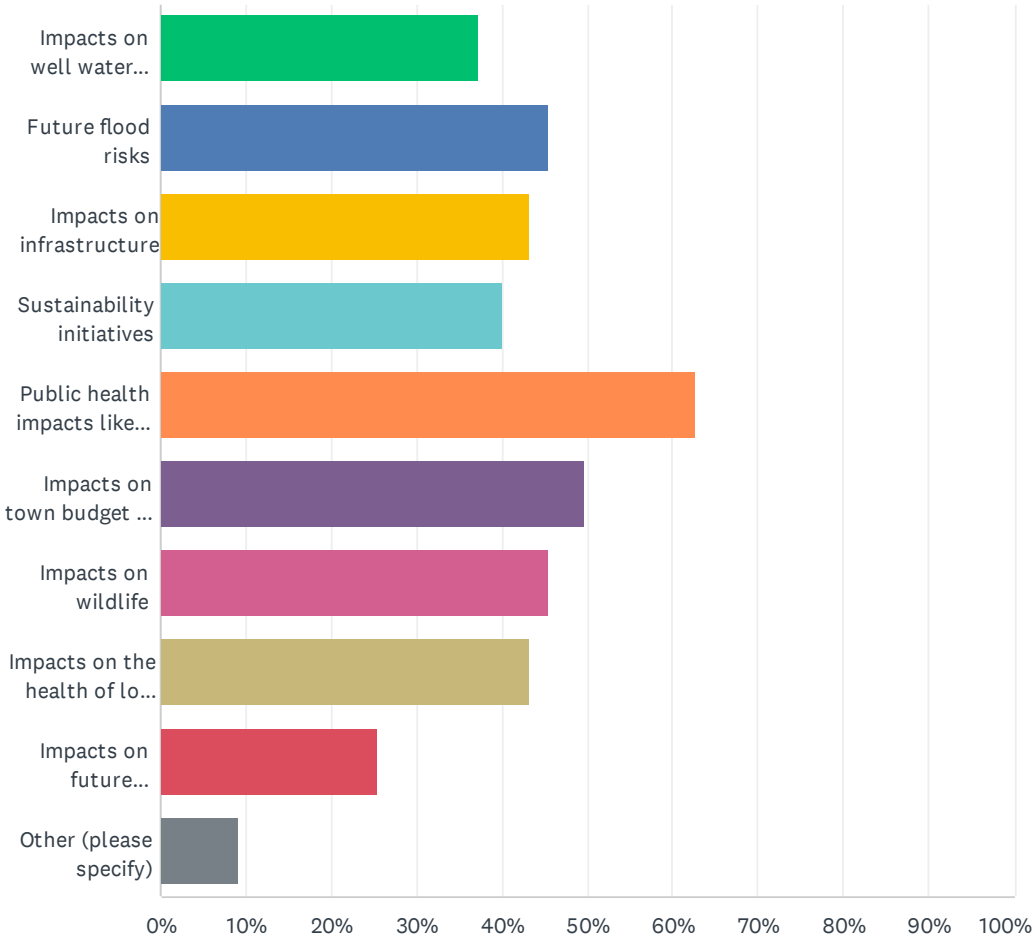
Answered: 203 Skipped: 10



	1	2	3	4	5	TOTAL	SCORE
Local natural resources and environments	26.60% 54	30.54% 62	18.72% 38	15.27% 31	8.87% 18	203	3.51
Resident health, safety, and property	58.62% 119	27.09% 55	10.34% 21	1.48% 3	2.46% 5	203	4.38
Local infrastructure	10.84% 22	29.06% 59	36.95% 75	15.27% 31	7.88% 16	203	3.20
Local business and the town economy	1.48% 3	7.39% 15	23.15% 47	45.81% 93	22.17% 45	203	2.20
Local government resources	2.46% 5	5.91% 12	10.84% 22	22.17% 45	58.62% 119	203	1.71

Q8 Which of the following aspects of natural hazards and climate change would you like to learn more about? Select all that you are interested in.

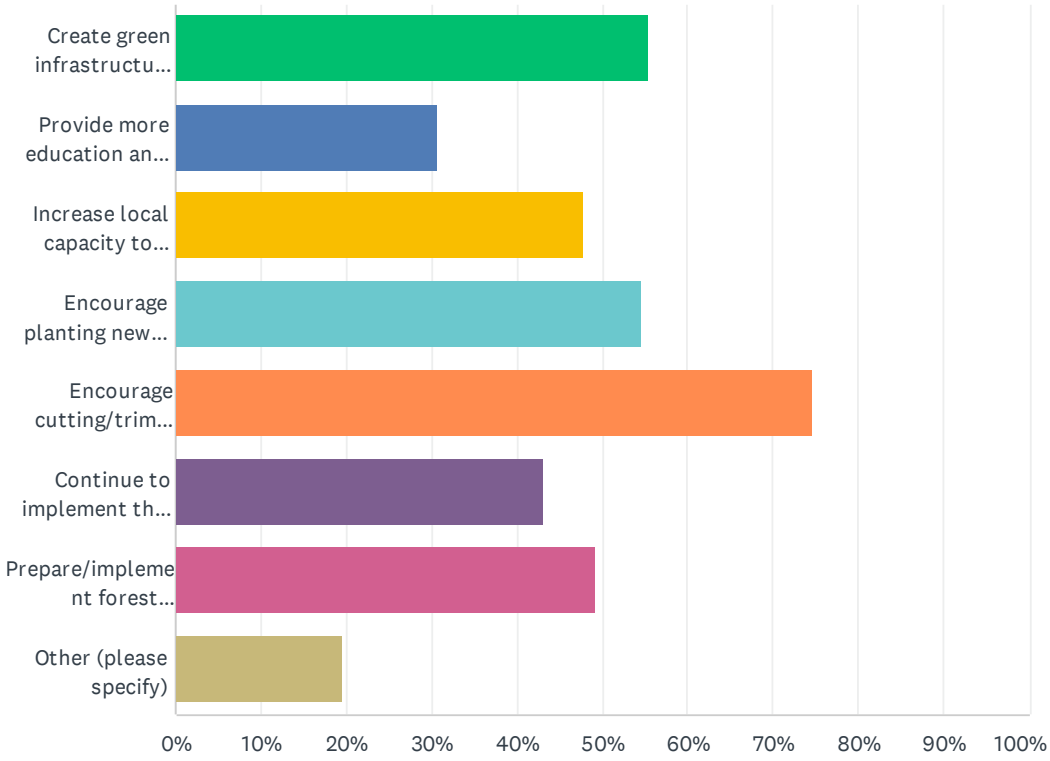
Answered: 185 Skipped: 28



ANSWER CHOICES	RESPONSES	
Impacts on well water quantity / quality	37.30%	69
Future flood risks	45.41%	84
Impacts on infrastructure	43.24%	80
Sustainability initiatives	40.00%	74
Public health impacts like increased risks of vector-borne disease (ex. Lyme disease, West Nile Virus, EEE - Eastern equine encephalitis)	62.70%	116
Impacts on town budget and finances	49.73%	92
Impacts on wildlife	45.41%	84
Impacts on the health of local forests	43.24%	80
Impacts on future development	25.41%	47
Other (please specify)	9.19%	17
Total Respondents: 185		

Q9 What actions should the Town of Northborough take to cultivate local resilience to natural hazards? Select all that you would like to see.

Answered: 209 Skipped: 4



ANSWER CHOICES	RESPONSES	
Create green infrastructure which improves storm water management	55.50%	116
Provide more education and outreach about how climate change could impact my life	30.62%	64
Increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects	47.85%	100
Encourage planting new trees, especially climate-resilient tree species	54.55%	114
Encourage cutting/trimming dead trees beside/hanging over roads	74.64%	156
Continue to implement the Northborough Forest Stewardship Program by editing the Forest Management Plans to incorporate climate adaptation optimization	43.06%	90
Prepare/implement forest harvest plans and invasive plant control for conservation areas in town in accordance with updated forest management plans	49.28%	103
Other (please specify)	19.62%	41
Total Respondents: 209		

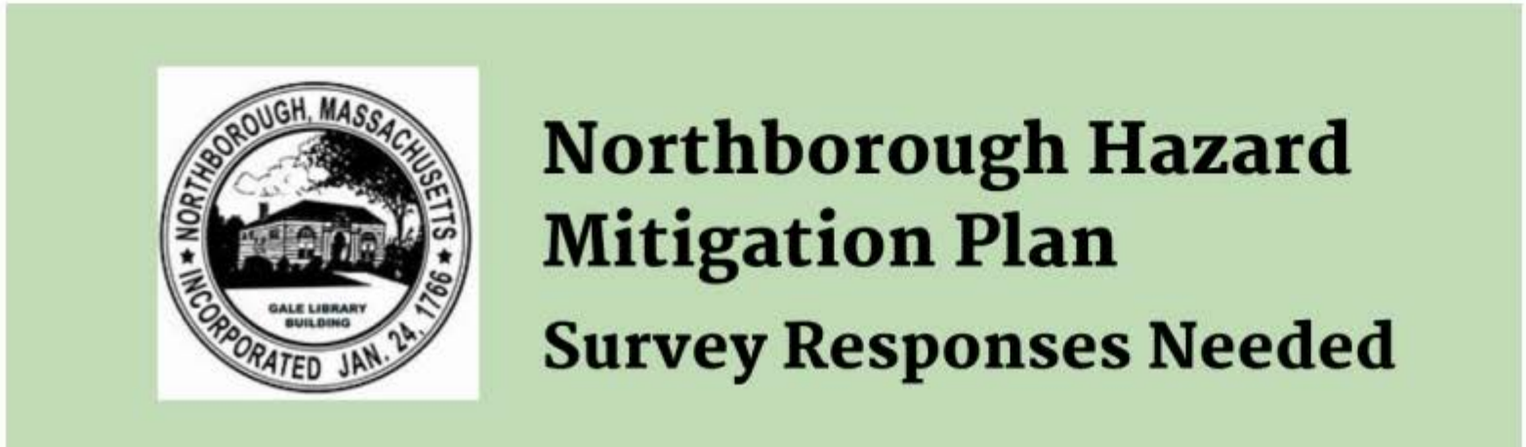
Community Survey - Northborough Hazard Mitigation Plan Survey

POSTED ON: JANUARY 5, 2024 - 8:26AM

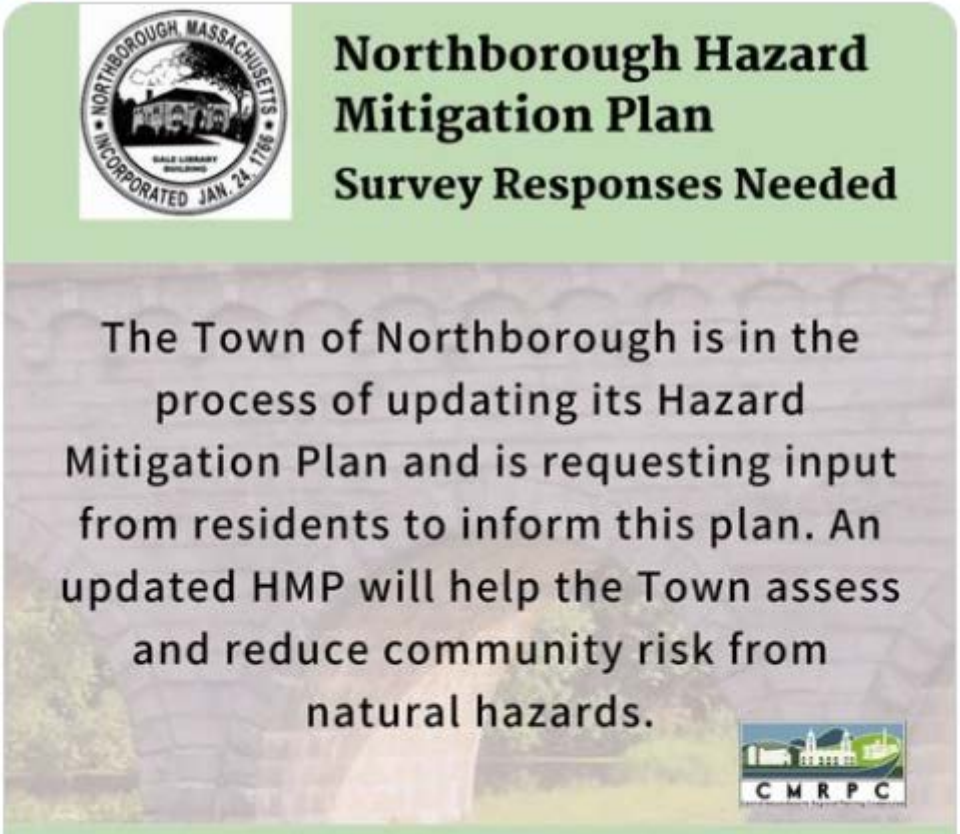
The Town of Northborough is updating its Hazard Mitigation Plan (HMP). An updated HMP will help the Town identify strategies to reduce its vulnerability to hazards like flooding, winter storms, and drought. Climate change may shift the extent and severity of certain natural hazards, including those that already impact Northborough.

By participating in this survey, you will help the Town of Northborough understand the current and future natural hazards that residents are most concerned about. Survey responses will be accepted until **January 31st, 2024**.

https://www.surveymonkey.com/r/8QWDVCS



Northborough Fire Department
January 5 at 8:51 AM ·



Northborough MA Town Clerk is in Northborough.
January 5 at 8:33 AM ·

https://www.surveymonkey.com/r/8QWDVCS

Northborough Cable Access Television
January 5 at 9:36 AM ·

The Town of Northborough is updating its Hazard Mitigation Plan (HMP). An updated HMP will help the Town identify strategies to reduce its vulnerability to hazards like flooding, winter storms, and drought. Climate change may shift the extent and severity of certain natural hazards, including those that already impact Northborough.

By participating in this survey, you will help the Town of Northborough understand the current and future natural hazards that residents are most concerned about. Survey responses will be accepted until January 31st, 2024.

Fill out the survey here: https://www.surveymonkey.com/r/8QWDVCS

Northborough Hazard Mitigation Plan

Survey Responses Needed

Government | Northborough

Northborough seeks input on hazard mitigation plan

By **Community Advocate** - January 12, 2024

Click me to copy current URL

Northborough is seeking input on its hazard mitigation plan. (Photo/Laura Hayes)

NORTHBOROUGH – The town is seeking input from residents as it is in the process of updating its Hazard Mitigation Plan.

Climate change may shift the extent and severity of certain natural disasters, including those that already impact Northborough. The updated plan will help the town identify strategies to reduce its vulnerability to various hazards such as flooding, winter storms and drought.

Through their participation in a survey, residents will help the town understand what current and future natural hazards are most concerning to them. People can participate in the survey until Jan. 31.

The survey can be found at https://www.town.northborough.ma.us/home/news/community-survey-northborough-hazard-mitigation-plan-survey.

Northborough Hazard Mitigation Plan Community Lifelines Survey

The Town of Northborough is working with the Central Massachusetts Regional Planning Commission to update the Town's Natural Hazard Mitigation Plan. The Town has identified the organizations, businesses, and town governments which you represent as potential community lifelines. We would like to involve community lifelines, defined by FEMA in their 2022 Local Mitigation Planning Policy Guide as "the most fundamental services in the community that, when stabilized, enable all other aspects of society to function," in the planning process.

1. What organization, business, or town government do you represent? What is the best E-mail and/or phone number to reach you?

2. If you are a representative of an organization or business in Northborough, what concerns, if any, does your organization or business have regarding vulnerabilities and/or natural hazards in town which affect your operations?

e.g. "*Our workplace experienced flooding, power loss, and damage from severe weather*", "*The people we serve do not have knowledge of emergency shelters in town*."

3. If you are a representative of a town government in a neighboring community to Northborough, what concerns does your town have regarding vulnerabilities and/or natural hazards that affect both Northborough and your community?

e.g. "*the flood inundation area from a potential dam failure affects both our town and Northborough*", "*We do not have sufficient coordination of evacuation routes between our town and Northborough*."

4. In what ways would you or another representative of your organization, business, or town government be able to be involved in the Northborough Hazard Mitigation Plan update process (select as many as you are interested in)?

- [ ] By attending a Hazard Mitigation Planning meeting or meetings with the Northborough HMP Team and CMRPC staff members
- [ ] By attending a public presentation on the Hazard Mitigation Plan update and providing comments then
- [ ] By being interviewed regarding any natural hazards concerns you have by the Northborough HMP Team and/or CMRPC staff members
- [ ] By providing written comments on a draft of the Northborough Hazard Mitigation Plan update
- [ ] Other (please specify)

  _____

- [ ] None of the above

APPENDIX C:

Meetings

Appendix C helps meet the following FEMA local mitigation plan requirements:

- *A1. "Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction?" (Requirement 44 CFR § 201.6(c)(1))*
- *A2. "Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process?" (Requirement 44 CFR § 201.6(b)(2)); and*
- *A3. "Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval?" (Requirement 44 CFR § 201.6(b)(1))*

Northborough Hazard Mitigation Plan Update
Local Planning Team Kickoff Meeting

Date/Time: July 31st, 2023, 10:30am
Location: Northborough Free Library Conference Room, 34 Main Street, Northborough, MA

AGENDA

I. Introductions

II. Plan Background

- Review Contract
- Roles and Responsibilities
- Estimated Timeline

III. Project Phases & Preliminary Schedule

Phase	Completion (proposed)
Assembly of local planning team, kickoff	July 2023
Information gathering	August 2023-March 2024
○ Natural hazards	
○ Critical infrastructure and facilities	
Mitigation strategy development	April-August 2024
Stakeholder and public involvement	August 2023- August 2024
Plan narrative development	September 2024-February 2025
Plan submission (initial)	March 2025
Plan adoption	April-May 2025

IV. Local Planning Team Meetings/Council Presentations

- Meeting #1 (kickoff)
- Meeting #2 (hazards and critical infrastructure/facilities) (can be two meetings)
- Meeting #3 (mitigation strategies)
- Presentation #1 (summary of draft plan – setting is flexible)
- Presentation #2 (final plan and request for adoption @ BOS) (optional)

V. Review of Mitigation Strategies

- 2018 HMP Mitigation Strategies

VI. Next Meeting – Natural Hazards and/or Infrastructure

- Date/location
- What to prepare

Northborough
MASSACHUSETTS

Meeting Name: Northborough Hazard Mitigation Plan Kickoff Meeting	Community: Northborough	Location: Northborough Free Library Conference Room, 34 Main Street, Northborough, MA
Date: July 31st, 2023		Meeting Time: 10:30 AM

Participant Name	Organization	Title	E-mail
Andrew Loew	CMRPC	Prog. Mgr.	aloew@cmrpc.org
Trish Settles	CMRPC	Dep Dir	tsettles@cmrpc.org
Michael Parr	LEPC	Hazmat Assistant	mparr@town.northborough.ma.us.
David Parenti	Northborough Fire	Fire Chief/EMD	dparenti@town.northborough.ma.us
Bob Frederico	Northborough Bldg. Dpt	Bld. Inspector	RFREDERICO@TOWN.NORTHBOROUGH.MA.US
Michael Seager	Northborough Health Department	Health Agent	mseager@town.northborough.ma.us
William Lyver	Police	Chief	wlyver@town.northborough.ma.us.
Laurie Connors	Planning	Director	lconnors@town.northborough.ma.us
Scott D. Charpentier	DPW	Director	scharpentier@town.northborough.ma.us
Neal P. Aspesi	Fire	Deputy	NASPESI@TOWN.NORTHBOROUGH.MA.US
Becca Meekins	Town	Asst. Town Administrator	rmeekins@town.northborough.ma.us

Northborough Hazard Mitigation Plan Update
Local Planning Team Meeting #2

Date/Time: September 25th, 2023, 10:00am
Location: Northborough Free Library Conference Room, 34 Main Street, Northborough, MA

AGENDA

I. Introductions

II. Meeting #1 Recap

III. Community Lifelines

- When should we start including them in the planning process?

IV. Reference Documents

V. Natural Hazards Review

a. Flooding
b. Severe Snowstorms, Ice Storms, and Nor'easters
c. Hurricanes
d. Severe Thunderstorms, Wind, and Tornadoes
e. Wildfires and Brushfires
f. Earthquakes
g. Dam Failure
h. Drought
i. Extreme Temperatures
j. Landslides and Other Hazards

VI. Break

VII. Critical Infrastructure/Facilities and Vulnerable Populations Review
Review previous CI/F/P lists and update as necessary

- Category 1 – Emergency Response Facilities
- Category 2 – Non-Emergency Response Facilities
- Category 3 – Dams
- Category 4 – Populations and Facilities to Protect

CMRPC
Central Massachusetts Regional Planning Commission

Northborough
MASSACHUSETTS

Meeting Name: Northborough Hazard Mitigation Plan Meeting #2

Community: Northborough

Location: Northborough Free Library Conference Room, 34 Main Street, Northborough, MA

Date: September 25th, 2023

Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Bob Frederico	Northborough	Building Inspector	BFREDERICO@TOWN.Northborough.MA.US
Vin Vignaly	Conserv. Comm.	Agent	VVIGNALY@town.northborough.ma.us
Scott Charpentier	DPW	Director	Too long
Neal Aspesi	Fire	Deputy	NASPESI@TOWN.NORTHBOROUGH.MA.US
Michael Parr	LEPC	Hazmat Asst.	mparr@town.northborough.ma.us
Laurie Connors	Planning	Director	lconnors@town.northborough.ma.us
Michael Seager	Health Dept		mseager@town.northborough.ma.us
Andrew Loew	CMRPC		aloew@cmrpc.org

Northborough Hazard Mitigation Plan Update
Local Planning Team Meeting #3

Date/Time: December 12th, 2023, 10:00am
Location: Northborough Free Library Conference Room, 34 Main Street, Northborough, MA

I. Introductions

II. Natural Hazards and Critical Infrastructure Meeting Recap

III. Community Lifelines

IV. Reference Documents

V. Existing Protection Measures Review

- Review/Update the Existing Protection Matrix

VI. Community Survey Planning

- Review Example
- Discuss Format/Timeline

VII. Public Presentation Planning

- Purpose
- Format
- Date/Time/Location
- Outreach

VIII. Preliminary Discussion of New Mitigation Strategies

IX. Next Meeting – Mitigation Strategy Development

- Date/Time/Location
- What to prepare

CMRPC
Central Massachusetts Regional Planning Commission

Northborough
MASSACHUSETTS

Meeting Name: Northborough Hazard Mitigation Plan Meeting #3	**Community: Northborough**	**Location: Northborough Free Library Conference Room, 34 Main Street, Northborough, MA**
Date: December 12th, 2023		**Meeting Time: 10:00 AM**

Participant Name	Organization	Title	E-mail
Michael Parr	LEPC	Hazmat Assistant	mparr@town.northborough.ma.us.
Scott D. Charpentier	DPW	Director	scharpentier town.northborough.ma.us
Robert Frederico	Building	B/I / ZEO	RFREDERICO@TOWN.NORTHBOROUGH.MA.US.
Marc Granaldo	CMRPC	Emergency Planner	mgranaldo@CMRPC.org
Will Talbot	CMRPC	assistant resiliency Planner	wtalbot@cmrpc.org
Vin Vignaly	Conservation	Agent	vvignaly@town.northborough.ma.us
Andrew Loew	CMRPC	Director	aloew@cmrpc.org
Laurie Connors	Planning	Director	lconnors@town.northborough.ma.us
NEAL ASPESI	FIRE	DEPUTY CHIEF	NASPESI@TOWN.NORTHBOROUGH.MA.US
Brian Griffin	Police	LT.	BGRIFFIN@TOWN.NORTHBOROUGH.MA.US
David Parenti	Fire	Chief / EMD	dparenti@ " " " "

Northborough Hazard Mitigation Plan Update
Local Planning Team Meeting #4

Date/Time: March 5th, 2024, 10:00am
Location: Northborough Free Library Conference Room, 34 Main Street, Northborough, MA

I. Introductions

II. Meeting #3 Recap

III. Community Lifelines

IV. Reference Documents

VIII. Discussion of Mitigation Strategies

- Review of last plan's mitigation strategies
- Development of new mitigation strategies
- Discussion of vulnerable populations and facilities

VI. Community Survey Results Review

VII. Public Presentation Planning

- Purpose
- Format
- Date/Time/Location
- Outreach

IX. Review of Updates to Existing Protection Measures

X. Next Meeting

- Date/Time/Location
- What to prepare

CMRPC
Central Massachusetts Regional Planning Commission

Northborough
MASSACHUSETTS

Meeting Name: Northborough Hazard Mitigation Plan Meeting #4	Community: Northborough	Location: Northborough Free Library Conference Room, 34 Main Street, Northborough, MA
Date: March 5th, 2024		Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Michael Parr	Fire/LEPC	Hazmat Asst.	mparr@town.northborough.ma.us
Bob Fredrico	Northborough Building	Building Insp.	RFREDERICO@Town.Northborough.ma.US
Brian Griffin	Police	Chief	BGRIFFIN@TOWN.NORTHBOROUGH.MA.US
Laura Connors	Planning	Planning Director	"
Vin Vignaly	ConCom	ConCom Agent	VVignaly@town.northborough.ma.us
Neal Aspesi	Fire	Deputy Chief	—
David Parenti	Fire	Chief	—
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org
Marc Gerardo	CMRPC	emergency prep planner	mgerardo@cmrpc.org
Sarah Plutnicki	CMRPC	Asst. Planner	splutnicki@cmrpc.org

Northborough Hazard Mitigation Plan Update
Local Planning Team Meeting #5

Date/Time: Wednesday, May 8th, 2024, 10:00am-12:00pm
Location: Northborough Free Library Conference Room, 34 Main Street, Northborough, MA

AGENDA

I. Introductions

II. Meeting #4 Recap

III. Community Lifelines

IV. Reference Documents

V. Public Presentation Planning

- Purpose
- Format
- Date/Time/Location
- Outreach

VI. Review of Northborough MVP Recommendations

- Discuss incorporating MVP recommendations into this HMP update as mitigation strategies

VII. Community Survey Results Review

- Brainstorm new mitigation strategies from community survey results

VIII. Existing Protection Measures Updates

IX. Next Meeting

- Date/Time/Location
- What to prepare

IX. Next Meeting – Existing Protection Measures Review, Public Forum and Community Survey Planning

- Date/location
- What to prepare

CMRPC Central Massachusetts Regional Planning Commission

Northborough MASSACHUSETTS

Meeting Name: Northborough Hazard Mitigation Plan Meeting #5	Community: Northborough	Location: Northborough Free Library Conference Room, 34 Main Street, Northborough, MA
Date: May 8th, 2024		Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Michael Parr	Fire /LEPC	Hazmat Asst.	mparr@town.northborough.ma.us
Bob Frederico	Northborough	Building Inspector	RFREDERICO@TOWN.NORTHBOROUGH.MA.US
Scott D. Charpentier	DPW	Director	scharpentier@town~
Bill Griffin	Northboro Police	Lt.	wgriffin@TOWN.Northborough.MA.US
Will Talbot	CMRPC	Asst. Planner	wtalbot@cmrpc.org
Max Granuzo	CMRPC	Emergency Prep Planner	mg[illegible]@CMRPC.org
Laurie Connors	Planning Dep.		lconnors@town.northborough.ma.us

Northborough Hazard Mitigation Plan Update
Local Planning Team Meeting #6

Date/Time: August 2nd, 2024, 10am-10:45am
Location: Zoom Meeting, https://us02web.zoom.us/j/84104363757

AGENDA

I. Meeting #5 Recap

II. Community Lifelines

III. Public Presentation and Public / Community Lifeline Comment Period Review

- Review of any questions and/or comments from the public, community lifelines, and/or the Select Board

IV. Review of Questions from Northborough HMP Team on Draft Plan

V. Review of Questions from CMRPC Staff

VI. Discuss High Hazard Potential Dams

VII. Next Steps

- Submission for MEMA and then FEMA review
    - Revisions made as are needed
- FEMA issues conditional approval
- Formal adoption of plan by Select Board
- Final approval by FEMA

Meeting Name:
Northborough Hazard Mitigation Plan Meeting #6

Community: Northborough

Location: Zoom meeting, link: https://us02web.zoom.us/j/84104363757

Date: August 2nd, 2024

Meeting Time: 10:00 AM

Participant Name	Organization	Title	E-mail
Michael Parr	Fire / LEPC	Hazmat Assistant	mparr@town.northborough.ma.us
David Parenti	Fire	Chief	dparenti@town.northborough.ma.us
Scott Charpentier	DPW	Director	scharpentier@town.northborough.ma.us
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org
Marc Granato	CMRPC	Emergency Preparedness Planner	mgranato@cmrpc.org

APPENDIX D:

Public Presentation at

Select Board Meeting

Materials

Appendix D helps meet the following FEMA local mitigation plan requirements:

- *A1. "Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction?" (Requirement 44 CFR § 201.6(c)(1))*
- *A2. "Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process?" (Requirement 44 CFR § 201.6(b)(2)); and*
- *A3. "Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval?" (Requirement 44 CFR § 201.6(b)(1))*

PUBLIC PRESENTATION
Northborough Hazard Mitigation Plan

The Town of Northborough is hosting a public presentation at a Select Board meeting on the Town's draft Hazard Mitigation Plan update.

- ***Attend to hear about draft mitigation strategies that can help the Town assess and reduce community risk from natural hazards.***

- ***The draft plan will be posted on the town website for public review for two weeks following this presentation.***

During the Select Board meeting on Monday, July 15th, 2024 at 7pm at the Northborough Town Hall at 63 Main Street, in the Select Board's Meeting Room, on Zoom, on the Northborough Cable YouTube channel, and on Charter channel 192 and Verizon channel 30.

If you have any comments on the draft plan or would like more information, contact Will Talbot at wtalbot@cmrpc.org.

If you need assistance accessing the Municipal Center, call the Select Board's office at (508) 393-5040, extension 1.

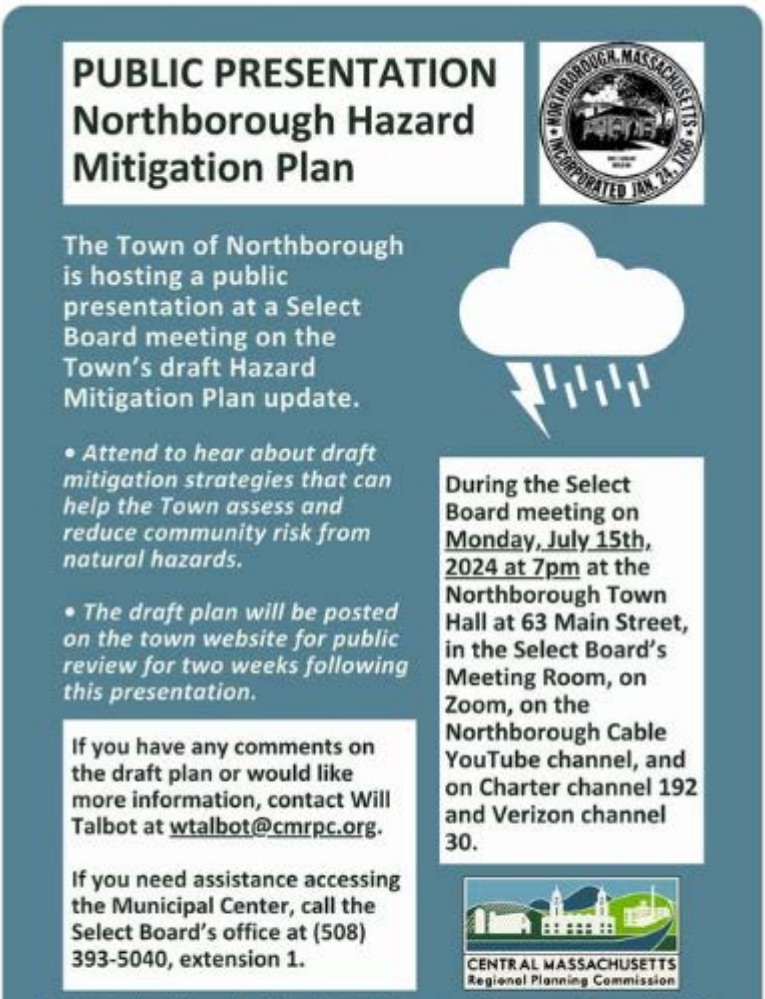
CENTRAL MASSACHUSETTS
Regional Planning Commission

Project funding is from the Massachusetts Emergency Management Agency (MEMA).

Northborough Fire Department
1h ·

Work is now underway on the update of Northborough's 2018 Natural Hazard Mitigation Plan, which will help guide local efforts to reduce damage from future natural disasters. The Town of Northborough invites local residents, business operators, property owners, and other interested parties to attend a public presentation on the draft 2024 Northborough Hazard Mitigation Plan update. This presentation will take place at the Select Board meeting on Monday, July 15th, 2024

Town of Northborough MA
July 3 ·



Northborough Fire Department
July 3 ·

Work is now underway on the update of Northborough's 2018 Natural Hazard Mitigation Plan, which will help guide local efforts to reduce damage from future natur... See more

2

Like Comment

Presentation to be held on draft update to Natural Hazard Mitigation Plan

by **Community Advocate** - July 3, 2024

Click me to copy current URL

Northborough will be holding a presentation on its Natural Hazard Mitigation Plan. (Photo/Laura Hayes)

NORTHBOROUGH – Efforts are underway to update Northborough's 2018 Natural Hazard Mitigation Plan, which will help guide local efforts to reduce damage from future natural disasters.

The town is inviting residents, businesses, property owners and other interested parties to a public presentation on the draft update to the plan on July 15 in the Select Board meeting room in Town Hall at 7 p.m. Community members will also be able to attend the presentation via Zoom, and it will be livestream with Northborough Cable Access on YouTube, Charter channel 192 and Verizon channel 30.

The plan is being developed by a team of local officials and staff with technical assistance provided by the Central Massachusetts Regional Planning Commission.

The planning process, funded through a Hazard Mitigation Grant Program grant, is a chance for the public to help protect the town from winter storms, thunderstorms, severe wind and other natural hazards. The plan will be available on the town's website for two weeks after the presentation.

The final adoption of the plan is contingent on approval from the Select Board, the Federal Emergency Management Agency and the Massachusetts Emergency Management Agency. Adoption will make the town eligible for various FEMA pre-disaster and post-fire hazard mitigation grants.

Town of Northborough, Natural Hazard Mitigation Plan
Public Presentation: July 15th, 2024

What is hazard mitigation? What is a mitigation plan?

- Hazard mitigation is the effort to reduce loss of life and property by lessening the impact of natural disasters.
- Mitigation is not disaster response; its goal is to reduce hazard impacts before a disaster occurs.
- A mitigation plan identifies natural hazards and the risks they pose to residents, infrastructure, property, and natural resources. It prioritizes projects, policies, education, and procedures for reducing these risks, now and in the future.
- Mitigation helps break the cycle of disaster damage, reconstruction, and repeated damage.

Why should Northborough complete and adopt this kind of plan?

- Natural hazard mitigation planning establishes a road map for achievable actions that can substantially reduce risks.
- The Federal Emergency Management Agency (FEMA) requires that cities and towns adopt and update a natural Hazard Mitigation Plan to be eligible for various FEMA pre-disaster and post-fire hazard mitigation grants.
- This plan is primarily funded by a grant from FEMA through MEMA (with a local in-kind match).
- FEMA and Northborough's Select Board adopted the Town's last natural hazard mitigation plan in October 2018, and this plan expired in October 2023.

What natural hazards pose the greatest risks to Northborough?

- Largest risks: winter storms, severe thunderstorms and wind
- Moderate risks: flooding, tornadoes, invasive species
- Lower risks: dam failures, extreme temperatures, drought, hurricanes, wildfires, earthquakes

Local partners

Local knowledge is essential to the mitigation planning process. Partners in Northborough to date include:

Chief and Emergency Management Director David Parenti, Deputy Chief Neal Aspesi, and Hazmat Assistant Michael Parr, Fire Department; Director Scott Charpentier, Department of Public Works; Chief Brian Griffin and Former Chief William Lyver, Police Department; Director Laurie Connors, Planning Department; Conservation Agent Vincent Vignaly, Conservation Commission; Inspector of Buildings / Zoning Enforcement Officer Robert Fredrico, Building Department; Health Agent Michael Seager, Health Department.

Planning timeline

- Information gathering via mapping, research, and local input — July 2023 to date
- Draft plan development — April – June 2024
    - Public comments/questions requested within two weeks of the draft plan being posted on the town website
- Public presentation #1 — June 2024
- MEMA review — Summer 2024
- FEMA approval and local adoption — Fall 2024
- 5-year update — 2029

Recent/ongoing mitigation activities include:

- Street sweeping and catch basin cleaning
- Maintaining and replacing problem culverts and maintaining and repairing problem roadways when needed and as funding allows
- Installing backup generators at critical public facilities when needed and as funding allows
- Participation in the National Flood Insurance Program (NFIP)
- SAFE and Senior SAFE Disaster Training Programs
- Dredging fire ponds and maintaining fire roads
- Compliance with the state building code, AAB codes, and ADA codes
- Vegetative debris program
- Dam monitoring
- Tree trimming program
- Snow removal
- Hazard warning systems and notifications
- Education and outreach
- Plans, regulations, and studies

Recommended high priority mitigation strategies in the DRAFT plan

A. Structure and Infrastructure Strategies

- Map and maintain fire roads in conservation areas.
- Incorporate energy efficiency measures as part of municipal building projects.
- Explore options for working with MassDOT to construct water retention structures / swales at the RT-9 - RT-20 Interchange.
- Explore establishing a redundant MWRA connection, as recommended by MassDEP, to ensure a reliable water supply for the Town.
- Remove dams and restore streams, prioritizing continuing work on the removal of Northborough Reservoir Dam. Explore options for acquiring and removing other significant and high hazard dams within town.
- Provide critical municipal facilities (such as the town hall, senior center, and library) with backup power to provide heating and cooling in extreme conditions.
- Drainage improvements at Church Street.

B. Preparedness, Coordination, and Response Strategies

- Continue to sweep streets at least once per year to increase stormwater management capacity; capture and dispose of properly (currently budgeted).
- Continue to properly clean, at least annually, or more often as required, all stormwater structures and basins (currently budgeted).
- Continue to utilize hazard warning systems and notifications: social media, town webpages, Code Red, and other communication methods. Interns are currently taking senior citizen information to sign them up for CodeRed. Post generator safety and use info on social media. Health Dept. to put out a brochure on 72-hr kits through Town-wide mailing, school children take-home, etc. Maintain internal instant messaging system, allowing for rapid response of emergency personnel.
- Actively enforce and comply with the 2021 update of the state building codes, promote successful working relationship between Fire Marshall and Building Inspector.
- Actively enforce and comply with the Massachusetts Wetlands Protection Act and enforce local wetlands bylaw.

- Continue to engage with the Local Emergency Planning Committee (LEPC) and Central Region Homeland Security Advisory Council (CRHSAC) for increased communication and coordination between local, regional, state, and federal agencies regarding disasters and emergencies.
- Evaluate and rank projects impacting flood prone streets/areas.
- Maintain and improve emergency services for vulnerable populations such as seniors, which could require increasing emergency transportation options (rideshare options), diversifying communications, expanding planning, and ensuring reliable power.
- Protect municipal buildings and services against flooding and provide adequate staffing and training.
- Prepare a communications plan and practice emergency protocols to ensure adequate staffing and equipment, spread knowledge of evacuation routes and services, and stock the materials needed to sustain evacuated residents.

C. Education and Awareness Strategies

- Support local public health initiatives and evaluate management of public health related concerns.

D. Local Plan and Regulation Strategies

- Expand the use of the Capital Improvement Program for vegetation removal equipment, paving, and dam repair.
- Update subdivision regulations to incorporate current construction practices and stormwater mitigation measures. Create homeowners' associations to permanently maintain stormwater basins and fire protection systems (such as cisterns). Update the common driveway bylaw.
- Evaluate, update, and maintain public safety communications system infrastructure.
- Continue to actively enforce and comply with State Building Code Requirements. Ensure proper certification for inspectors.
- Actively enforce and comply with the stormwater management bylaw under the jurisdiction of the Conservation Commission.
- Update the Hazard Mitigation Plan every five years and monitor implementation by meeting to review mitigation strategies annually.

The draft plan with the full list of mitigation strategies will be available shortly on Northborough's town website.

Comments and questions should be directed to Will Talbot (wtalbot@cmrpc.org) at CMRPC within two weeks of the draft plan being posted on the town website.

This natural hazard mitigation planning activity is funded by an FY 2023 Hazard Mitigation grant from the Federal Emergency Management Agency through the Mass. Emergency Management Agency

TOWN OF NORTHBOROUGH HAZARD MITIGATION PLAN

Northborough Select Board
July 15th, 2024

Marc Granato, Emergency Preparedness Planner

Will Talbot, Assistant Planner

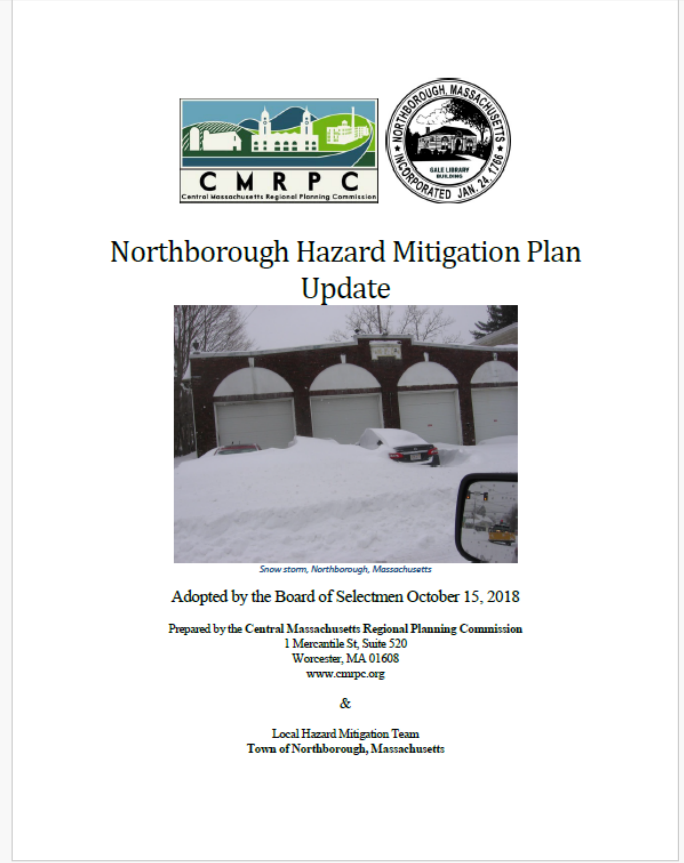
Andrew Loew, Director, Community Development & Resiliency Planning

Central Massachusetts Regional Planning Commission

WHY IS NORTHBOROUGH COMPLETING THIS PLAN?

- The Federal Emergency Management Agency (FEMA) requires that cities and towns adopt and update a natural Hazard Mitigation Plan to be eligible for various FEMA pre-disaster and post-fire hazard mitigation grants.

- This plan will meet FEMA's requirements and help the town make good use of its resources.
- Northborough's last HMP update was approved in October 2018 and expired in October 2023.



C M R P C
Central Massachusetts Regional Planning Commission

NORTHBOROUGH, MASSACHUSETTS • INCORPORATED JAN. 24, 1766 •

Northborough Hazard Mitigation Plan Update

Snow storm, Northborough, Massachusetts

Adopted by the Board of Selectmen October 15, 2018

Prepared by the Central Massachusetts Regional Planning Commission
1 Mercantile St, Suite 520
Worcester, MA 01608
www.cmrpc.org

&

Local Hazard Mitigation Team
Town of Northborough, Massachusetts

PLAN FOR MITIGATING DAMAGES FROM NATURAL HAZARDS

- Flooding
- Severe Snowstorms / Ice Storms / Nor'easters
- Hurricanes
- Severe Thunderstorms / Wind / Tornadoes
- Wildfires / Brush Fires
- Earthquakes
- Dam Failure
- Drought
- Extreme Temperatures
- Invasive Species
- Other Hazards (Landslides, Groundwater Intrusion)

Not an Emergency Response Plan

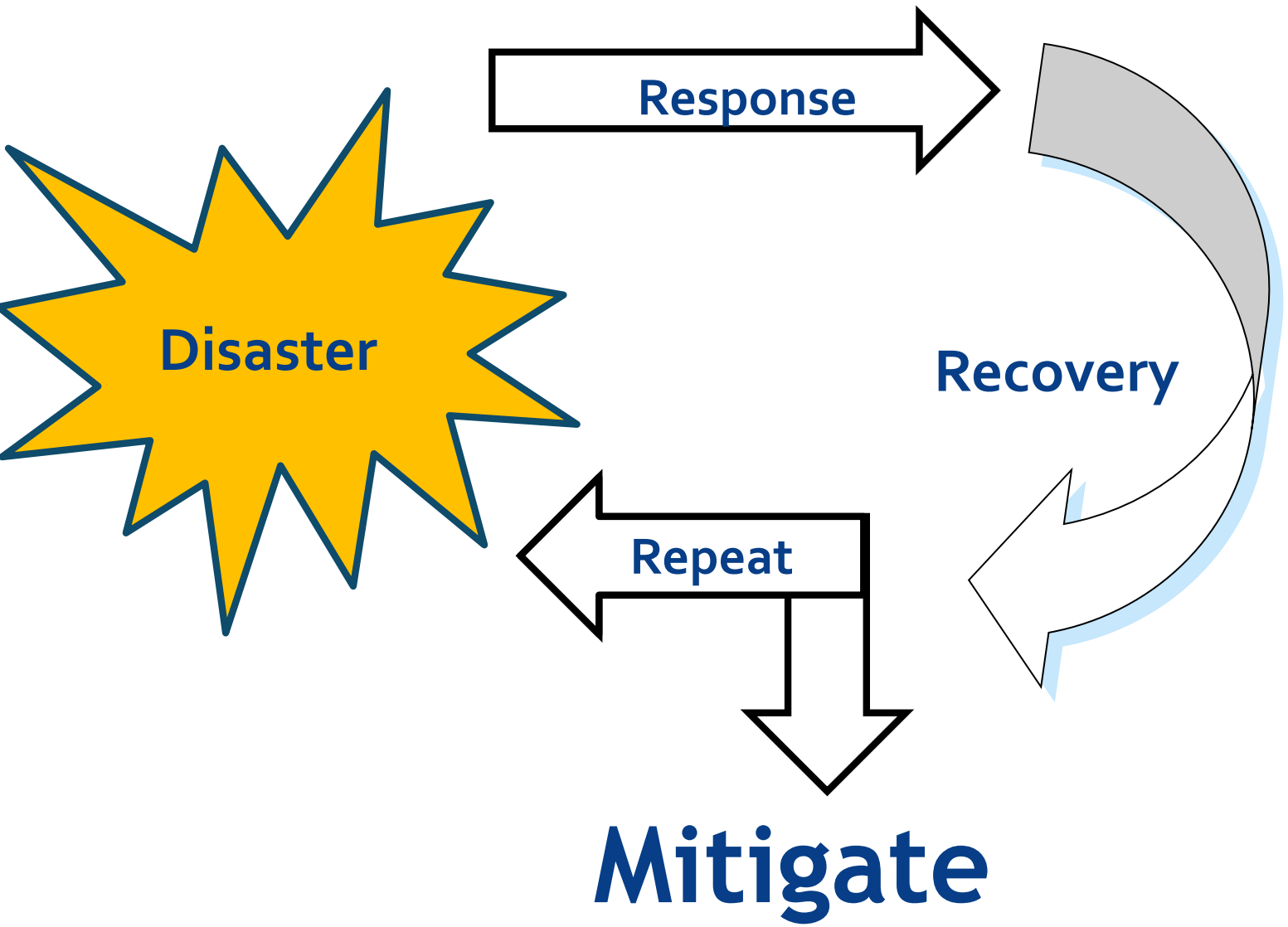
WHAT IS HAZARD MITIGATION?

- *To permanently reduce or prevent losses of life, injuries and property damage by using long-term strategies*
- *What preventive actions are being taken NOW to reduce future risks and damages?*
- *What additional actions can be taken in the FUTURE?*
- *According to the National Institute of Building Sciences Natural Hazard Mitigation Saves: 2019 Report, on average between 4 to 6 dollars is saved for every dollar spent on hazard mitigation*

THE BENEFITS OF MITIGATION

National Benefit-Cost Ratio (BCR) Per Peril *BCR numbers in this study have been rounded	Beyond Code Requirements	Federally Funded
Overall Hazard Benefit-Cost Ratio	**$4:1**	**$6:1**
Riverine Flood	$5:1	$7:1
Hurricane Surge	$7:1	Too few grants
Wind	$5:1	$5:1
Earthquake	$4:1	$3:1
Wildland-Urban Interface Fire	$4:1	$3:1

Breaking the Cycle of Risk



Four Tools & Techniques for Hazard Mitigation

1. Structure & Infrastructure Projects
2. Preparedness, Coordination & Response Actions
3. Education & Awareness Programs
4. Local Plans & Regulations

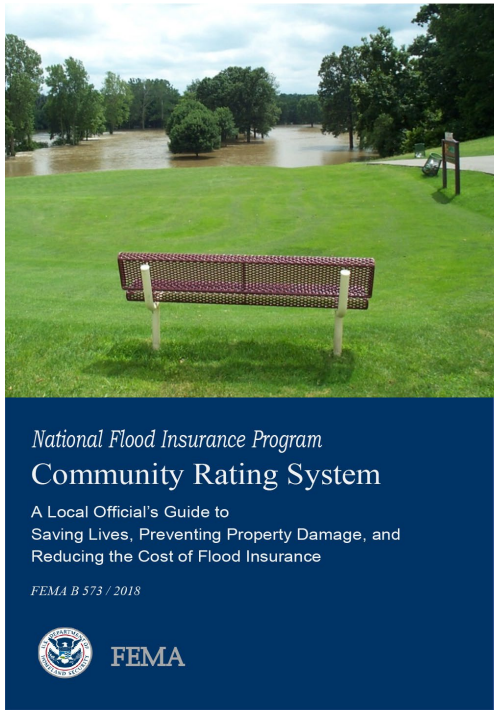
STRUCTURE AND INFRASTRUCTURE PROJECTS

- Prevent floodwaters from reaching properties
- Man-made structures to control water flows
- Culverts, dams, storm drainage facilities, pumping facilities

PREPAREDNESS AND RESPONSE

- National Flood Insurance Program
- Evacuation Planning
- Community Rating System
- Facilitate and coordinate the administration, enforcement and collaboration

NATIONAL FLOOD INSURANCE PROGRAM



EDUCATION AND AWARENESS

- Natural hazard awareness websites
- Hazard information at libraries, schools, and public buildings
- Information brochures mailed to residents (e.g., safe operation of home generators)
- Public outreach at community events

LOCAL PLANS & REGULATIONS

- Planning & Zoning
- Subdivision and Site Plans
- Floodplain regulations
- Wetlands bylaws
- Storm water regulations
- Building Code
- Master Plans
- MVP Plans

PLANNING PROCESS

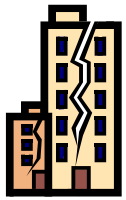
- CMRPC provides technical assistance to the Town for plan development
- The Town coordinates through its Local Hazard Mitigation Team
- Public Survey
- Public presentation (tonight), during plan development and review of the draft plan
- Submittal of Draft Plan to MEMA and FEMA for review, revision, and approval
- Plan adoption by the Select Board

DEVELOPMENT OF THE PLAN

CMRPC assisted the Northborough Local Hazard Mitigation Planning Team to:

- Identify & Map Critical Facilities
- Identify & Map Locally Identified Hazard Areas
- Identify & Review Existing Mitigation Measures
- Identify and Prioritize New Mitigation Strategies
- Gather Feedback & Input from the Public



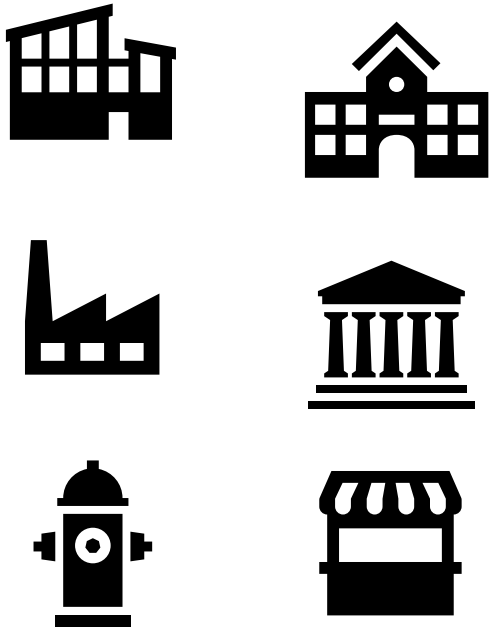



IDENTIFY CRITICAL FACILITIES

Database & GIS maps of critical facilities, infrastructure

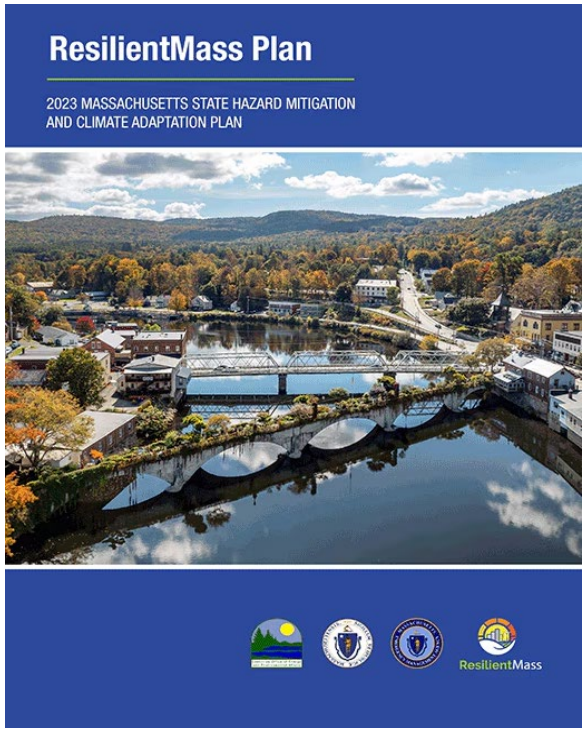
Sites identified include:

- Emergency Response Facilities
- Water Supply and Sewer Facilities, Town Facilities, and Utilities
- Dams
- Facilities and populations to protect



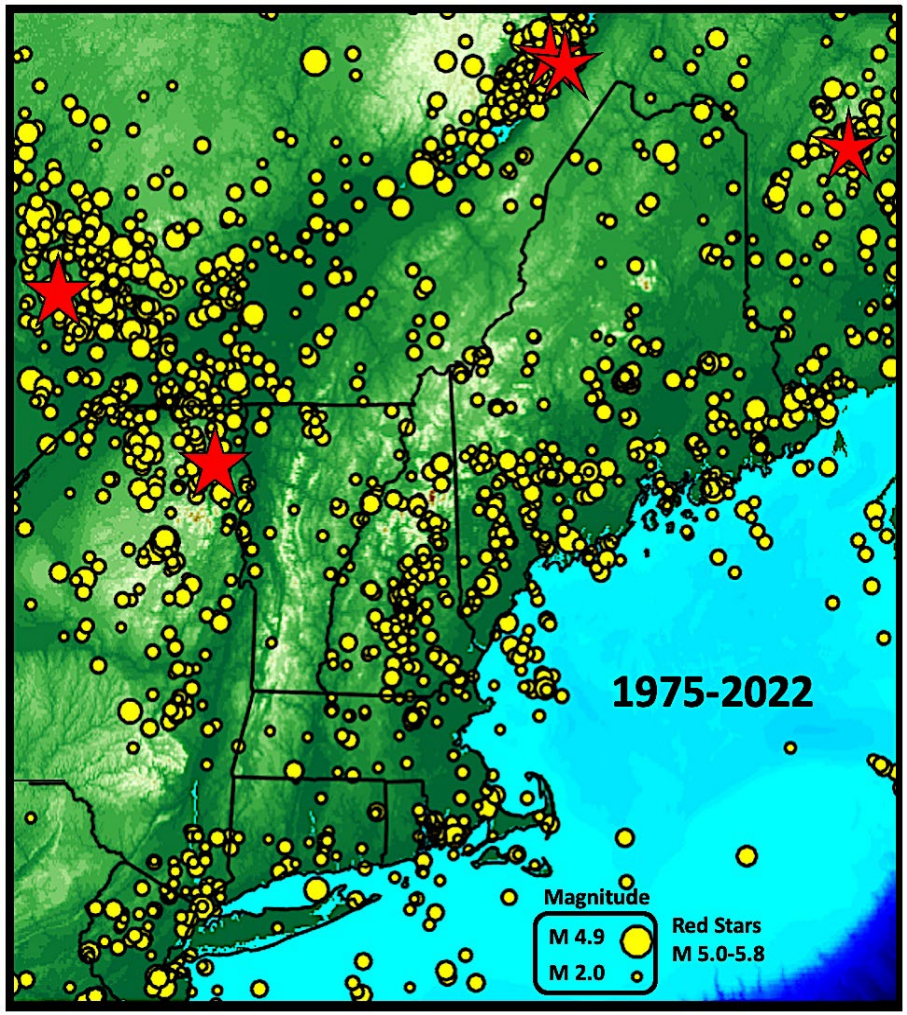
HAZARD IDENTIFICATION & MAPPING

- State & Federal data on floodplains, snowfall, wind speeds, hurricanes, earthquake risk, etc.
- Review Mass. State Hazard Mitigation Plan
- Coordinate with Local Team to get local information on hazard areas and potential future developments



OTHER HAZARDS – GEOLOGIC, WIND, & SNOW

Earthquakes from 1975 to 2022 2+ Magnitude



Recent Declared Hurricanes & Snow Disasters

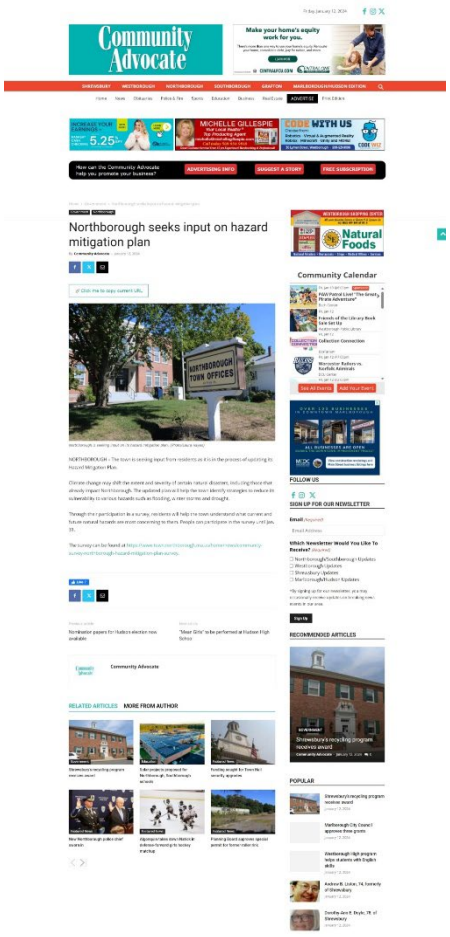
Disaster	Declaration Date	Incident Period	FEMA ID
Hurricane Lee	09/15/23	09/15/23 - 09/17/23	EM-3599-MA
Mashpee Wampanoag Tribe Tropical Storm Henri	08/22/21	8/20/21 -	3566-EM-Mashpee Wampanoag Tribe

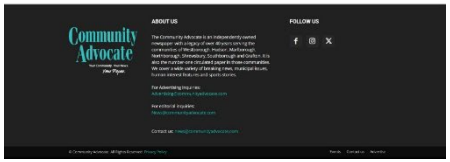
Disaster	Declaration Date	Incident Period	FEMA ID
Massachusetts Severe Winter Storm and Snowstorm	04/18/22	01/28/22 - 01/29/22	DR-4651-MA
Massachusetts Severe Winter Storm and Snowstorm	07/19/18	03/13/18 - 03/14/18	DR-4379-MA

SELECT LOCALLY-IDENTIFIED HAZARD AREAS

- Flooding
  - Several streets along Church St
  - SW Cutoff
- Severe Snow / Ice
  - Howard St
  - Ball Street
- Wildfire
  - Mt. Pisgah
  - Little Chauncy Pond
  - Edmunds Hill
- Potential Dam Failure
  - Bartlett Pond Dam on Bartlett St
  - Northborough Reservoir Dam in Shrewsbury
  - Smith Pond Dam on Otis St

PUBLIC SURVEY – Winter 2023-2024





- 213 total responses
- Hazards of greatest concern: winter storms / ice, thunderstorms / microbursts / extreme wind, and invasive plant hazards.
- The survey was promoted through the Town website, the Fire Department Facebook page, the Local Cable Access TV network, and the Community Advocate newspaper
  - Survey flyers and paper copies were also posted at several high traffic locations in town.

EXISTING MITIGATION MEASURES

MULITIHAZARD

- Comprehensive Emergency Management Plan (CEMP)
- Compliance with the state building code, AAB codes, and ADA codes
- Education and outreach
- Hazard warning systems and notifications
- SAFE and Senior SAFE Disaster Training Programs
- Plans, regulations, and studies
- Vegetative debris program

FLOOD RELATED HAZARDS

- National Flood Insurance Program
- Street sweeping
- Catch basin cleaning
- Roadway treatments
- Drainage preventive practices to reduce clogging
- Subdivision Rules and Regulations
- Zoning Regulations

DAM FAILURES

- State permits for dam construction
- DCR dam safety regulations

WIND-RELATED HAZARDS

- Tree trimming program

WINTER-RELATED HAZARDS

- Salting and sanding of roads and plowing

BRUSH FIRE RELATED HAZARDS

- Permits for outdoor burning
- Dredging fire ponds and maintaining fire roads

NORTHBOROUGH MITIGATION STRATEGIES

- Where are the GAPS?
- What actions will further reduce vulnerability?
- Where are the PRIORITIES?

DRAFT PLAN SELECT HIGH-PRIORITY MITIGATION MEASURES

- Map and maintain fire roads in conservation areas.
- Explore establishing a redundant MWRA connection to ensure a reliable water supply for the Town.
- Provide critical municipal facilities with backup power to provide heating and cooling in extreme conditions.
- Maintain and improve emergency services for vulnerable populations such as seniors.
- Evaluate, update, and maintain public safety communications system infrastructure.

PLAN APPROVAL AND ADOPTION

- The Draft plan will be reviewed by MEMA.
- FEMA will review the plan and is the agency that issues conditional approval.
- A Select Board resolution to adopt the plan can occur after FEMA conditional approval.
- FEMA issues final plan approval.
- The plan will be in effect for 5 years.

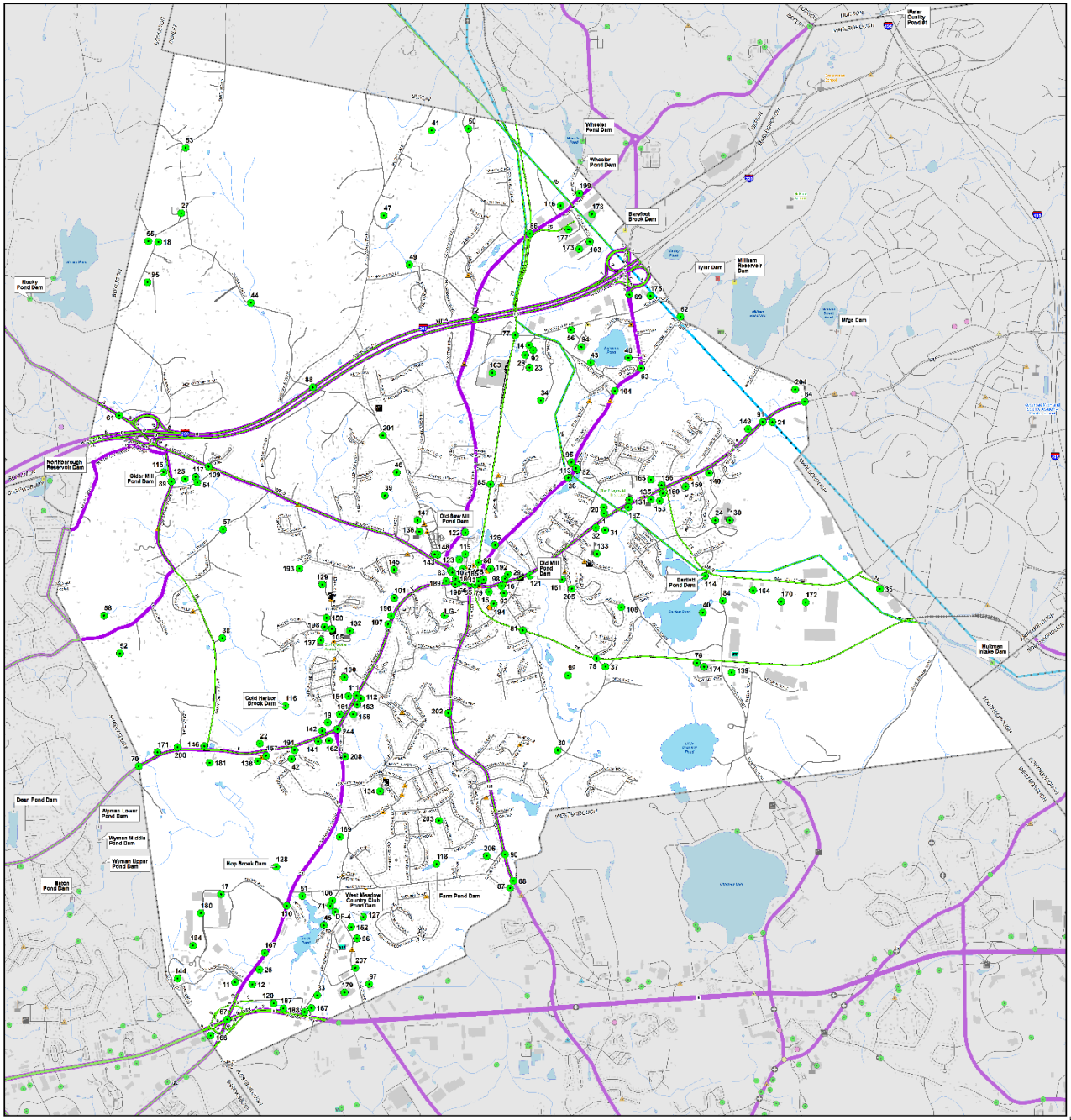
IMPLEMENTING THE PLAN
WHAT HAPPENS AFTER THE PLAN IS APPROVED?

- Establish a local implementation group.
- Prepare a timeline for implementation.
- Integrate the plan's recommendations with other local plans and policies.
- Seek FEMA and other funding sources and other resolutions for plan mitigation measures.
- Meet at least yearly to review progress of plan implementation.
- Update the plan every 5 years.

DRAFT PLAN

The full draft plan will be available on the Northborough town website.

Please send any comments on or questions about the plan to wtalbot@cmprc.org within two weeks of the draft plan being posted on the town website.



Hazard Mitigation Plan

Map 1
Critical Infrastructure and Facilities
Town of Northborough, Massachusetts

June 2024

Legend

- Assisted Living
- Clinics
- Elderly Housing
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Courts
- Water Treatment Plant
- Waste Water Treatment Plant
- Airports
- Town Halls
- Local Police
- Fire Station
- Schools (Pre-K through High School)
- Aqueducts
- Active Rail Line

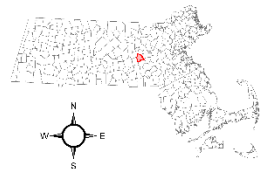
- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Dams (2/2012)

- High Hazard
- Significant Hazard
- Low Hazard
- N/A

Locally Defined

- Critical Infrastructure
- Critical Infrastructure
- Critical Infrastructure



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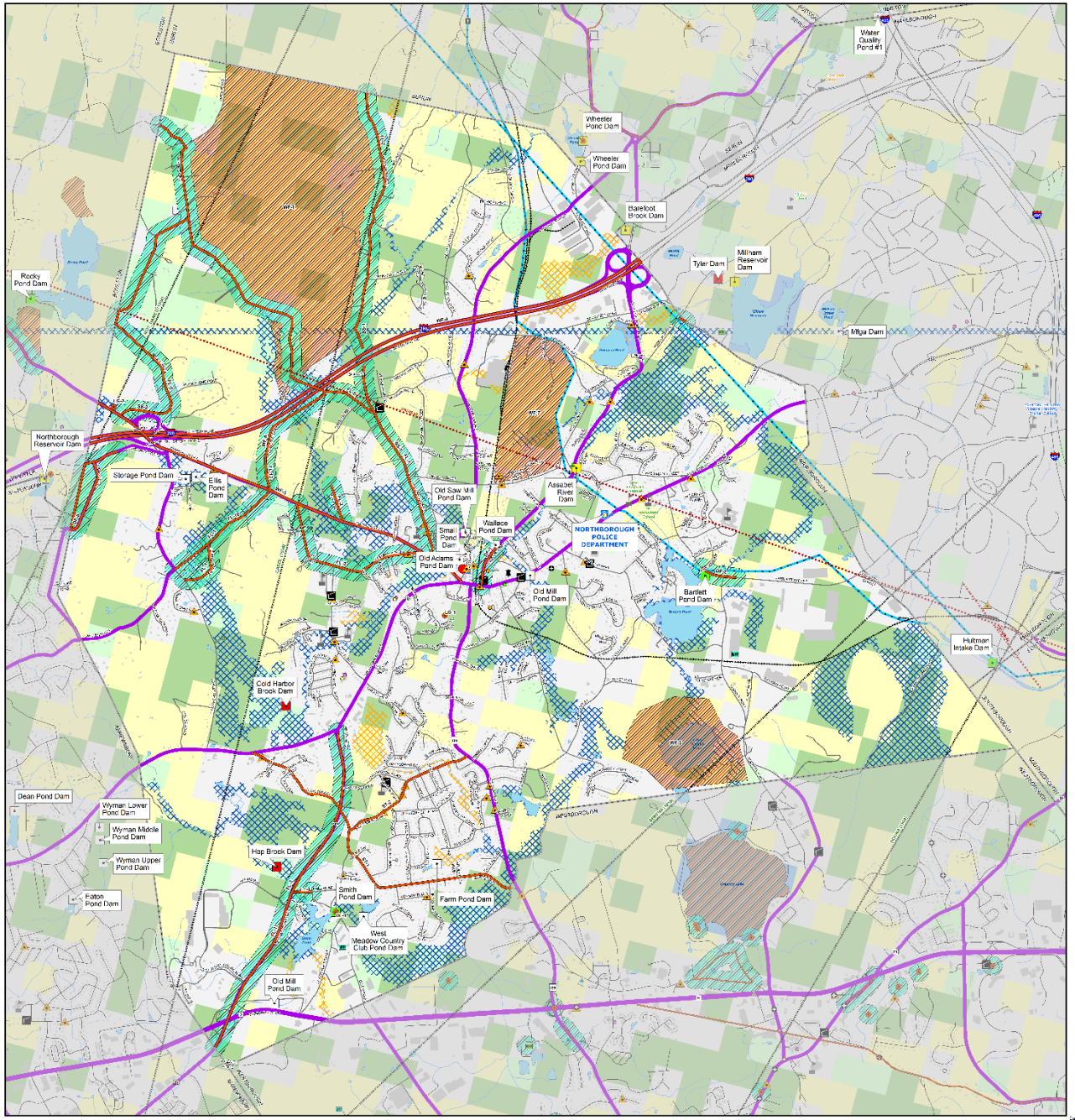

Hazard Mitigation Plan

Map 2
Hazards
Town of Northborough, Massachusetts

June 2024

Legend

- Assisted Living
- Clinics
- Elderly Housing
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Courts
- Water Treatment Plant
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- Aqueducts
- Active Rail Line

- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

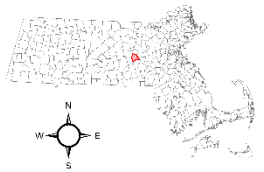
Hazards

Dams (2/2012)
- High Hazard
- N/A

FEMA DFIRM Flood Zones
- 100-year Flood Area*
- 500-year Flood Area
- Repetitive Loss Property Areas
- NOAA Historic Hurricane Tracks (1842-2022)

USDA Wildfire Hazard Potential, Version 2023
- 1: Very Low
- 2: Low
- 3: Moderate
- 4: High
- 5: Very High
- 6: Non-burnable
- 7: Water

Locally Defined Hazards
- Hazard
- Hazard
- Possible Flood Area Hazard



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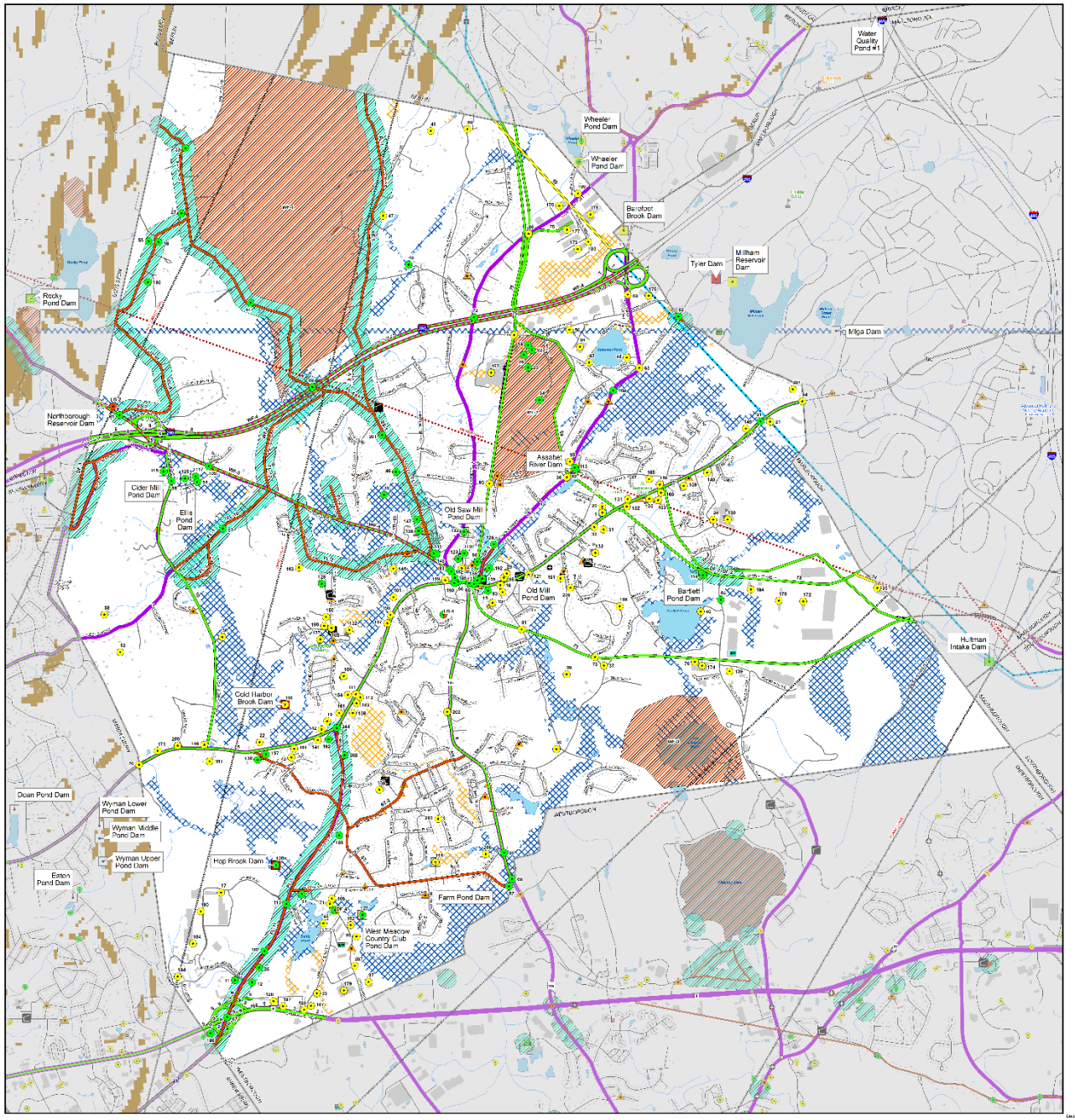
CMRPC



Hazard Mitigation Plan

Map 3
Vulnerable Critical Infrastructure and Facilities
Town of Northborough, Massachusetts
June 2024

Legend

- Assisted Living
- Clinics
- Elderly Housing
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Courts
- Water Treatment Plant
- Waste Water Treatment Plant
- Airports
- Town Halls
- Local Police
- Fire Station
- Schools (Pre-K through High School)
- Aqueducts
- Active Rail Line
- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Hazards

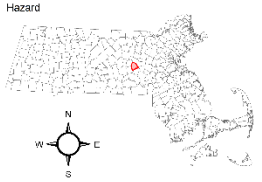
Dams (2/2012)
- High Hazard
- Significant Hazard
- Low Hazard
- N/A

FEMA DFIRM Flood Zones
- 1% Annual Chance Flood Hazard or Regulatory Floodway
- 0.2% Annual Chance Flood Hazard

- High Slope (15% and above)
- Repetitive Loss Property Areas
- NOAA Tornado Tracks (as of 9/2021)
- IBTrACS Historical Hurricane Tracks (1842-2020)

Locally Defined

- Hazard
- Vulnerable Critical Infrastructure
- Vulnerable Critical Infrastructure/ Hazard
- Non-vulnerable Critical Infrastructure
- Non-vulnerable Critical Infrastructure/ Hazard
- Hazard
- Vulnerable Critical Infrastructure
- Vulnerable Critical Infrastructure/ Hazard
- Non-vulnerable Critical Infrastructure
- Possible Flood Area
- Hazard
- Vulnerable Critical Infrastructure
- Non-vulnerable Critical Infrastructure



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CMRPC

Northborough
MASSACHUSETTS

Meeting Name:	Community: Northborough	Location: Town Hall Offices, 63 Main Street, Northborough, MA and Zoom
Northborough Hazard Mitigation Plan Select Board Meeting Public Presentation Date: July 15th, 2024		Meeting Time: 7:00 PM

Participant Name	Organization	Title	E-mail
Mitch Cohen	Select Board	Chair	
Laura Ziton		Clerk	
Lisa Maselli			
Michael Tietjen			
Julianne S. Hirsh			

CMRPC
Central Massachusetts Regional Planning Commission

Northborough
MASSACHUSETTS

Meeting Name:
Northborough Hazard Mitigation Plan
Select Board Meeting Public Presentation
Date: July 15th, 2024

Community: Northborough

Location: Town Hall Offices, 63 Main Street, Northborough, MA and Zoom

Meeting Time: 7:00 PM

Participant Name	Organization	Title	E-mail
Tim McInerney	TA Northborough	TA	TMcinerney@Town.Northborough.MA.US
ROBERT LICHT	HISTORIC DISTRICT COMM.	CHAIR	LICHTR@MSN.COM
NEAL ASPESI	FIRE DEPT	DC	NASPESI@TOWN.NORTHBOROUGH.MA.US
Patrick McManus	Fire Dept	Capt.	PMCMANUS@town.northborough.MA.US
Andy Doyle	Town	Town Clerk	adoyle@town.northboro.ma.us
Jeff Amberson	resident		KJA270@AOL.com
Dawn Rand	Fire Station Building Com.	Chair	MissDBR@aol.com
ROBERT THEVE	NFD	CAPT	rtheve@town.northborough.MA.US
Michael Parr	NFD / LEPC	HazMAT Asst	mparr@ " "
David Parenti	NFD/EMD	Chief	dparenti@ " "

CMRPC
Central Massachusetts Regional Planning Commission

Northborough
MASSACHUSETTS

Meeting Name:
Northborough Hazard Mitigation Plan
Select Board Meeting Public Presentation
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Participant Name	Organization	Title	E-mail
Scott Charpentier	DPW	Director	
Isabella Canuso	HHS	Director	icanuso@town.northborough.ma.us
~~Brian~~ Griffin	Police	Chief	BGriffin@Town.Northborough.MA.US
Lawrence Thompson	FD	Admin	LThompson@town.northborough.ma.US
Kelly Guenette	NSC	chair	Kguenette@nsboro.k12.ma.us
Mary Ellen Duggan	Public Schools	Nurse Leader	mduggan@nsboro.k12.ma.us
Richard P. Rand	Resident		RETTRand@Aol.com

APPENDIX E:

Public Comment

Period Outreach

Materials

Appendix E helps meet the following FEMA local mitigation plan requirements:

- *A1. "Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction?" (Requirement 44 CFR § 201.6(c)(1))*
- *A2. "Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process?" (Requirement 44 CFR § 201.6(b)(2)); and*
- *A3. "Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval?" (Requirement 44 CFR § 201.6(b)(1))*

Home

Town of Northborough Hazard Mitigation Plan

POSTED ON: JULY 15, 2024 - 12:06PM

Northborough Hazard Mitigation Plan

The Northborough Hazard Mitigation Team along with staff from the Central Massachusetts Regional Planning Commission (CMRPC) have worked diligently to develop a comprehensive Hazard Mitigation Plan.

- To view the draft Northborough Hazard Mitigation Plan - click here
- To submit comments or questions - click here

PUBLIC PRESENTATION Northborough Hazard Mitigation Plan

The Town of Northborough is hosting a public presentation at a Select Board meeting on the Town's draft Hazard Mitigation Plan update.

- *Attend to hear about draft mitigation strategies that can help the Town assess and reduce community risk from natural hazards.*
- *The draft plan will be posted on the town website for public review for two weeks following this presentation.*

During the Select Board meeting on Monday, July 15th, 2024 at 7pm at the Northborough Town Hall at 63 Main Street, in the Select Board's Meeting Room, on Zoom, on the Northborough Cable YouTube channel, and on Charter channel 192 and Verizon channel 30.

If you have any comments on the draft plan or would like more information, contact Will Talbot at wtalbot@cmrpc.org.

If you need assistance accessing the Municipal Center, call the Select Board's office at (508) 393-5040, extension 1.

CENTRAL MASSACHUSETTS Regional Planning Commission

Project funding is from the Massachusetts Emergency Management Agency (MEMA).

APPENDIX
F: Glossary

APPENDIX F

GLOSSARY OF TERMS

As used in this plan, these terms are defined as follows:

Blizzard – Issued for sustained or frequent gusts to 35 mph or more for an hour or greater and considerable falling and/or blowing snow. These conditions frequently occur alongside reduced to or below one-quarter mile. These conditions must be the predominant condition over a 3-hour period.

Blizzard warning - Sustained winds or frequent gusts of 35 mph or higher, occurring in combination with considerable falling and/or blowing snow. When proclaimed, these conditions are expected to prevail for a period of at least three (3) hours. Visibilities will frequently be reduced to less than one-quarter mile.

Blowing snow - Wind driven snow that reduces visibility to six (6) miles or less causing significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.

Community Lifelines - The most fundamental services in the community that, when stabilized, enable all other aspects of society to function (definition from FEMA)

Conflagration - A large destructive fire; which attains such intensity that it creates and sustains its own wind system. It is most commonly a natural phenomenon, created during some of the largest bushfires, forest fires, and wildfires.

Drifting snow - Uneven distribution of snowfall caused by strong surface winds. Drifting snow is usually associated with blowing snow.

Flurries – Intermittent light snow with no measurable accumulation; a light dusting is all that is expected.

Exposure - The people, property, systems, or functions that could be lost to a hazard. Generally, exposure includes what lies in the area that the hazard could affect.

Freeze - Occurs when the surface air temperature is 32 degrees Fahrenheit or below over a widespread area for a climatologically significant period of time. The term “freeze” is usually restrictive to advective situations or occasions when wind or other conditions prevent frost.

Freezing rain or drizzle – Rain that falls as a liquid but freezes into an icy glaze when it hits the ground or other surfaces such as trees, cars, and roads=.

Frost - The formation of thin ice crystals on the ground or other surfaces in the form of scales, needles, feathers, or fans. Frost develops when the temperature of the earth's surface falls below 32 degrees Fahrenheit, but because frost is primarily an event that occurs as the result of radiation cooling, it frequently occurs with air temperatures in the middle 30s.

Graupel - Small pellets of ice created when super-cooled water droplets coat or rime, a snowflake. The pellets are cloudy or white, not clear like sleet, and are often mistaken for hail. Same as snow pellets or small hail.

Gustnado - A whirlwind of dust or debris at or near the ground with no condensation funnel. Typically forms as an eddy in thunderstorm outflows.

Hail - A form of showery precipitation in the form of irregular pellets or balls of thin ice that occur when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice.

Heavy snow - This definition depends on the region of the USA. In Massachusetts, heavy snow means that six (6) or more inches of snow have fallen in 12 hours, or eight (8) inches in 24 hours. Heavy snow is also observed when snow is falling at a rate of one (1) inch per hour.

Heavy Snow Warning - Snow accumulations are expected to approach or exceed six (6) inches in 12 hours or eight (8) inches or more in 24 hours but will not be accompanied by significant wind. During a heavy snow warning, freezing rain and sleet are not expected.

Hurricane - An intense tropical cyclone in the Atlantic, Caribbean Sea, Gulf of Mexico, or eastern Pacific, which the maximum 1-minute sustained surface wind is 74 mph or greater.

Ice Storm - An ice storm is used to describe occasions when damaging accumulation of ice are expected during freezing rain situations. Significant accumulations of ice are recognized to pull down trees and utility lines, resulting in power loss; they are defined as one-quarter inch or greater.

Ice Storm Warning – Predicted significant coating of freezing rain; one-quarter inch or more is expected to accumulate in an area.

Invasive Species - A species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (definition from the Invasive Species Advisory Committee of the U.S. Department of the Interior).

Mitigation - The process of reducing the severity of the impact of natural hazards through planning. Each hazard requires a specific type of mitigation. In some cases, we can use engineering solutions (such as an earthquake-resistant building) to at least temporarily reduce the impact of a natural hazard. In other cases, the only form of mitigation that is guaranteed to be successful is to limit or not allow human activities where the hazard occurs (such as in floodplains).

Natural Disaster - A hazard event caused by nature or the natural process of the earth, such as a flood or tornado. Natural disasters result in widespread destruction or death to the lives of individuals, damaging their property, causing economic loss and/or the inability for a population to rebuild.

Natural Hazard - An act or phenomenon that has the potential to produce harm or other undesirable consequences to a person or thing.

Risk - Depends on all three factors: hazard, vulnerability, and exposure. Risk is the estimated impact that a hazard would have on people, services, facilities, and structures in a community. It refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.

Sleet – Pellets of ice composed of frozen or mostly frozen rain drops or refrozen partially melted snowflakes. Sleet usually bounces when hitting a surface and does not stick to objects. However, it can accumulate like snow and cause a hazard to motorists. Heavy sleet occurs when a half of an inch of sleet accumulates

Snow Showers - Snow falling at varying intensities for brief periods of time. Some accumulation is possible.

Snow Squalls - Intense, but of limited duration, periods of moderate to heavy snowfall, accompanied by strong, gusty surface winds and possible lightning.

Storm Surge – An abnormal rise in sea level, accompanying a hurricane or other intense storm, whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the cyclone. Storm surge is usually estimated by subtracting the normal or astronomic tide from the observed storm tide. Storm surges can reach 25' high and 50-100 miles wide. This can cause severe erosion, major flooding and extensive damage to coastal areas.

Sustained Wind - Two-minute average wind measured at about 33' above the surface. BB.

Technological Disaster - A disaster that results from a technological or man-made hazard event.

Technological Hazard - A hazard that originates in accidental or intentional human activity (oil spill, chemical spill, building fires, terrorism, etc.)

Tropical Depression - A tropical cyclone in which the maximum 1-minute sustained surface wind is 38 mph or less.

Tropical Storm - A tropical cyclone in which the maximum 1-minute sustained surface wind ranges from 39-73 mph.

Vulnerability - Susceptibility to physical injury, harm, damage, or economic loss. It depends on an asset's construction, contents, and economic value of its functions. Vulnerability assessment provides the extent of injury and damages that may result from a hazard event of a given intensity in a given area.

Wind Chill Warning - Life-threatening wind chills reaching minus 50 degrees Fahrenheit or lower. Criteria varies by state.

Watch (Storm) - A watch is used when the risk of a hazardous weather event has increased significantly, but the occurrence, location and timing are still uncertain.

Warning/Advisory (Storm) - These products are issued when a hazardous weather event is occurring, is imminent, or has a very high probability of occurrence. A warning is used for conditions posing a threat to life or property. Advisories are for less serious conditions that cause significant inconvenience and, if caution is not exercised, could lead to situations that may threaten life and property.

Whiteout - A condition caused by falling and/or blowing snow that reduces visibility to nothing or zero miles; typically, only a few feet. Whiteouts can rapidly occur, blinding motorists and creating chain-reaction crashes involving multiple vehicles. Whiteouts are most frequent during blizzards.

Wind Chill - The wind chill is based on the rate of heat loss from exposed skin caused by the combined effects of wind and cold. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature. This temperature is the reading the body "feels" given the combination of wind and air temperature. At wind speeds of four (4) mph or less, the wind chill temperature is the same as the actual air temperature. The threshold for potentially dangerous wind chill conditions is about negative 20 degrees Fahrenheit.

APPENDIX G:

Certificate of

Adoption

TOWN OF NORTHBOROUGH

Town Hall
63 Main Street
Northborough, MA 01532

SELECT BOARD

selectboard@town.northborough.ma.us
www.town.northborough.ma.us
(508) 393-5040 x1

CERTIFICATE ADOPTION
SELECT BOARD
TOWN OF NORTHBOROGH, MASSACHUSETTS

A RESOLUTION ADOPTING THE *NORTHBOROUGH HAZARD MITIGATION PLAN*

WHEREAS, the Town of Northborough established a Committee to prepare the 2025 update of the *Northborough Hazard Mitigation Plan*; and

WHEREAS, the updated *Northborough Hazard Mitigation Plan* contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Northborough; and

WHEREAS, duly-noticed public meetings were held by the LOCAL HAZARD MITIGATION PLANNING TEAM on July 15, 2024; and August 4, 2025

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

NOW, THEREFORE BE IT RESOLVED that the Town of Northborough SELECT BOARD adopts the 2025 update of the *Northborough Hazard Mitigation Plan*, in accordance with M.G.L. 40 or the charter and bylaws of the Town of Northborough.

ADOPTED AND SIGNED this day, August 4, 2025

Julianne S. Hirsh, Chair

Laura Ziton, Vice Chair

Michael Tietjen, Clerk

Jonathan Rea, Member

Jacob Jones, Member

This Certificate of Adoption helps meet the following FEMA local mitigation plan requirements:

- *F1. "For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance?" (Requirement 44 CFR § 201.6(c)(5)).*