

# Berlin Hazard Mitigation Plan



Golden Skep Farms, Berlin, MA.  
Source: Town of Berlin, Massachusetts website.



**CENTRAL MASSACHUSETTS  
Regional Planning Commission**

Adopted by the Select Board

March 16th, 2026

Prepared by **Central Massachusetts  
Regional Planning Commission**

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Select Board  
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**CERTIFICATE OF ADOPTION SELECT BOARD  
TOWN OF BERLIN, MASSACHUSETTS**

A RESOLUTION ADOPTING THE *BERLIN HAZARD MITIGATION PLAN*

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

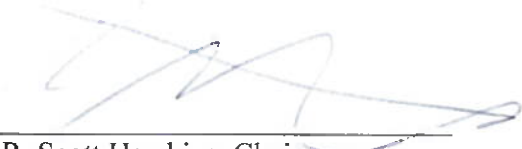
**WHEREAS**, the updated *Berlin Hazard Mitigation Plan* contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Berlin; and

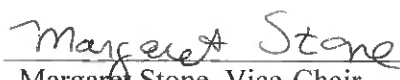
**WHEREAS**, duly noticed public meetings were held by the LOCAL HAZARD MITIGATION PLANNING TEAM on March 10, 2025 and March 16, 2026; and

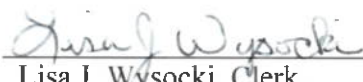
**WHEREAS**, the Town of Berlin authorizes responsible departments and/or agencies to execute their responsibilities demonstrated in the plan.

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

**ADOPTED AND SIGNED** this 16th day of March, 2026.

  
\_\_\_\_\_  
R. Scott Hawkins, Chair

  
\_\_\_\_\_  
Margaret Stone, Vice-Chair

  
\_\_\_\_\_  
Lisa J. Wysocki, Clerk

*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 Berlin by the Central Massachusetts Regional Planning Commission (CMRPC).

The Berlin 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.

The Berlin Hazard Mitigation Planning team, consisting of local staff and volunteers, includes:

Kristen Rubin, Town Administrator

Michael McQuillen, Fire Department, Chief of the Department

Jon Paulino, Fire Department, Lieutenant and Fire Prevention Officer

Eric Schartner, Police Department, Chief of the Department

Abigail Vianna, Public Safety Department, Administrative Assistant

Fred Cummings, Jr., Highway Department, Superintendent

Richard Hanks, Inspectional Services, Building Commissioner

Tim Wheeler, Planning Board, Member

Carolyn MacDonald, Conservation Commission, Chair

Mattie Vandenboom, Conservation Commission, Conservation Agent

June Poland, Town Accountant

CMRPC would also like to thank Dee Green, Administrative Assistant to the Town Administrator, for her help throughout the HMP update process and Linda White from Highland Ridge for her participation in the planning process.

In addition, CMRPC would like to thank Kristina Johnson, Director of Hudson Planning and Community Development; Jeff Zukowski, Hazard Mitigation Planner at MEMA; Shelly O’Toole, Hazard Mitigation Supervisor at MEMA; Ray Ferrin, Local Coordinator at MEMA; Paula Davison, Regional Engineer at MA DCR; Ngala Shofola, Civil Engineer at MA DCR; Matt Brown, Executive Director at OARS; Heather Cockerton, Ecological Restoration Coordinator at OARS; Sarah Widing, Senior Water Resources Engineer at Interfluve; Joseph Bibbo, Program Manager at the MWRA; and Matthew Oates, Engineering Director at Benderson Development for their participation in the planning process for the High Hazard Potential Dams Appendix.

We would also like to thank the staff of the Central Massachusetts Regional Planning Commission for facilitating the process and preparing this document.

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We would also like to extend our gratitude to the Massachusetts Emergency Management Agency (MEMA) for their guidance and feedback regarding this plan. We would especially like to thank Ray Ferrin, the MEMA Local Coordinator for Berlin and nearby communities, for his active involvement and guidance in the planning process.

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## 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 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 Berlin, 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 Berlin. The negative effects of these natural hazards on the built environment can lead to these events to be classified as natural disasters. As climate change continues to progress, the severity and frequency of the risks caused by natural hazards 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 Berlin 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:

- B1. “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 2021 Hazard Mitigation Grant Program grant to the Town of Berlin from the Federal Emergency Management Agency (FEMA) through the Massachusetts Emergency Management Agency (MEMA).

The planning process in Berlin 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 Berlin 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. 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 Berlin. 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 Berlin Hazard Mitigation Planning team, consisting of local staff and volunteers, included:

Kristen Rubin, Town Administrator

Michael McQuillen, Fire Department, Chief of the Department

Jon Paulino, Fire Department, Lieutenant and Fire Prevention Officer

Eric Schartner, Police Department, Chief of the Department

Abigail Vianna, Public Safety Department, Administrative Assistant

Fred Cummings, Jr., Highway Department, Superintendent

Richard Hanks, Inspectional Services, Building Commissioner

Tim Wheeler, Planning Board, Member

Carolyn MacDonald, Conservation Commission, Chair

Mattie Vandenboom, Conservation Commission, Conservation Agent

June Poland, Town Accountant

To discuss hazard areas, critical infrastructure and other community assets, and plan priorities and strategies, the Hazard Mitigation Planning Team met ten times on August 6<sup>th</sup>, 2024, September 12<sup>th</sup>, 2024, October 9<sup>th</sup>, 2024, November 13<sup>th</sup>, 2024, December 18<sup>th</sup>, 2024, January 15<sup>th</sup>, 2025, February 4<sup>th</sup>, 2025, March 5<sup>th</sup>, 2025, March 26<sup>th</sup>, 2025, and April 24<sup>th</sup>, 2025. Between meetings and during the development of the draft and final plans, information and comments were shared among the local team and CMRPC. On October 16<sup>th</sup>, 2024, the Hazard Mitigation Planning team launched a public survey to gauge residents, workers, visitors, and business owners' concerns about and experiences with natural hazards in the Town of Berlin. The survey was distributed on the Town's website, the Town's social media pages, and the Powderhouse News digital newsletter. Printed flyers for and copies of the survey were distributed around the Town, including at the public library, municipal offices, general store, 19 Carter Community Center, and transfer station as well as at three housing developments in town: North Brook Village, Meadow Brook Village, and Rockwell Apartments. A total of 59 responses were collected. Survey responses were discussed by the local planning team at its December 2024 meeting and helped inform the development and prioritization of the plan's mitigation strategies. Representatives from the surrounding communities of Boylston, West Boylston, Clinton, Bolton, Hudson, Marlborough, and Northborough were invited to comment on the draft plan during the public comment period in an effort to gather input.

As planning activities progressed, a public presentation was made by CMRPC and the local planning team on March 10<sup>th</sup>, 2025 at a Berlin Select Board meeting to provide a summary of key aspects of the draft plan report. The presentation was able to be attended remotely via Zoom and was broadcast on the Town's YouTube channel; 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 on the Town's website for public comment for two weeks from May 14<sup>th</sup>, 2025 through May 28<sup>th</sup>, 2025. 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 and members of the public during the public presentation and from a community lifeline stakeholder 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; Feedback received during the public presentation informed the development of the mitigation strategy relating to improving town emergency personnel's access to the Mount Pisgah Conservation Area, community lifeline stakeholder feedback from Interfluve informed the descriptions of and mitigation strategy relating to progress on moving towards removing the Wheeler Pond Dam, and feedback received from the community survey informed the descriptions of and mitigation strategy relating to basement flooding.

The final draft plan was submitted to MEMA for review on July 14<sup>th</sup>, 2025 and then relayed to FEMA for federal review. After receiving FEMA's notice of approval pending adoptions on February 18<sup>th</sup>, 2026, the plan was formally adopted by a vote of the Select Board at their March 16<sup>th</sup>, 2026 meeting.

The Berlin 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

Administrator on the local hazard mitigation planning team and the consistent participation of the Planning Board and Conservation Commission members during the meetings. In addition, CMRPC, which is the State-designated Regional Planning Agency (RPA) for Berlin, works with all agencies that regulate development in its region; these agencies 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 and any mitigation strategies or hazards identified by these entities and agencies were incorporated in this Berlin 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 toward 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.”<sup>1</sup> In addition, these community lifelines were sent a survey in which they could describe any concerns related to natural hazards in Berlin they have as well as how they would like to participate in the Berlin HMP planning process.

#### **Safety and Security Lifelines:**

- National Grid
- Eversource
- The Massachusetts Water Resources Authority

#### **Schools**

- The Growing Room of Berlin (71 River Road West, Berlin, MA)
- Berlin-Boylston School District
  - Berlin Memorial School
  - Tahanto Regional Middle/High School
  - Boylston Elementary School

#### **Food, Water, and Shelter Lifelines:**

- Food
  - Berlin Family Food Pantry (23 Linden Street, Berlin, MA)
  - Berlin General Store (19 Central Street, Berlin, MA)
  - Market Basket (8 Highland Common E, Hudson, MA)
  - WHEAT Community Connections and WHEAT Community Cafe (272 High Street, Clinton, MA)
  - Shaw’s (201 Washington St, Hudson, MA)

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<sup>1</sup> 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](https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-policy-guide_042022.pdf).

- **Emergency Shelter Lifelines:**
  - Municipal Offices (23 Linden St, Berlin MA)
  - Berlin Memorial School (34 South St, Berlin MA)
  
- **Special Needs Population/ Elderly Housing/ Assisted Living/ Low-Income Housing**
  - Northbrook Village I & II (135 Pleasant St, Berlin MA)
  - Sawyer Hill EcoVillage Co-Housing (22 Village Lane, Berlin, MA)
  - Highland Ridge 55+ Duplexes (64 Highland St, Berlin, MA)
  - The Hilltop at Berlin Woods (aka Green Acres) (Parker Road, Berlin, MA)
  - Autism Behavioral Center (1 Whitney Road, Berlin, MA)
  - Meadowbrook Village (Brook Lane, Berlin, MA)

**Faith Communities**

- First Parish Church of Berlin
- St Joseph the Good Provider

**Health and Medical Lifelines:**

- **Hospitals / Clinics**
  - Acton Medical Associates (36 Highland Common East, Berlin, MA)
  - Emerson Urgent Care (38 Highland Common East, Hudson, MA)
  - UMass Health Alliance Clinton Hospital (201 Highland St, Clinton, MA)
  - Berlin Animal Hospital (240 Central St, Berlin, MA)
  
- **Pharmacy**
  - CVS Pharmacy (423 Donald Lynch Boulevard, Marlborough, MA)

**Communications Lifelines:**

- Charter/Spectrum
- Verizon

**Transportation Lifelines:**

- CSX Rail Line

**Hazardous Materials Lifelines:**

- STERIS
- Hudson Transfer Station
- Berlin Transfer Station

## 2.0 COMMUNITY PROFILE AND DEVELOPMENT TRENDS

### 2.1 REGIONAL AND COMMUNITY PROFILE

The Central Massachusetts Regional Planning Commission (CMRPC) 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 3,158 reside in Berlin.<sup>2</sup>

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. Berlin is located in the northeast sub-region, which consists of the following five towns located to the east and northeast of Worcester: Berlin, Boylston, Shrewsbury, Northborough, 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.<sup>3</sup> According to this same source, between 2003 and 2024, average annual precipitation in the Worcester, MA area has been relatively high at 51.32 inches,<sup>4</sup> and, between 1999-2000 and 2023-2024, average annual snowfall has been 70.7 inches.<sup>5</sup> Approximately 30 miles from the Atlantic coast, Berlin and its neighboring communities are subject to a variety of types of severe storms, including hurricanes, nor'easters, thunderstorms, and blizzards.

The District of Berlin, Massachusetts, was incorporated in 1784, and it later formed the Town of Berlin in 1812. Berlin is situated between the Nashua River and Assabet River Valleys and sits along or near two major interstate highways. Interstate 495 (I-495), which is a radial beltway around Greater Boston, runs across the east of the Town, connecting it to surrounding areas like Marlborough and various other communities in the suburbs of Boston. Additionally, Interstate 290

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<sup>2</sup> 2020 Census table P1, Data.Census.gov, United States Census Bureau, accessed January 21, 2025, [https://data.census.gov/profile/Berlin\\_town,\\_Worcester\\_County,\\_Massachusetts?g=060XX00US2502705490](https://data.census.gov/profile/Berlin_town,_Worcester_County,_Massachusetts?g=060XX00US2502705490)

<sup>3</sup> 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>.

<sup>4</sup> 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>.

<sup>5</sup> 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>.

(I-290), an auxiliary interstate highway that is an east-west spur route that connects Auburn, Worcester, Shrewsbury, Northborough and Marlborough, passes through Marlborough near its northern border; there is an easy connection into Berlin from I-290 in Marlborough via Solomon Pond Road / River Road West.

Berlin is known in the region for its open spaces, its cultural and natural assets, its historic town center, and its distinctive rural character. As the Town is a “Right to Farm” Community, Berlin’s Town Bylaws promote the pursuit of agriculture and promote agriculture-based economic opportunities within town.<sup>6</sup> Berlin has an area of 13.1 square miles.<sup>7</sup> The Town has a healthy employment base, and its residents have consistently had a low unemployment rate below the national average; This rate was 3.9% in 2021, 3.1% in 2022, and 2.9% in 2023. As reported in December 2024, 2,279 Berlin residents were employed and 81 Berlin residents were unemployed.<sup>8</sup>

Given its recent population trends and the population growth rate of 34% in the last two decades, Berlin’s population is projected to continue growing.<sup>9</sup> According to the 2023 Town of Berlin Housing Production Plan, Berlin is projected to grow to having 3,736 residents by 2040 and 4,047 residents by 2050.<sup>10</sup> The Town saw high growth between 1950 and 1970 when the population grew from 1,349 to 2,099. In the 1980s, the Town’s growth rate fell to 5.5%, and it remained less than 5% in the following two decades. The growth rate rose again in the 2000s to 24.1% and then fell back to 10.2% in 2010. The population grew from 2,380 in 2000 to 3,158 in 2020.<sup>11</sup>

According to the 2020 US Census, 2,796 individuals (88.5% of Berlin’s population) identify as white, 38 individuals (1.2% of the Town’s population) identify as Asian, 18 individuals (0.6% of the Town’s population) identify as Black or African American, 47 individuals (1.4% of the Town’s population) identify as some other race, and 226 individuals (7.1 % of the Town’s population) identify as belonging to two or more races.<sup>12</sup> In addition, according to the 2020 Census, 127 individuals, or 4.5% of Berlin residents, identify as Latino or Hispanic.<sup>13</sup>

The median age in town, according to the 2020 US Census, is 47.3 years old, which is comparatively

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<sup>6</sup> Town of Berlin, “Right to Farm community,” [www.townofberlin.com](http://www.townofberlin.com), accessed February 18, 2025.

<https://www.townofberlin.com/agricultural-commission/pages/%E2%80%9Cright-farm%E2%80%9D-community>

<sup>7</sup> Massachusetts Department of Economic Research, “Municipal Employment Data: Berlin - 2010,” accessed February 19, 2025. <https://lmi.dua.eol.mass.gov/lmi/MunicipalEmploymentData/LmiTown?A=000263>

<sup>8</sup> Massachusetts Department of Economic Research, “Municipal Employment Data: Berlin - 2010,” [lmi.dua.eol.mass.gov](http://lmi.dua.eol.mass.gov), March 2024, <https://lmi.dua.eol.mass.gov/lmi/MunicipalEmploymentData/LmiTown?A=000269>.

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

<sup>10</sup> Town of Berlin Housing Production Plan 2023; accessed Feb 19, 2025; <https://cmrpc.org/wp-content/uploads/2024/02/Berlin-Housing-Production-Plan-2023.pdf>

<sup>11</sup> “Berlin,” [Cmrpc.org](http://cmrpc.org), Central Massachusetts Regional Planning Commission, accessed Feb 20, 2025, <https://cmrpc.org/data-center/community-snapshots/berlin/>

<sup>12</sup> “DP1: Profile of General Population and Housing Characteristics,” [Data.Census.gov](http://Data.Census.gov), United States Census Bureau, accessed Feb 20, 2025; [https://data.census.gov/profile/Berlin\\_town,\\_Worcester\\_County,\\_Massachusetts?g=060XX00US2502705490#populations-and-people](https://data.census.gov/profile/Berlin_town,_Worcester_County,_Massachusetts?g=060XX00US2502705490#populations-and-people) ; *2023 American Community Survey 5-Year Estimates* (table: [S0101](https://data.census.gov/tables//2023/acs/5yr/S0101))

<sup>13</sup> “P9: Hispanic or Latino, and Not Hispanic or Latino By Race,” 2020 Decennial Census, [Data.Census.gov](http://Data.Census.gov), United States Census Bureau, accessed Feb 20, 2025; <https://data.census.gov/table/DECENNIALDHC2020.P9?t=Race+and+Ethnicity&g=060XX00US2502705490>

much higher than the State's median age of 39.9.<sup>14</sup> As per the 2023 American Community Survey 5-year estimates, the median age in Berlin has risen to 50.4, and 30.4% of the population in Berlin is 65 years and older, compared to 17.6% of the population in Worcester County. Of this 30.4% of the population, 17.9% are between 65-74 years old, 9.0% are between 75-84 years old, and 3.6% are 85 years old and older. According to the 2023 American Community Survey 5-Year-Estimate, 12.5% of the Town's population is under 18 years old.<sup>15</sup>

At \$122,411, median household annual income in Berlin (according to 2023 American Community Survey 5-year estimates) is significantly higher than the State's median household annual income of \$99,858 and Worcester County's median household annual income of \$94,099.<sup>16</sup> The poverty rate in town (according to 2022 ACS 5-year estimates) is 4.7%,<sup>17</sup> which is less than half of the State's and Worcester County's poverty rates of 10% and 10.3% respectively.<sup>18</sup>

According to 2023 ACS 5-year estimates, there are 1,502 housing units in Berlin, MA, of which 96.3% or 1,447 units are occupied. 1,155 units or 79.8% of units in town are owner-occupied, and 20.2% of units in town are renter-occupied.<sup>19</sup> The median value of the owner-occupied housing units in town is estimated to be \$566,800 as of the 2023 ACS 5-year estimates; housing costs in Town are relatively higher compared to in the State and to Worcester County, whose comparable numbers are \$525,800 and \$390,700, respectively.<sup>20</sup> 73.5% of occupied homes in town are single-family homes (detached or attached), and 25.9% are multi-unit structures.<sup>21</sup> According to the 2020 US Census, Berlin's vacancy rate is 4.4%, which is relatively lower than the comparable rates in the State and Worcester County, which are 8.3% and 5.7%, respectively.<sup>22</sup>

According to 2023 ACS 5-year estimates, the ages of the houses in Berlin range from very old to new – 20.1% of occupied units were built before 1939, 9.6% were built between 1940 and 1959, 13% were built between 1960 and 1979, 16.8% were built between 1980 and 1999, 18.8% were built between 2000 and 2009, and 21.7% were built between 2019 and 2023.<sup>23</sup>

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<sup>14</sup> Ibid

<sup>15</sup> "S0101: Age and Sex." 2023 American Community Survey 5 Year Estimate. Data.Census.gov. United States Census Bureau, accessed Feb 20, 2025, <https://data.census.gov/table/ACSST5Y2023.S0101?g=060XX00US2502705490>

<sup>16</sup> "S1901: Median Income in the Past 12 Months (in 2023 Inflation-Adjusted Dollars)," Data.Census.gov, United States Census Bureau, accessed Feb 21, 2025, [https://data.census.gov/table/ACSST1Y2023.S1901?g=040XX00US25\\_050XX00US25027\\_060XX00US2502705490](https://data.census.gov/table/ACSST1Y2023.S1901?g=040XX00US25_050XX00US25027_060XX00US2502705490)

<sup>17</sup> "S1701: Poverty Status in Last 12 Months," 2023 American Community Survey 5-Year Estimates. Data.Census.gov, United States Census Bureau, accessed Feb 20, 2024, [https://data.census.gov/table/ACSST5Y2023.S1701?g=040XX00US25\\_050XX00US25027\\_060XX00US2502705490](https://data.census.gov/table/ACSST5Y2023.S1701?g=040XX00US25_050XX00US25027_060XX00US2502705490)

<sup>18</sup> Ibid

<sup>19</sup> "DP04: Selected Housing Characteristics," 2023 American Community Survey 5-Year Estimates. Data.Census.gov, United States Census Bureau, accessed Feb 20, 2024, <https://data.census.gov/table/ACSDP5Y2023.DP04?g=060XX00US2502705490>

<sup>20</sup> Ibid

<sup>21</sup> "S2504: Physical Housing Characteristics for Occupied Housing Units," Data.Census.gov, United States Census Bureau, accessed February 21, 2025, <https://data.census.gov/table/ACSST5Y2023.S2504?g=060XX00US2502705490>

<sup>22</sup> "DP1: Profile of General Population and Housing Characteristics," Data.Census.gov.

<sup>23</sup> "S2504: Physical Housing Characteristics for Occupied Housing Units," Data.Census.gov. United States Census Bureau, accessed February 21, 2025, <https://data.census.gov/table/ACSST5Y2023.S2504?g=060XX00US2502705490>

## 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 Berlin Development Projects between 2018 - 2024**

Name	Status	Permitting Years	Housing Units	Commercial SQ Feet	Project Type
Riverbridge	Complete	2009-2020	201	Retail: 148000	Mixed Use/ large multifamily
Southwood Commons	Complete	2021-2023	12	0	Single Family
West Street Crossing	Complete	2021-2021	5	0	Single Family
Gibbs Road	Complete	2019-2022	5	0	Single Family
Highland Ridge	Complete	2021-2024	66	0	Single Family

The Town of Berlin is a suburban town with rural characteristics, though it has large highways connecting it to the rest of the state which have led to ongoing economic pressure in town to develop additional housing and commercial projects. In the last five years, a large mixed-use/ multifamily project called Riverbridge at the South Berlin rotary has been completed where River Road West, Whitney Road, and South Street converge. Spread over 112 acres, this project has 201 housing units and 148,000 square feet of retail space. 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 other single family residential projects have also been completed in town over the last few years, including a 66-unit project called Highland Ridge at 32 Campbell Road and smaller projects at Southwood Commons (12 units), Gibbs Road (5 units), and West Street Crossing (5 units). There are no new projects in the pipeline as per town data.

Recent development in Berlin has slightly increased the Town’s overall vulnerability to natural hazards, as 9 of the 60 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. Five of these properties have buildings located in locally identified flooding hazard areas, two of these properties have buildings located in locally identified wildfire hazard areas, one of these properties has a building located in a locally identified microburst hazard area, one of these properties has a building located in a locally identified dam failure hazard area (notably for which the dam is being removed), and one of these properties has buildings located in the 100-year and 500-year flood zones. Notably, other areas of town are likely to have a similar level of risk to potential future microbursts as areas along the locally identified microburst hazard

area's path.

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. As climate change increases natural hazard risks and residential development increases, it will be especially important to standardize the incorporation of resilience measures in new development. 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 from the areas of highest vulnerability.<sup>24</sup>

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. Berlin 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 resources 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 Berlin needs to be in line with the State Building Code. In addition, on May 2<sup>nd</sup>, 2011, Berlin codified a Stretch Energy Code based on the International Energy Conservation Code (IECC) 2009 building code created by the International Code Council; this stretch code went into effect on January 1<sup>st</sup>, 2012.<sup>25</sup> This Stretch Energy Code provides a more energy efficient

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<sup>24</sup> 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>.

<sup>25</sup> "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>.

alternative to the base energy code for both new construction and existing buildings in Berlin, strengthening the Town's climate resilience and hazard mitigation capabilities.

The Town of Berlin has been a Green Community since it was designated in 2012. Berlin is one of over 300 other municipalities participating in the Green Communities Program, and the Town has hit the 20% energy reduction that was committed to when becoming a Green Community. On August 15, 2024, the Town of Berlin joined the National Grid Community Solutions Program and signed a non-binding MOU which establishes a special offering of integrated technical, financial, and operational support by National Grid to the portfolio of existing town-owned facilities. This partnership is intended to increase energy efficiency in the Town's building stock, improve comfort in buildings, and reduce adverse environmental impacts.

As the population of Berlin 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 Berlin adopted an Open Space and Recreation Plan and the Municipal Vulnerability Plan; the Town also adopted a Housing Production Plan in 2023. 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 Berlin.

## 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 BERLIN

This Critical Facilities List for the Town of Berlin 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:

- Berlin'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.

Berlin'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 Berlin),
- 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 2: Emergency Response Facilities in Berlin**

Type	Name	Address	Details	Has Emergency Generator?
<b>Emergency Operations Center/Police Station</b>	Police Station	23 Linden Street	This station was noted as vulnerable to lightning strikes by the local HMP team and CMRPC's GIS analysis. It is also located near but not in the high slope (15% and above) hazard area.	Yes
<b>Fire Department</b>	Fire Headquarters	23 Linden Street	This station was noted as vulnerable to lightning strikes by the local HMP team and CMRPC's GIS analysis. It is also located near but not in the high slope (15% and above) hazard area.	Yes
	Cistern	1 Whitney Road	This facility has been noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.	N/A
	Cistern	135R Pleasant Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	N/A
	Cistern	69 Brook Lane	This facility is located near but not in the high slope (15% and above) hazard area.	N/A
	Cistern	1 Parker Road	This facility is located near but not in the high slope (15% and above) hazard area.	N/A
	Cistern	1 Village Lane	There are no noteworthy concerns regarding natural hazard impacts on this facility.	N/A

Type	Name	Address	Details	Has Emergency Generator?
<b>Fire Department (cont.)</b>	Cistern	Near the intersection of Wheeler Hill Road and Campbell Road	This facility is located near but not in the high slope (15% and above) hazard area.	N/A
	Drafting site	116 Hyland Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	N/A
	Drafting site	39 Fosgate Road	This facility is located near but not in the 500-year flood zone and the high slope (15% and above) hazard area.	N/A
	Dry Hydrant	34 South Street	This facility is located near but not in the high slope (15% and above) hazard area.	N/A
	Dry Hydrant	2 Peach Hill Road	There are no noteworthy concerns regarding natural hazard impacts on this facility.	N/A
	Dry Hydrant	91 River Road West	This facility is located near but not in the high slope (15% and above) hazard area.	N/A
	Dry Hydrant	157 Pleasant Street	This facility has been noted as vulnerable by CMRPC's GIS analysis because it is in the 100-year flood zone.	N/A
	Dry Hydrant	33 Sawyer Hill Road	This facility is located near but not in the 500-year flood zone.	N/A
	Dry Hydrant	72 Central Street	This facility has been noted as vulnerable by CMRPC's GIS analysis because it is in the 500-year flood zone.	N/A

Type	Name	Address	Details	Has Emergency Generator?
<b>Fire Department (cont.)</b>	Dry Hydrant	135 Lancaster Road	This facility has been noted as vulnerable by CMRPC's GIS analysis because it is in the 100-year flood zone. It is also located near but not in the high slope (15% and above) hazard area.	N/A
	Dry Hydrant	170 Linden Street	This facility has been noted as vulnerable by CMRPC's GIS analysis because it is in the 500-year flood zone.	N/A
	Dry Hydrant	76 Ball Hill Road	This facility is located very near but not in the 500-year flood zone. It is also located near but not in the high slope (15% and above) hazard area, and a locally identified landslide hazard area.	N/A
	Dry Hydrant	60 Brook Lane	This facility is located near but not in the 500-year flood zone.	N/A
<b>Communications Facilities</b>	Berlin Municipal Offices	23 Linden Street	This facility was noted as vulnerable to lightning strikes by the local HMP team and CMRPC's GIS analysis. It is also located near but not in the high slope (15% and above) hazard area.	Yes
	Repeater Site / Battery Back Up Area	Near the field at the end of Taylor Road	This facility is located near but not in the high slope (15% and above) hazard area and a locally identified invasive species hazard area.	No, but the battery back-up area allows for 6 hours of continued operations in the case of an emergency.

Type	Name	Address	Details	Has Emergency Generator?
<b>Communications Facilities (cont.)</b>	Repeater Site / Battery Back Up Area	76 Coburn Road	This facility is located near but not in the high slope (15% and above) hazard area.	Yes, there is an extension cord at the repeater site going to another generator that the Town doesn't own. The battery back-up area also allows for 6 hours of continued operations in the case of an emergency.
<b>Highway Department</b>	Highway Department Headquarters	112 West Street	This facility is located near but not in the 500-year flood zone.	Yes
<b>Emergency Shelters</b>	Berlin Municipal Offices (specifically the Public Safety Building)	23 Linden Street	This facility was noted as vulnerable to lightning strikes by the local HMP team and CMRPC's GIS analysis. It is also located near but not in the high slope (15% and above) hazard area. This shelter also serves as a warming and cooling shelter for the Town.	Yes
	Berlin Memorial School	34 South Street	This school is located near but not in the high slope (15% and above) hazard area. This shelter also serves as a warming and cooling shelter for the Town.	Yes
<b>Primary Evacuation Routes</b>	I-495	I-495	This route has been noted as vulnerable by CMRPC's GIS analysis because it intersects and runs near the high slope (15% and above) hazard area and the 500-year flood zone.	N/A

Type	Name	Address	Details	Has Emergency Generator?
Primary Evacuation Routes (cont.)	MA-62	MA-62 (Boylston Road, West Street, Central Street, and Coolidge Road)	This route has been noted as vulnerable by CMRPC's GIS analysis because it intersects and runs near the high slope (15% and above) hazard area, the 100-year and 500-year flood zones, and, along Boylston Road and West Street respectively, two locally identified invasive species hazard areas.	N/A
	Pleasant Street / South Street / River Road West	Pleasant Street / South Street / River Road West	This route has been noted as vulnerable by CMRPC's GIS analysis because it intersects and runs near the high slope (15% and above) hazard area, the 100-year and 500-year flood zones, and a locally identified flooding hazard area. It also runs near a locally identified wildfire hazard area. In addition, a locally identified microburst hazard path crosses this route; other areas of town are likely to have a similar level of risk to potential future microbursts in town as areas along this path. The bridge along South Street where it crosses North Brook to the north of Jones Road is currently closed and unpassable, as the State told the Town to shut the bridge down. The Town has received design funds for and has applied for construction funds for the repair of this bridge.	N/A
Railroad Crossings	Railroad Crossing	Jones Road and South Street	This railroad crossing has been noted as vulnerable by CMRPC's GIS analysis because it intersects a locally identified wildfire hazard area. It is also located near but not in the high slope (15% and above) hazard area.	N/A
	Railroad Crossing	Linden Street	This railroad crossing has been noted as vulnerable by CMRPC's GIS analysis because it intersects a locally identified wildfire hazard area. It is also located near but not in the 100-year and 500-year flood zones.	N/A

Type	Name	Address	Details	Has Emergency Generator?
<b>Railroad Crossings (cont.)</b>	Railroad Crossing	Derby Road and West Street	This railroad crossing has been noted as vulnerable by CMRPC's GIS analysis because it intersects a locally identified wildfire hazard area. It is also located near but not in the 100-year flood zone.	N/A
	Railroad Crossing	Randall Road and West Street	This railroad crossing has been noted as vulnerable by CMRPC's GIS analysis because it intersects a locally identified wildfire hazard area. It is also located near but not in the 100-year flood zone.	N/A
	Railroad Crossing	Crosby Road and Belleview Road	This railroad crossing has been noted as vulnerable by CMRPC's GIS analysis because it intersects a locally identified wildfire hazard area. A locally identified microburst hazard path also intersects with this railroad crossing; other areas of town are likely to have a similar level of risk to potential future microbursts in town as areas along this path.	N/A
<b>Hospitals / Clinics</b>	Emerson Urgent Care at Hudson	38 Highland Common East	This urgent care is located near but not in the high slope (15% and above) hazard area.	Yes
	Veterinary Hospital	240 Central Street	This veterinary hospital has been identified as vulnerable to flooding and mudslides by the local HMP team, as there is a steep, 60-degree grade of dirt and trees six feet behind the building. It was also identified as vulnerable by CMRPC's GIS analysis because it is in the high slope (15% and above) hazard area.	No
	Acton Medical Associates	36 Highland Common East	This medical office has been identified as vulnerable by CMRPC's GIS analysis because it is in the high slope (15% and above) hazard area.	Yes

### 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 Berlin.

**Table 3: Non-Emergency Response Facilities in Berlin**

Type	Name	Address	Details	Has Emergency Generator?
<b>Water Supply</b>	Water Pump Station		This facility is owned by Hudson. It is located near but not in the high slope (15% and above) hazard area and a locally identified invasive species hazard area.	Yes
<b>Sewer</b>	Wastewater Pump Station		This facility is owned by Hudson. There are no noteworthy concerns regarding natural hazard impacts on this facility.	Yes
<b>Town Facilities</b>	Berlin Public Library	23 Carter Street	This library is located near but not in the high slope (15% and above) hazard area.	No
	Transfer Station (Trash / Recycling Drop Off)	35 Jones Road	This facility is located near but not in the 100-year flood zone.	No
<b>Utilities</b>	Verizon Central Office	23 Highland Street	This facility is located near but not in the 500-year flood zone and the high slope (15% and above) hazard area.	Yes
	Gas Pipeline	Runs through the south side of town	This pipeline has been noted as vulnerable by CMRPC's GIS analysis because it intersects the 100 and 500-year flood zones, a locally identified flooding hazard area, and the high slope (15% and above) hazard area. It was also identified as being vulnerable to earthquakes by the local HMP team, as there are concerns that the pipeline could crack in places in the case of an earthquake.	N/A

Type	Name	Address	Details	Has Emergency Generator?
Utilities (cont.)	CSX Railroad	Runs through town, starting in the northwest of town, turning southeast, and ending in the south of town	This railroad line has been noted as vulnerable by CMRPC's GIS analysis because there is a locally identified wildfire hazard area along its entire length in town and it intersects and runs near the high slope (15% and above) hazard area, the 100-year and 500-year flood zones, and an additional locally identified wildfire hazard area. Also, a locally identified microburst hazard path crosses this railroad line; other areas of town are likely to have a similar level of risk to potential future microbursts in town as areas along this path.	N/A
	MWRA Pipeline – Cosgrove Aqueduct	Runs in a northwest-southeast direction from the west of town to the south of town	The higher part of the aqueduct along its full stretch in town has recently been re-lined. It was identified as vulnerable to earthquakes by the local HMP team. This aqueduct has also been noted as vulnerable by CMRPC's GIS analysis because it intersects and runs near the high slope (15% and above) hazard area as well as the 100-year and 500-year flood zones. It also runs near a locally identified wildfire hazard area.	N/A
	MWRA Pipeline – Wachusett Aqueduct	Runs in a northwest-southeast direction from the west of town to the south of town and to the north and east of the Cosgrove Aqueduct	This aqueduct has also been noted as vulnerable by CMRPC's GIS analysis because it intersects and runs near the high slope (15% and above) hazard area, the 100-year and 500-year flood zones, and locally identified wildfire hazard areas. Also, a locally identified microburst hazard path crosses this aqueduct; other areas of town are likely to have a similar level of risk to potential future microbursts in town as areas along this path.	N/A

Type	Name	Address	Details	Has Emergency Generator?
<b>Hazardous Waste Sites</b>	Uncapped Landfill	Jones Road	This uncapped landfill is closed when bad weather occurs. It is located near but not in the 100-year flood zone.	No
	Hudson Landfill	East of 148 Gates Pond Road	This landfill, which is closed and is owned by the Town of Hudson, is located near but not in the high slope (15% and above) hazard area.	No
	STERIS	435 Whitney Street	This facility is located in Northborough right to the south of its border with Berlin.	Yes

### 3.4 CATEGORY 3 – DAMS<sup>26</sup>

The third category is a listing of dams in Berlin and dams of concern regarding Berlin.

**Table 4: Dams in / of Concern Relating to Berlin**

National ID	Dam Name	Owner	Regulatory Authority	Hazard Code	Notes
MA00458 and MA00459	Wheeler Pond Dam	Private – Robin Bonazzoli, Trustee of the Bonazzoli Family Estate	Office of Dam Safety	Significant Hazard	This dam was rated as poor in the 2009 inspection / evaluation report for it. In 2023, this dam continued to show signs of failure. The Dam’s owner partnered with OARS (the Organization for the Assabet, Sudbury, and Concord Rivers) and Interfluve to develop grants to support the design and permitting of the Dam’s removal. In February 2025, the Town, OARS, and Interfluve reported that they have received funds through a MA EEA Dam and Seawall Repair or Removal Grant for currently underway permitting for the Dam’s removal. The project proponents will be seeking grant funding in 2025 and 2026 to complete the dam removal project. The Dam’s removal is anticipated in late 2026 or 2027, as funding allows. This dam was identified as a dam failure hazard by the local HMP team and CMRPC’s GIS analysis; it is also in the 100-year flood zone.
MA00958	Gates Pond Dam	Public – Town of Hudson	Office of Dam Safety	Low Hazard	This dam has been noted as vulnerable by CMRPC’s GIS analysis because it is in the 500-year flood zone. It is also near but not in the high slope (15% and above) hazard area.
MA01229	Lester G. Ross Dam	Public – MA Department of Conservation and Recreation	Office of Dam Safety	High Hazard	This dam is in satisfactory condition according to the June 19 <sup>th</sup> , 2024 inspection / evaluation report for it. It has been noted as vulnerable by CMRPC’s GIS analysis because it is in the 100-year flood zone and a locally identified wildfire hazard area. It is also near but not in the high slope (15% and above) hazard area. Despite being in satisfactory condition, it has been identified as vulnerable by the local HMP team because it would have significant negative impacts on people and infrastructure in town if it were to fail after an earthquake or flooding event.

<sup>26</sup> “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
MA01230	Brewer Brook Dam	Public – MA Department of Conservation and Recreation	Office of Dam Safety	Significant Hazard	This dam is in satisfactory condition according to the July 2023 inspection / evaluation report for it. It has been noted as vulnerable by CMRPC's GIS analysis because it is in the 100-year flood zone. It is also near but not in the high slope (15% and above) hazard area. Despite being in satisfactory condition, it has been identified as vulnerable by the local HMP team because it would have significant negative impacts on people and infrastructure in town if it were to fail after an earthquake or flooding event.
MA02568	Storage Pond Dam / At Berlin	Public – MA Department of Conservation and Recreation	Non-Jurisdictional - Other	N/A	This dam is located near but not in the 100-year flood zone and the high slope (15% and above) hazard area.
MA02738	Storage Pond Dam	Public – MA Department of Conservation and Recreation	Non-Jurisdictional - Other	N/A	This dam has been noted as vulnerable by CMRPC's GIS analysis because it is in the 100-year flood zone.
MA03377	Highland Commons Pond B Dam & Dike	Private – Benderson Development	Office of Dam Safety	Significant Hazard	This dam is in satisfactory condition according to the December 23 <sup>rd</sup> , 2021 inspection / evaluation report. There are plans for another inspection of this dam to occur in 2025. It is located near but not in the high slope (15% and above) hazard area.
MA03263	Wachusett Reservoir South Dike	Public – MA Water Resources Authority and MA Department of Conservation and Recreation	Office of Dam Safety	High Hazard	This dam is located in the neighboring towns of Clinton and Boylston. It is located near but not in the 500-year flood zone and the high slope (15% and above) hazard area.

The Fahey Dam (MA02739, Private, Non-Jurisdictional - Other, N/A) is still included in the MassGIS dams database but was noted by the HMP team in town and the Office of Dam Safety to no longer exist. Massachusetts Department of Conservation and Recreation engineers could not find this dam when they looked for it in the past decade; it was likely removed in the early 1900's.

For additional information on dams and dam failure hazards in Berlin, also see Chapter 4 and the Hazardous Dams Appendix (Appendix F).

### 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 5: Facilities and Populations to Protect in Berlin**

Type	Name	Address	Details
<b>Special Needs Population / Elderly Housing / Assisted Living / Low-Income Housing</b>	Group Home	11 Larkin Road	This group home is located near but not in the high slope (15% and above) hazard area.
	Senior Housing (Northbrook Village I)	135 Pleasant Street	There are no noteworthy concerns regarding natural hazard impacts on this senior housing development.
	Senior Housing (2) (Northbrook Village II)	135 Pleasant Street	There are no noteworthy concerns regarding natural hazard impacts on this senior housing development.
	Sawyer Hill EcoVillage Co-Housing – 40B	22 Village Lane	This housing development is located near but not in the high slope (15% and above) hazard area.
	Autism Behavioral Center	1 Whitney Road	This facility has been noted as vulnerable by CMRPC’s GIS analysis because it is in a locally identified flood hazard area.
<b>Public Buildings / Areas</b>	Carter Community Center	19 Carter Street	This community center is located near but not in the high slope (15% and above) hazard area.
	1870 Old Town Hall	12 Woodward Ave	This facility has an emergency generator, and there is potential for it to be used as an overflow shelter in the case of an emergency situation in town. It has been noted as vulnerable by CMRPC’s GIS analysis because it is in the high slope (15% and above) hazard area.

Type	Name	Address	Details
<b>Schools / Daycares<sup>27</sup></b>	Berlin Memorial School	34 South Street	This school is located near but not in the high slope (15% and above) hazard area.
	The Growing Room of Berlin	71 River Road West / 14 Newsome Road	This daycare has been noted as vulnerable by CMRPC's GIS analysis because it is in a locally identified flood hazard area.
	Andre Duarte da Silva Home Daycare	7 Tyler Road	This daycare has been noted as vulnerable by CMRPC's GIS analysis because it is in a locally identified flood hazard area. It is also near but not in the 500-year flood zone.
	Donoghue Home Daycare	79 Jones Road	This daycare has been noted as vulnerable by CMRPC's GIS analysis because it is in the high slope (15% and above) hazard area. It is also near a locally identified wildfire hazard area.
	Scott Home Daycare	21 Jones Road	There are no noteworthy concerns regarding natural hazard impacts on this daycare.
<b>Other Housing</b>	Meadowbrook Village	Brook Lane	This housing development has been noted as vulnerable by CMRPC's GIS analysis because it is partially in the 500-year flood zone and the high slope (15% and above) hazard area.
	Rockwell Apartments	12 Tyler Road and other nearby addresses	This housing development was identified as vulnerable to a locally identified flooding hazard by the local HMP team and CMRPC's GIS analysis. It is also partially located in the 100-year flood zone.

<sup>27</sup> "Licensed Child Care Search," Childcare.Mass.gov, Massachusetts Department of Early Education and Care, accessed February 13, 2025, <https://childcare.mass.gov/findchildcare>.

Type	Name	Address	Details
<b>Other Housing (cont.)</b>	Highland Ridge	32 Campbell Road	This housing development was identified as vulnerable by CMRPC's GIS analysis because it is in the high slope (15% and above) hazard area.
<b>Hotels</b>	Homewood Suites by Hilton Boston Marlborough	60 River Road West	This hotel was identified as vulnerable to a locally identified flooding hazard by the local HMP team and CMRPC's GIS analysis. It is also near but not in the 500-year flood zone.
<b>Business Centers</b>	Solomon Pond Mall	601 Donald Lynch Boulevard	This mall is partially in Marlborough and partially in Berlin, with the address of the mall being in Marlborough. This mall was identified as vulnerable by CMRPC's GIS analysis because it is located partially in the high slope (15% and above) hazard area. It is also near but not in the 100-year flood zone.
	Highland Commons	Highland Commons West and Highland Commons East	This business center is partially in Hudson and partially in Berlin. It was identified as vulnerable by CMRPC's GIS analysis because it is located partially in the high slope (15% and above) hazard area. It is also near but not in the 100-year flood zone.
<b>Historic Buildings/Sites<sup>28</sup></b>	According to the Massachusetts Cultural Resources Information System (MACRIS) online database accessed in February 2025, there are seven areas, 103 buildings, three burial grounds, one object, and six structures listed in the MACRIS database in Berlin. Six of these historic areas, none of these buildings, none of these burial grounds, none of these objects, and two of these structures lie within regulated or locally identified flood areas within town. The following historic sites were identified by the Berlin HMP Core Team as critical facilities or infrastructure: the 19 Carter Community Center (formerly the Berlin Old Methodist Episcopal Church), the 1870 Old Town Hall, and the Wachusett Aqueduct.		

<sup>28</sup> "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)<sup>29</sup> and the knowledge of local HMP committee members, the following table shows the largest employers in Berlin:

**Table 6: Employment Centers in Berlin**

Company name	Address	Number of Employees	NAICS Code
<b>Cabela’s</b>	Highland Commons	100-499	4591
<b>BJs</b>	Highland Commons	100-499	4552
<b>Berlin Memorial School</b>	South Street	50-99	6111
<b>Autism Behavioral Center</b>	Whitney Road	20-49	6222
<b>Berlin Country Club</b>	Carr Road	20-49	8134
<b>Berlin Fire / EMS Department</b>	Linden Street #1	20-49	9221
<b>Berlin Town Select Board</b>	Linden Street #2	20-49	9211
<b>Growing Room of Berlin</b>	River Road West	20-49	6244
<b>Homewood Suites by Hilton</b>	River Road West	20-49	7211
<b>National Lumber</b>	Central Street	20-49	4441
<b>ULTA</b>	Highland Commons	20-49	4561
<b>TJ Maxx</b>	Coolidge Street	20-49	4551
<b>LL Bean</b>	Highland Commons	20-49	4591
<b>Michael’s</b>	Highland Commons	20-49	4599
<b>110 Grill</b>	Highland Commons	20-49	7225
<b>Fit Factory</b>	Highland Commons	20-49	7139
<b>JC Penney</b>	Donald Lynch Boulevard	20-49	4522
<b>Regal Solomon Pond Theatre</b>	Donald Lynch Boulevard	20-49	5121
<b>Berlin Animal Hospital</b>	Central Street	10-19	5419
<b>Berlin Police Department</b>	Linden Street	10-19	9221
<b>Dunkin’</b>	River Road West	10-19	7225
<b>Dynamic Fire Protection Inc</b>	Carter Street	10-19	4238
<b>Organomation Associates</b>	River Road West	10-19	3345
<b>Mooyah Burgers</b>	Highland Commons	10-19	7225
<b>Qdoba</b>	Highland Commons	10-19	7225
<b>Kitchen Views</b>	Central Street	10-19	4422

<sup>29</sup> "Largest 25 Employers in Berlin," Lmi.dua.eol.mass.gov, Massachusetts Department of Economic Research, accessed September 3, 2024, <https://lmi.dua.eol.mass.gov/LMI/LargestEmployersArea/LEARResult?A=05&GA=000263>.

<b>Company name</b>	<b>Address</b>	<b>Number of Employees</b>	<b>NAICS Code</b>
<b>Donahue Corry Associates Inc.</b>	Central Street	10-19	3231
<b>Five Below</b>	Highland Commons	10-19	4522
<b>Hey Kiddo's Playtime</b>	Donald Lynch Boulevard	10-19	7139

Local HMP committee members also noted that Emerson Health Urgent Care Hudson is a notable employer in town.

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## 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 Berlin.<sup>30</sup> 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. As per the 2023 American Community Survey 5-year estimates, the median age in Berlin has risen to 50.4, and 30.4 % of the population in Berlin is 65 years and older. Also according to the 2023 American Community Survey 5-year estimates, 12.5% of the Town's population is under 18 years old.<sup>31</sup> According to 2023 ACS 5-year estimate data, approximately 8.7% of the population in town speaks a language other than English at home;<sup>32</sup> Approximately 18.3% of the population in Berlin has a disability, according to this same data.<sup>33</sup> This 2023 ACS 5-year estimate data also shows that people without health insurance account for about 3.1% Berlin's population<sup>34</sup> and that about 4.7% of the Town's population is living in poverty.<sup>35</sup>

Outreach to vulnerable community members was a vital part of the public outreach strategy for the

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<sup>30</sup> "Massachusetts 2020 Environmental Justice Populations," Mass-eoeaa.maps.arcgis.com, Massachusetts Executive Office of Energy and Environmental Affairs, accessed February 21, 2025, <https://mass-eoeaa.maps.arcgis.com/apps/webappviewer/index.html?id=1d6f63e7762a48e5930de84ed4849212>.

<sup>31</sup> "S0101: Age and Sex." 2023 American Community Survey 5 Year Estimate. Data.Census.gov. United States Census Bureau, accessed Feb 20, 2025, <https://data.census.gov/table/ACSST5Y2023.S0101?g=060XX00US2502705490>

<sup>32</sup> "S1601: Language Spoken at Home," Data.Census.gov, United States Census Bureau, accessed Feb 21, 2025, <https://data.census.gov/table/ACSST5Y2023.S1601?g=060XX00US2502705490>

<sup>33</sup> "S1810: Disability Characteristics," Data.Census.gov, United States Census Bureau, accessed Feb 21, 2025, .

<sup>34</sup> "S2701: Selected Characteristics of Health Insurance Coverage in the United States," Data.Census.gov, United States Census Bureau, accessed Feb 21, 2025, <https://data.census.gov/table/ACSST5Y2023.S2701?g=060XX00US2502705490>

<sup>35</sup> "S1701: Poverty Status in the Past 12 Months," Data.Census.gov, United States Census Bureau, accessed Feb 21, 2025, [Data.Census.gov.https://data.census.gov/table/ACSST5Y2023.S1701?g=060XX00US2502705490](https://data.census.gov/table/ACSST5Y2023.S1701?g=060XX00US2502705490)

Berlin Hazard Mitigation Plan. Paper HMP surveys were made available at the municipal offices, 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 able to be attended remotely via Zoom and was broadcast on the Town's YouTube channel.

## 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 Berlin 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 Berlin:

- Flooding, including changes in groundwater
- Severe Snowstorms / Ice Storms/ Nor’easters
- Hurricanes
- Severe Thunderstorms / Wind / Tornadoes
- Wildfires
- Earthquakes
- Dam Failure
- Drought, including changes in groundwater
- 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.<sup>36</sup> 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 Berlin municipal plan. These different priorities are based more on the specificities of local conditions in Berlin 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 and power outages as well as 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% by 2030.<sup>37</sup> These impacts to the regional food supply chain are expected to be similar

<sup>36</sup> "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>.

<sup>37</sup> Estimates derived from application of data from the following two sources:

to impacts on state and national crop yields and food distribution patterns. While the State's 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 the Region's 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,<sup>38</sup> 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% 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.<sup>39</sup>

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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.

<sup>38</sup> 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>.

<sup>39</sup> "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.<sup>40</sup> 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.<sup>41</sup>

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

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<sup>40</sup> 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>.

<sup>41</sup> 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 which 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 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 in the Region by the end of the century are the highest in the Commonwealth.<sup>42</sup>

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% by 2030 and by 14% by 2070; these declines in key commodity crop yields may disproportionately impact the local

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<sup>42</sup> 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>.

economies that rely on agricultural production and the individual farm workers and employers who work in this sector.<sup>43</sup>

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 hazards, 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 Berlin 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, although the local HMP planning team in Berlin also noted significant concerns relating to wildfires, drought, and man-made landslides.

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#### 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 7: Previous Federally Declared Disasters and Massachusetts State of Emergency Declarations in Worcester County<sup>44</sup>**

Disaster Declaration	Disaster Type	Incident Period	Declaration Date
<a href="#">Massachusetts Severe Storms and Flooding (DR-4780-MA)</a>	Flooding	September 11, 2023 - September 13, 2023	May 15, 2024
<a href="#">Massachusetts Hurricane Lee (EM-3599-MA)</a>	Hurricane	September 15, 2023 - September 17, 2023	September 15, 2023

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<sup>43</sup> Estimates derived from application of USEPA (2017) and Beach et al. (2015)

<sup>44</sup> “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>.

<a href="#">Shelter Capacity Crisis</a>	Not a Natural Hazard	August 8, 2023 - Present	August 8, 2023
<a href="#">Massachusetts Covid-19 Pandemic (DR-4496-MA)</a>	Pandemic	January 20, 2020 - May 11, 2023	March 27, 2020
<a href="#">Massachusetts Severe Winter Storm and Snowstorm (DR-4379-MA)</a>	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 13<sup>th</sup>-14<sup>th</sup>, 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 Berlin. 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 Berlin are:

- Flooding, including changes in groundwater,
- Severe Snowstorms / Ice Storms / Nor'easters,
- Hurricanes,
- Severe Thunderstorms / Wind / Tornadoes,
- Wildfire,
- Earthquakes,
- Dam Failure,
- Drought, including changes in groundwater,
- Extreme Temperatures,
- Invasive Species, and
- Other Hazards (including landslides)

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 8: Percentage of Town Impacted by Natural Hazard**

Land Area Affected by Occurrence	%age 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 9: 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 10: 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.

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#### 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.

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#### 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 Berlin can be applied to expected natural hazards, regardless of their unpredictability.

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#### 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.

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#### 4.2.11 RISK ASSESSMENT

**Table 11: Hazard Risk Assessment for Each Natural Hazard in Berlin**

Type of Hazard	Location of Occurrence	Probability of Future Events	Impact	Potential Climate Change Effects	Hazard Risk Index Rating
<i>Flooding, including changes in groundwater</i>	Small	Moderate	Minor	Increase extent; increase probability	3
<i>Severe Snowstorms / Ice Storms / Nor’easters</i>	Large	Very High	Minor	Increase extent	2
<i>Hurricanes</i>	Large	Low	Minor	Increase extent; increase probability	4

Type of Hazard	Location of Occurrence	Probability of Future Events	Impact	Potential Climate Change Effects	Hazard Risk Index Rating
Severe Thunderstorms / Wind	Small	Moderate	Minor for severe thunderstorms; Limited for severe wind	Unclear	2
Tornadoes	Small	Very Low	Limited	Unclear	3
Wildfire	Small	Moderate	Minor	Increase extent; increase probability	4
Earthquakes	Large	Very Low	Minor	None	5
Dam Failure	Small	Very Low	Catastrophic	Indirect effects related to flooding	4
Drought, including changes in groundwater	Large	Low	Minor	Increase extent; increase probability	3
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;<sup>45</sup> modified to reflect conditions in Berlin.

<sup>45</sup> "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 Berlin.

**Table 12: 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
<i>Flooding, Including Changes in Groundwater</i>	The Autism Behavioral Center, The Growing Room, Andre Duarte da Silva Home Daycare, Meadowbrook Village, and Rockwell Apartments have been identified as vulnerable to flooding, including flooding caused by changes in groundwater, 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 as the Town ages and continues to grow, the Town would be at higher risk in the case of flooding, including flooding caused by changes in groundwater, occurring.	If the pace of residential, commercial, and/or industrial development in town increases, 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, including flooding caused by changes in groundwater, 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, including flooding caused by changes in groundwater.
<i>Severe Snowstorms / Ice Storms / Nor'easters</i>	If the Town continues to grow and more people from vulnerable populations frequent critical infrastructure sites which are affected by winter storms, 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
<i>Hurricanes</i>	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 the Town ages and continues to grow and more people from vulnerable populations live in and/or frequent these critical infrastructure sites, the Town would be at higher risk in the case of hurricanes occurring.	If many 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.
<i>Severe Thunderstorms / Wind</i>	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 the Town ages and continues to grow and more people from vulnerable populations live in and/or frequent these critical infrastructure sites, the Town would be at higher risk in the case of severe thunderstorms / wind occurring.	If many 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.
<i>Tornadoes</i>	There are no anticipated impacts from changes in population on the impacts of tornadoes in Berlin.	If many 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 Berlin, but some studies indicate that the number of days with tornadoes will decrease but the number of tornadoes on these days will increase. <sup>46</sup>

<sup>46</sup> "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
<i>Wildfire</i>	Donoghue Home Daycare has been identified as vulnerable to wildfires by CMRPC's GIS analysis; if the Town continues to grow and more people frequent this critical infrastructure site, the Town would be at higher risk in the case of wildfire occurring.	If the pace of residential, commercial, and/or industrial development in town increases, 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.
<i>Earthquakes</i>	There are no anticipated impacts from changes in population on the impacts of earthquakes in Berlin.	If older developments in town continue to not be updated 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 Berlin.
<i>Dam Failure</i>	If the Town continues to grow and more people from vulnerable populations live in and/or frequent critical infrastructure sites in the inundation zones of dams, 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.
<i>Drought, Including Changes in Groundwater</i>	There are no anticipated impacts from changes in population on the impacts of drought, including drought-induced changes in groundwater, in Berlin.	If commercial and industrial development is built in and/or the pace of residential development in town increases, the Town will face increased risk from wells drying out due to lower groundwater levels caused by drought.	Land in Berlin may become harder or impossible to farm due to more frequent and severe drought which causes groundwater levels to lower. The Town may see an increase in population, with people from parts of the country facing more severe drought impacts (such as more severely low groundwater levels) moving to the northeast.

Type of Hazard	Impacts from Changes in Population	Impacts from Changes in Land Use and Development	Impacts from Climate Change
<i>Extreme Temperatures</i>	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 Berlin 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. Berlin may see an increase in population, with people from parts of the country facing more severe extreme heat impacts moving to the northeast.
<i>Invasive Species</i>	There are no anticipated impacts from changes in population on the impacts of invasive species in Berlin.	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.

Berlin has grown steadily in population in recent decades. The Town has a high population of pre-retirement age older adults between 40 and 74 years old, with the Town's largest five-year age cohort being older adults between 55 and 59 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 children and teenagers between 10 and 14 years old.<sup>47</sup> 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.

<sup>47</sup> "Berlin," Cmrpc.org

## 4.3 FLOODING, INCLUDING CHANGES IN GROUNDWATER

The local HMP planning team identified flooding, including flooding caused by changes in groundwater, as one of the most prevalent natural hazards in Berlin. 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 raised groundwater levels during storms to dam failures. Riverine and stormwater flooding both occur in Berlin, 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.

### LOCATION

Flooding and flood-prone areas in Berlin, including areas prone to flooding caused by changes in groundwater, are closely associated with the 100-year / 1% flood areas identified by FEMA. According to a GIS analysis performed by CMRPC, there are 211 parcels in Berlin that are susceptible to 1% (100-year) floods. See below for a discussion of previous flood occurrences in town and their locations. Building footprints in town 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 Berlin having numerous flooding problems, most of Berlin is upland and built away from rivers and ponds. Berlin'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 Berlin:

- The Assabet River (flood zone AE),
- The Assabet River Branch No. 2 (flood zone AE),
- North Brook (flood zone AE),
- Wrack Meadow Brook (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

### 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% (100-year) 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% / 100-year 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% / 500-year flood zone.

the summer than in other seasons.<sup>48</sup>

As of September 2022, the Town of Berlin 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 Berlin has 3 NFIP policy holders in town, and the NFIP insures up to \$734,000 of property in the Town. NFIP has paid out no claims to policy holders in Berlin.<sup>49</sup>

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## EXTENT

The average annual precipitation for the closest weather station to Berlin (which is located at the Worcester Regional Airport) has been 53.64 inches for the period from 2017 to 2023.<sup>50</sup> Water levels in Berlin's rivers, streams, groundwater sources, 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, Berlin 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.<sup>51</sup> 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.<sup>52</sup> Shallow flooding caused by changes in groundwater system is measured with the same classification systems as other types of flooding.

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

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<sup>48</sup> 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=2cdcfc8d29a9ba73c75a69614806808>.

<sup>49</sup> "Community Overview: Berlin, Town of," NFIP Community Information System, accessed July 2, 2024.

<sup>50</sup> 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>.

<sup>51</sup> 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/>.

<sup>52</sup> "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>.

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## PREVIOUS OCCURRENCES

In addition to experiencing flooding in the floodplains mapped by FEMA as 1% and .2% annual chance flood zones, Berlin periodically experiences minor flooding at isolated locations due to drainage problems or problem culverts. Town staff have reported that flooding events in certain areas are becoming more frequent in recent years. The following specific flooding locations (mapped in Appendix A) were identified by the Berlin Hazard Mitigation Planning Team:

- The area around the intersection of River Road West, South Street, and Whitney Road.
  - A major flooding event in this area, which includes the Rockwell Apartments and the Homewood Suites by Hilton Boston Marlborough hotel, could cause up to 300 people to need to be evacuated.

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 Berlin;<sup>53</sup> 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:

- 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.
- 07/22/2016 – Flood: A cold front moved through southern New England and when coupled with the existing heat and humidity, resulted in showers and thunderstorms 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

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<sup>53</sup> “Storm Events Database Search Results for Worcester County, Massachusetts,” NCEI.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](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).

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.
- 07/17/2018 – 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.
- 08/23/2020 – Flash Flood: Diurnally driven thunderstorms brought wind damage, hail, and some flooding to mainly western and central Massachusetts.
- 09/11/2023 – 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.<sup>54</sup>

The local HMP team in town also noted that Route 62 has seen a washout occur in the past 30 years after a pond higher in elevation than the road overflowed and that the recently built Brewer Road Culvert has prevented washouts in more recent times.

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## PROBABILITY OF FUTURE EVENTS

Based upon previous data, there is a “moderate” probability (a 10% to 40% chance) of localized flooding, including flooding caused by changes in groundwater, occurring in Berlin in the next year.

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<sup>54</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,” pages 5.1-34-5.1-35.

This represents a slight increase as compared to the last town HMP update due to increased precipitation driven by climate change.

## IMPACT

The Town faces a minor impact from flooding, including flooding caused by changes in groundwater, 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 Berlin 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 13: HAZUS Potential Damages to Berlin from .2% Annual Chance Flood Event**

	.2% annual chance flood event
<b>Building Characteristics</b>	
Estimated total number of buildings in Berlin	1,215
Estimated total building replacement value (2024 \$)	\$651,212,000
<b>Building Damages</b>	
# of buildings sustaining minor damage (1-10%)	1
# of buildings sustaining moderate damage (11-40%)	0
# of buildings sustaining severe damage (41-50%)	0
# of buildings destroyed	0
<b>Population Needs</b>	
# of households displaced	9
# of people seeking public shelter	6
<b>Value of Damages</b>	
Total property damage (buildings and content)	\$ 1,580,000
Total losses due to business interruption	\$ 1,980,000
<b>Total Economic loss</b>	<b>\$ 3,560,000</b>

Though there are no recorded instances of a flood event of this size in Berlin, 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 Berlin’s infrastructure, society, and environment may face more flooding

(including flooding caused by changes in groundwater), 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.

The following critical infrastructure sites and routes identified in this plan were noted as being especially vulnerable to flooding, in several cases including flooding caused by changes in groundwater, by the local HMP planning team in Berlin and/or CMRPC's GIS analysis:

- One cistern and four dry hydrants in town,
- All identified primary evacuation routes in town,
- The Veterinary Hospital,
- The CSX Railroad,
- Both MWRA pipelines in town,
- The Wheeler Pond, Gates Pond, Lester G. Ross, Brewer Brook, and Storage Pond dams,
- The Autism Behavioral Center
- The Growing Room of Berlin and Andre Duarte da Silva daycares,
- Meadowbrook Village,
- Rockwell Apartments, and
- The Homewood Suites by Hilton Boston Marlborough hotel.

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## 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 a 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.<sup>55</sup>

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

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## VULNERABILITY

Based on this analysis and the assessment of the Berlin Local HMP Planning Team, Berlin faces a hazard index rating of “3 – medium risk” from flooding including flooding caused by changes in groundwater. Additionally, sections of evacuation routes, including I-495, MA-62, and Pleasant Street / South Street / River Road West, are located in or adjacent to 100-year / 1% and/or 500-year / 0.2% flood zones. Moreover, the local HMP planning team identified the area around the intersection of River Road West, South Street, and Whitney Road to be susceptible to flooding. If evacuation routes and critical facilities such as those listed above are flooded, emergency response and/or evacuations could be hampered.

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## MITIGATION STRATEGIES

The Town of Berlin is currently able to effectively respond to flooding, including flooding caused by changes in groundwater, 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, including flooding caused by changes in groundwater. The local HMP planning team identified the following strategies that could be used to reduce the threat of flooding in Berlin:

- Dredge fire ponds which are currently too shallow and dry out quickly during the summer months. This would also help with stormwater collection and help prevent flooding in the areas of the ponds.
- Complete work to remove the privately-owned Wheeler Pond Dam; this dam is in failure per the MA Office of Dam Safety. The Town, OARS, and Interfluve have received funds through a MA EEA Dam and Seawall Repair or Removal Grant for currently underway permitting for the Dam's removal. The project's proponents will seek grant funding for the dam removal project in 2025 and 2026. As funding allows, the Dam's removal is expected

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<sup>55</sup> Ibid.

to occur in late 2026 or in 2027.

- Protect additional open space for hazard mitigation purposes through acquisition or conservation restriction, especially floodplains, riverfront areas, wetlands, steep slopes, and parcels that connect to other protected open spaces. Priority areas should include areas near where EJ and/or vulnerable populations live, trails and shared-use paths, water-based recreational opportunities, and NHESP identified core habitat and/or critical natural landscapes.
- Conduct a field inventory of bridges in town and utilize this inventory to rank and prioritize bridge projects for increased flood resiliency and storm-hardening. Design and implement priority bridge/culvert resizing or replacement projects, including for culverts identified in the 2024 Berlin Culvert Assessment Report and the forthcoming culvert assessment being performed by OARS. Fund routine bridge maintenance in town.
- Protect and restore wetlands as a means of mitigating flooding and stormwater runoff.
- Perform a town-wide inventory and drainage assessment of culverts.
- Assess and permanently protect forestland and wetlands in town to ensure reductions in flooding and wildfire damages.
- Re-implement and expand on the Town's vegetative debris program and thereby mitigate the risk of stormwater flooding, riverine flooding, winter storm damage, and other hazard impacts. Investigate working with the Central Massachusetts Mosquito Control Project to implement this strategy.
- Coordinate with the State to evaluate and repair dams identified by the Office of Dam Safety.
- Educate the public about strategies for preventing basement flooding, such as constructing and maintaining rain gardens or other nature-based and small-scale mitigation strategies.
- Join the Central Massachusetts Regional Stormwater Coalition, which can aid the Town in public outreach and in funding drainage improvements.
- Develop an education campaign to increase support for a Wetlands Protection Bylaw which can provide stronger protection for the Town's water resources and can improve water supply health, improve water retention, and reduce adverse flooding impacts.
- Investigate acquiring and preserving properties which, if preserved, will continue to mitigate the impacts of flooding and other hazards.
- Continue actively enforcing and complying with the Massachusetts Wetlands Protection Act.
- Seek to implement a local wetlands bylaw.
- Complete a town-wide stormwater management and containment plan, as the Town will likely soon be no longer exempt from the MS4 permit. Promote low-impact development / natural mitigation measures, such as rain gardens, in this plan.
- Adopt a stormwater bylaw for the Town and encourage low-impact development measures as part of this bylaw. Draft this new bylaw as part of a forthcoming zoning diagnostic process.

## 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 Berlin is susceptible to severe snowstorms, ice storms, and nor'easters; this means that the location of occurrence of severe snowstorms 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, including nor'easters, 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 / nor'easter, 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 14: Northeast Snowfall Impact Scale Categories<sup>56</sup>**

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

An ice storm is a winter storm in which freezing rain occurs and accumulates as ice on the ground when it lands on cold surfaces. 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. The expected extent of ice storms in Berlin is similar to the expected extent of snowstorms in town. Ice storms with Sperry-Piltz indexes of zero through five

<sup>56</sup> National Centers for Environmental Information, "The Northeast Snowfall Impact Scale (NESIS)," [ncei.noaa.gov](https://www.ncei.noaa.gov/access/monitoring/rsi/nesis), National Oceanic and Atmospheric Association, accessed June 12, 2024, <https://www.ncei.noaa.gov/access/monitoring/rsi/nesis>.

could possibly occur in Berlin, with ice storms with a lower index and more minimal impacts such as black ice being present in some areas being expected to have a higher likelihood of occurring in town; More destructive ice storms with maximum extents resembling the December 2008 ice storm which affected much of the northeastern USA and which caused 0.5-0.75 inches of ice accumulation in town<sup>57</sup> could possibly occur in town.

**Table 15: The Sperry-Piltz Ice Accumulation Index<sup>58</sup>**

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.<sup>59</sup> The types of storm classifications under the Miller classification are listed below. Miller C / Storm Type C nor'easters are expected to be the most common type of nor'easters to affect Berlin, with Miller A / Storm Type A, Miller B / Storm Type B, and Miller E / Storm Type E nor'easters also anticipated to potentially affect the Town.

<sup>57</sup> Hayden Frank and Joe DelliCarpini, "WFO Taunton Storm Series Report # 2009-01: Analysis of the December 11-12, 2008 Destructive Ice Storm across Interior Southern New England," Weather.gov, National Weather Service Forecast Office, 2009, [https://www.weather.gov/media/box/science/December\\_2008\\_Ice\\_Storm.pdf](https://www.weather.gov/media/box/science/December_2008_Ice_Storm.pdf).

<sup>58</sup> "What is the Sperry-Piltz Ice Accumulation Index?," Spia-index.com, SPIA Index, accessed March 18, 2025, <https://spia-index.com/>

<sup>59</sup> 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>.

**Table 16: 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.
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 locations 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.

Broadly speaking, the extent of damages for the winter storm category of natural hazard includes the results of heavy snowfall, strong winds, freezing rain, and/or snow and ice accumulation. Typically, the damage extent is lesser for a snowstorm, greater for an ice storm, and greatest for a nor'easter, which combines both snow and ice with high winds. A nor'easter can be categorized under the NEISIS Scale and/or the Sperry-Piltz Ice Accumulation Index depending on what kind of wintry precipitation is to be expected.

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#### PREVIOUS OCCURRENCES

Based on data available from the National Oceanic and Atmospheric Administration, there have been 88 high-impact snowstorms (including nor'easters) since 1956 that have affected the northeast USA. Of these, approximately 47 storms (including nor'easters) resulted in at least 10 inches of snow fall in Berlin. These storms are listed in the table below:<sup>60</sup>

**Table 17: High-Impact Snowstorms with Snow Falls in Berlin 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

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<sup>60</sup> Ibid.

Start Date	NESIS Value	NESIS Category	NESIS Classification
3/03/2019	1.29	1	Notable
3/11/2018	3.16	2	Significant
3/5/2018	3.45	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
2/11/2014	5.28	3	Major
3/4/2013	3.05	2	Significant
2/7/2013	4.35	3	Major
10/29/2011	1.75	1	Notable
2/1/2011	5.30	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
1/17/2009	1.32	1	Notable
3/15/2007	2.54 +/- 0.03	2	Significant
2/12/2006	4.10	3	Major
1/21/2005	6.80	4	Crippling
2/15/2003	7.50	4	Crippling
2/6/2003	1.30	1	Notable
1/2/2003	2.49	1	Notable
3/31/1997	2.29	1	Notable
1/6/1996	11.78	5	Extreme
2/2/1995	1.43	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
12/25/1969	6.29	4	Crippling
2/22/1969	4.29	3	Major
2/8/1969	3.51	2	Significant
2/5/1967	3.50	2	Significant
1/11/1964	6.91	4	Crippling
2/2/1961	7.06	4	Crippling

Start Date	NESIS Value	NESIS Category	NESIS Classification
1/18/1961	4.04	3	Major
12/11/1960	4.53	3	Major
3/2/1960	8.77	4	Crippling
3/18/1958	3.51	2	Significant
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:<sup>61</sup>

- 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.<sup>62</sup> Between 2013 and 2022, there were 63 heavy snow days, 12 blizzard days, and two ice storm days in Massachusetts. As was previously mentioned, the December 2008 ice storm affected Berlin and led to 0.5-0.75 inches of ice accumulation in town.<sup>63</sup>

The local HMP team noted that all rural roads in town are vulnerable to severe winter storms. They also noted that the ice storm of 2008 devastated the Town and caused power outages which lasted for over a week and that the Halloween snowstorm which occurred on October 30<sup>th</sup>, 2011 caused tree debris to have to be cleared out from roads in town, including Boylston Road.

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## 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 Berlin in any given year is “very high” (70% or greater).

Based on the information from the 2023 ResilientMass Plan described above, on average, Berlin can expect to experience one to two nor’easters per year.<sup>64</sup> As this plan also describes, there were 63 heavy snow days, 12 blizzard days, and two ice storm days between 2013 and 2022 in Massachusetts, and Berlin and the rest of the state should expect a relatively similar number of these types of storms over the next ten years.

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<sup>61</sup> “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%2CM ASSACHUSETTS](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%2CM ASSACHUSETTS).

<sup>62</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan”

<sup>63</sup> Hayden Frank and Joe DelliCarpini, “WFO Taunton Storm Series Report # 2009-01: Analysis of the December 11-12, 2008 Destructive Ice Storm across Interior Southern New England”

<sup>64</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan”

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## IMPACT

Berlin 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.

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## EXPOSURE

Certain features within Berlin’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.

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## 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.<sup>65</sup> 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 snowstorms that do occur will likely be worse. Increased wintertime rain also creates a greater risk for wintry mix, sleet, and ice storms; in addition, increased wintertime rain will increase the frequency of hazardous roadway conditions, as temperature drops during nights after this rain will

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<sup>65</sup> Ibid.

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 snowstorms, ice storms, and nor'easters in Berlin. 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 noted that extreme snowfall events are high on their list of concerns.

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## VULNERABILITY

Based on the above assessment, Berlin 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 first responders. Also, private wells in town are vulnerable to losing power due to ice accumulation caused by ice storms, and the evacuation routes listed in section 3.2 of this plan are vulnerable to becoming difficult to access because of roads being iced over after ice storms.

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## MITIGATION STRATEGIES

The Town of Berlin 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 Berlin, 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 Berlin:

- Conduct a field inventory of bridges in town and utilize this inventory to rank and prioritize bridge projects for increased flood resiliency and storm-hardening. Design and implement priority bridge/culvert resizing or replacement projects, including for culverts identified in the 2024 Berlin Culvert Assessment Report and the forthcoming culvert assessment being performed by OARS. Fund routine bridge maintenance in town.
- Purchase brining equipment and utilize it for the Highway Department's road treatment winter operations.
- Re-implement and expand on the Town's vegetative debris program and thereby mitigate the risk of stormwater flooding, riverine flooding, winter storm damage, and other hazard impacts. Investigate working with the Central Massachusetts Mosquito Control Project to implement this strategy.
- Join the Central Massachusetts Regional Stormwater Coalition, which can aid the Town in public outreach and in funding drainage improvements.
- Develop an education campaign to increase support for a Wetlands Protection Bylaw which can provide stronger protection for the Town's water resources and can improve water supply health, improve water retention, and reduce adverse flooding impacts.
- Participate in Regional Debris Management Planning.

## 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 if they are in the southern or northern hemisphere, respectively. 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 1<sup>st</sup>. 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.<sup>66</sup>

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### LOCATION

Because of this hazard’s regional nature, all of Berlin 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.

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### 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 18: The Saffir-Simpson Scale (1)<sup>67</sup>**

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

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<sup>66</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan”

<sup>67</sup> 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>.

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## PREVIOUS OCCURRENCES

Hurricanes which have affected the region near Berlin are shown in the following table:<sup>68</sup>

**Table 19: Hurricanes Which Have Affected the Region Near Berlin**

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

The HMP team in town noted that Superstorm Sandy, Hurricane Gloria, and Hurricane Bob were the most impactful out of these storms in town.

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## PROBABILITY OF FUTURE EVENTS

Berlin’s inland location in central Massachusetts reduces the risk 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 occurring in Berlin. 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.

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<sup>68</sup> “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=eyJzZWZlY2hTdHJpbmciOiJNYXNzYWNodXNldHRzLCBVU0EiLCJzZWZlY2hUeXBlljoiZ2VvY29kZWQilCjVc21JRCi6ljiYxMzE1IiwiaWY2F0ZWdvcmlscyI6WwYJINSiSlkg0liwiSDMiLCJIMiSlkgxliwiVFMiLCJURCiSlkVUIl0sinllyXzljpbXSwibW9udGhziXSwiZW5zbyl6W10sinByZXNzdXJlIjp7InJhbmdlljpbMCwxMDMwXSwiaW5jbHVkZVVua25vd25QcmVzc3VyZSI6dHJ1ZX0sImJ1ZmZlcil6NjAsImJ1ZmZlcVuaXQiOlsiTmF1dGJlYWwgTWIsZXMiXSwic29ydFNlbGVjdGlvbil6eyJ2YWx1ZSI6InllyXzX25ld2VzdCislmxhYmVsljoiWWVhciAoTmV3ZXN0KSJ9LCJhcHBseVRvQU9Jljp0cnVlLCJpc1N0b3JtTGFiZWxzVmIzaWJsZSI6dHJ1ZX0=>.

## IMPACT

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

**Table 20: The Saffir-Simpson Scale (2)**

Storm Category	Damage Level	Description of Damages	Wind Speed (MPH)
1	MINIMAL	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
	Very dangerous winds will produce some damage		
2	MODERATE	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
	Extremely dangerous winds will cause extensive damage		
3	EXTENSIVE	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
	Devastating damage will occur		
4	EXTREME	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
	Catastrophic damage will occur		
5	CATASTROPHIC	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+
	Catastrophic damage will occur		

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 Berlin 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 21: HAZUS Potential Damages to Berlin 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	1,215	
Estimated total building replacement value (2024 \$)	\$ 651,332,000	

Building Damages		
# of buildings sustaining minor damage	51	197
# of buildings sustaining moderate damage	4	31
# of buildings sustaining severe damage	0	2
# of buildings destroyed	0	1
Population Needs		
# of households displaced	0	5
# of people seeking public shelter	0	3
Debris		
Building debris generated (tons)	205	850
Tree debris generated (tons)	6,745	11,382
# of truckloads to clear building debris	8	34
Value of Damages		
Total property damage (buildings and content)	\$ 4,701,840	\$ 14,530,420
Total losses due to business interruption	\$ 255,080	\$ 1,262,630

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>.

Berlin 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 Berlin’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;
- Municipal buildings, which 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 are also vulnerable to hurricanes.

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## POTENTIAL CLIMATE CHANGE EFFECTS

According to the 2023 ResilientMass Plan, there are two major ways that climate change influences hurricanes and tropical storms:<sup>69</sup>

- 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 Berlin.

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## VULNERABILITY

Based on the above analysis, Berlin 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 they do not remove them entirely. The HMP team in town also noted that the Town has taken steps to increase its preparedness for future hurricanes in the past two years by increasing its tree trimming and tree take-down efforts near powerlines and roadways as well as by increasing its efforts to clean culverts and unclog / open waterways. Historically, by the time a storm has arrived in Berlin, 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.

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## MITIGATION STRATEGIES

The Town of Berlin 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 Berlin:

- Conduct a field inventory of bridges in town and utilize this inventory to rank and prioritize bridge projects for increased flood resiliency and storm-hardening. Design and implement priority bridge/culvert resizing or replacement projects, including for culverts identified in the 2024 Berlin Culvert Assessment Report and the forthcoming culvert assessment being performed by OARS. Fund routine bridge maintenance in town.
- Protect and restore wetlands as a means of mitigating flooding and stormwater runoff.
- Perform a town-wide inventory and drainage assessment of culverts.
- Re-implement and expand on the Town’s vegetative debris program and thereby mitigate the risk of stormwater flooding, riverine flooding, winter storm damage, and other hazard impacts. Investigate working with the Central Massachusetts Mosquito Control Project to implement this strategy.
- Join with Central Massachusetts Regional Stormwater Coalition to aid in public outreach and funding drainage improvements.

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<sup>69</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan”

- Develop an education campaign to increase support for a Wetlands Protection Bylaw which can provide stronger protection for the Town's water resources and can improve water supply health, improve water retention, and reduce adverse flooding impacts.
- Continue actively enforcing and complying with the Massachusetts Wetlands Protection Act.
- Seek to implement a local wetlands bylaw.
- Complete a town-wide stormwater management and containment plan, as the Town will likely soon be no longer exempt from the MS4 permit. Promote low-impact development / natural mitigation measures, such as rain gardens, in this plan.
- Adopt a stormwater bylaw for the Town and encourage low-impact development measures as part of this bylaw. Draft this new bylaw as part of a forthcoming zoning diagnostic process.
- Participate in Regional Debris Management Planning.

## 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.<sup>70</sup>

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 Berlin approximately 40 miles east of the zone of most frequent past occurrences.

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### 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 Berlin 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 % of the Town generally affected.

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### EXTENT

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

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<sup>70</sup> “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 22: Enhanced Fujita Scale Levels and Descriptions of Damage<sup>71</sup>**

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 forests uprooted.
EF4	Devastating	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.

**Table 23: Extent Scale for Hail<sup>72</sup>**

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 Ball
1.75	Golf Ball
2.0	Hen Egg
2.5	Tennis Ball

<sup>71</sup> 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>.

<sup>72</sup> 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/hailsizes.htm>.

2.75	Baseball
3.00	Tea Cup
4.00	Grapefruit
4.50	Softball

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## PREVIOUS OCCURRENCES

Because thunderstorms and wind affect Berlin 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.<sup>73</sup>

- In 1953, an F4 tornado struck Worcester. The event resulted in at least 90 fatalities and more than 1,200 injuries. Extensive property damage occurred. 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. Several deaths were reported, all in Hampden County. No deaths were reported in Worcester County.

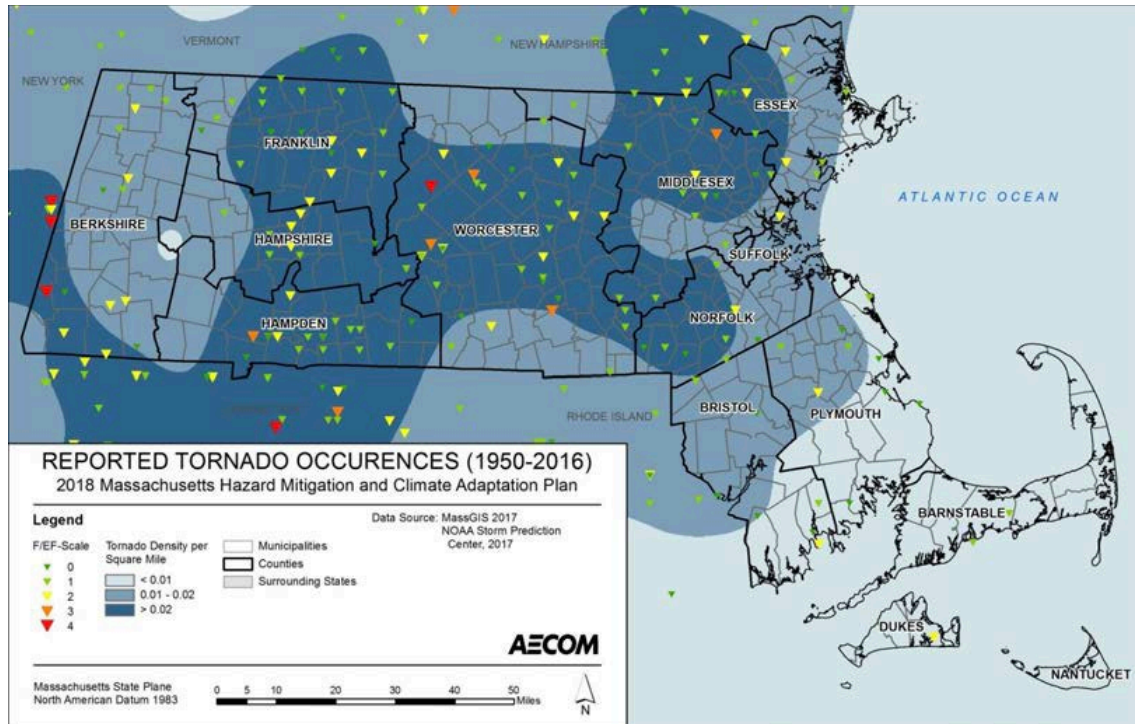
In the last 6 years, there has only been one small tornado that has affected communities near Berlin:

- 2018 Tornado (East Douglas, Uxbridge, Upton)<sup>74</sup>

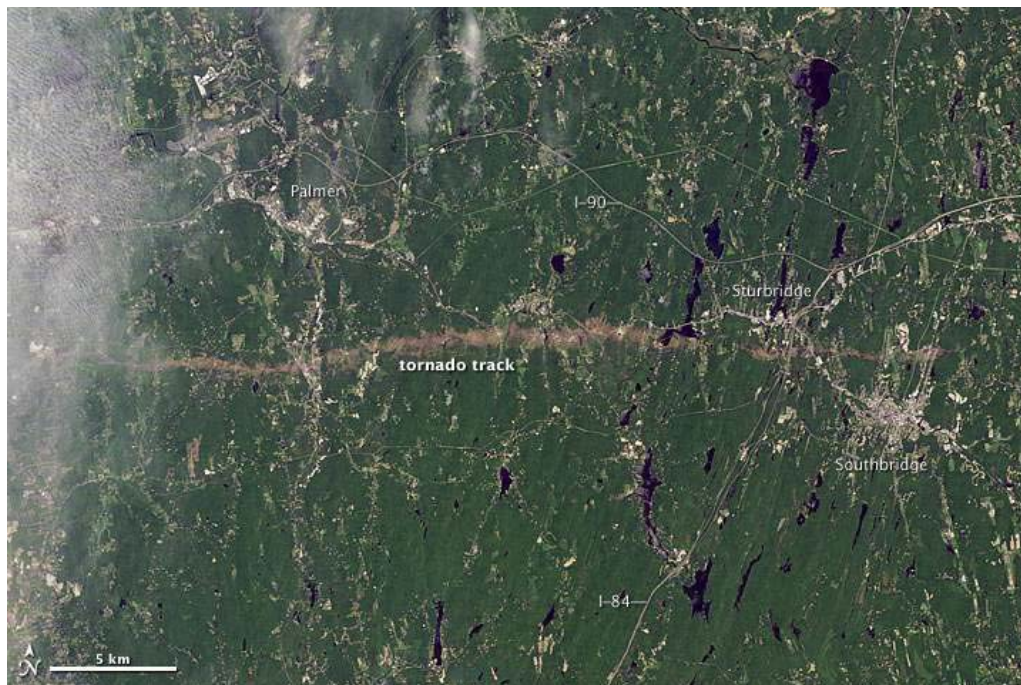
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<sup>73</sup> "Tornado Paths," Arcgis.com, ESRI, accessed March 13, 2025, <https://www.arcgis.com/apps/View/index.html?appid=01672085b139432e8fe1296a743f67d7>.

<sup>74</sup> Ibid.



**Figure 1: Density of Reported Tornadoes per Square Mile (1950-2016)<sup>75</sup>**



**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.**

<sup>75</sup> “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, and they are severe, long-lived thunderstorms. Approximately 20% of supercells produce tornadoes. In Berlin, there have been several severe thunderstorm / wind occurrences:<sup>76</sup>

- 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.
- 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.
- 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 thunderstorms moved across most of Massachusetts and a portion of northern Connecticut and northern Rhode Island.
- 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

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<sup>76</sup> “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](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).

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.

The HMP team in Berlin noted that wind shear / microburst events occurred in town along South Street and Crosby Street in 2017/2018 and on September 9<sup>th</sup>, 2023. The 2017/2018 event also affected the east side of the Town of Hudson as well as the Town of Stow, and the 2023 event may have also affected the Town of Northborough.

- Specifically, the following critical infrastructure routes and sites identified in this plan were noted as having been affected by these wind shear events by CMRPC's GIS analysis:
  - Pleasant Street / South Street / River Road West,
  - The Railroad Crossing at Crosby Road and Belleview Road,
  - The CSX Railroad, and
  - The Wachusett Aqueduct.

The HMP team in town also noted that the Town has experienced sporadic lightning strikes.

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## PROBABILITY OF FUTURE EVENTS

According to the 2023 ResilientMass Plan, Massachusetts averages two to five tornadoes per year.<sup>77</sup> Only two tornadoes in the state (which occurred in 1953 and 2011) have 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 Berlin is difficult.

Based upon the available historical record, as well as Berlin'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.

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## IMPACT

Overall, Berlin 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. Berlin 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 22 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

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<sup>77</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

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 forests uprooted.
- 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 Berlin, 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. Many 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 41.1% of the Town's 1,502 total housing units were constructed in 1979 or earlier (according to 2023 American Community Survey 5-year estimates).<sup>78</sup>

Berlin's median home value is \$566,800 (according to 2023 American Communities Survey 5-year estimates).<sup>79</sup> Utilizing the total value of all property in town, \$984,816,023,<sup>80</sup> and an estimated 10 % damage to 5 % of all structures, the estimated amount of damage from a tornado in town is \$4,924,080.12. The cost of repairing or replacing roads, bridges, utilities, and contents inside structures is not included in this estimate.

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## EXPOSURE

Certain features within Berlin'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.

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## 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

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<sup>78</sup> "DP04: Selected Housing Characteristics," Data.Census.gov, United States Census Bureau, accessed February 20, 2024,

<https://data.census.gov/table/ACSDP5Y2023.DP04?q=dp04+selected+housing+characteristics&g=060XX00US2502705490,2502746820>.

<sup>79</sup> Ibid.

<sup>80</sup> Data Analytics and Research Bureau, "Assessed Values by Class," Dlsgateway.dor.state.ma.us, Massachusetts Department of Revenue, February 20, 2025, <https://dlsgateway.dor.state.ma.us/reports/rdPage.aspx?rdReport=PropertyTaxInformation.AssessedValuesbyClass.assessedvaluesbyclass&tbl assessedvalues-PageNr=4&rdDataCache=400584956&rdShowModes=&rdSort=&rdNewPageNr=True1&rdRequestForwarding=Form>.

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.<sup>81</sup>

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

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## VULNERABILITY

Based on the above assessment, Berlin 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 Berlin makes the Town particularly vulnerable to tornadoes, despite their relative infrequency.

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## MITIGATION STRATEGIES

The Town of Berlin 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 tornadoes in Berlin:

- Dredge fire ponds which are currently too shallow and dry out quickly during the summer months. This would also help with stormwater collection and help prevent flooding in the areas of the ponds.
- Complete work to remove the privately-owned Wheeler Pond Dam; this dam is in failure per the MA Office of Dam Safety. The Town, OARS, and Interfluve have received funds through a MA EEA Dam and Seawall Repair or Removal Grant for currently underway permitting for the Dam’s removal. The project’s proponents will seek grant funding for the dam removal project in 2025 and 2026. As funding allows, the Dam’s removal is expected to occur in late 2026 or in 2027.
- Conduct a field inventory of bridges in town and utilize this inventory to rank and prioritize bridge projects for increased flood resiliency and storm-hardening. Design and implement priority bridge/culvert resizing or replacement projects, including for culverts identified in the 2024 Berlin Culvert Assessment Report and the forthcoming culvert assessment being performed by OARS. Fund routine bridge maintenance in town.
- Protect and restore wetlands as a means of mitigating flooding and stormwater runoff.
- Perform a town-wide inventory and drainage assessment of culverts.
- Re-implement and expand on the Town’s vegetative debris program and thereby mitigate the risk of stormwater flooding, riverine flooding, winter storm damage, and other hazard impacts. Investigate working with the Central Massachusetts Mosquito Control Project to implement this strategy.

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<sup>81</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,” page 5.1-56.

- Coordinate with the State to evaluate and repair dams identified by the Office of Dam Safety.
- Join the Central Massachusetts Regional Stormwater Coalition, which can aid the Town in public outreach and in funding drainage improvements.
- Investigate acquiring and preserving properties which, if preserved, will continue to mitigate the impacts of flooding and other hazards.
- Continue actively enforcing and complying with the Massachusetts Wetlands Protection Act.
- Seek to implement a local wetlands bylaw.
- Complete a town-wide stormwater management and containment plan, as the Town will likely soon be no longer exempt from the MS4 permit. Promote low-impact development / natural mitigation measures, such as rain gardens, in this plan.
- Adopt a stormwater bylaw for the Town and encourage low-impact development measures as part of this bylaw. Draft this new bylaw as part of a forthcoming zoning diagnostic process.
- Participate in Regional Debris Management Planning.

## 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 are 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.”<sup>82</sup> When relative moisture drops, light fuels like grasses become drier and burn more easily.<sup>83</sup>

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.

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### LOCATION

Approximately 74.4% of the total land area in Worcester County is deciduous forest, evergreen forest, forested wetland, scrub/shrub land, scrub/shrub wetland, or grassland.<sup>84</sup> Much of the Central Region of Massachusetts, including Berlin, has a high risk of wildfires for the state.<sup>85</sup> In Berlin, approximately 38.6% of land is deciduous forest, approximately 20.0% of land is evergreen forest, approximately 10.6% of land is forested wetland, approximately 0.8% of land is scrub/shrub land, and approximately 3.1% of land is grassland.<sup>86</sup> Berlin is developed in a moderately suburban to rural pattern, with several 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 % of its total area.

Berlin 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 along Ball Hill Road, Linden Street, and Lyman Road as well as residents living in other nearby areas. Additionally, lightning strikes and faulty power infrastructure can lead to wildfires developing in town.

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<sup>82</sup> “Understanding Fire Danger,” Nps.gov, United States National Park Service, August 17, 2023, <https://www.nps.gov/articles/understanding-fire-danger.htm>.

<sup>83</sup> Ibid.

<sup>84</sup> 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>.

<sup>85</sup> “Massachusetts State Hazard Mitigation and Climate Adaptation Plan,” September 2018

<sup>86</sup> Massachusetts Bureau of Geographic Information, “MassGIS Data: 2016 Land Cover/Land Use”

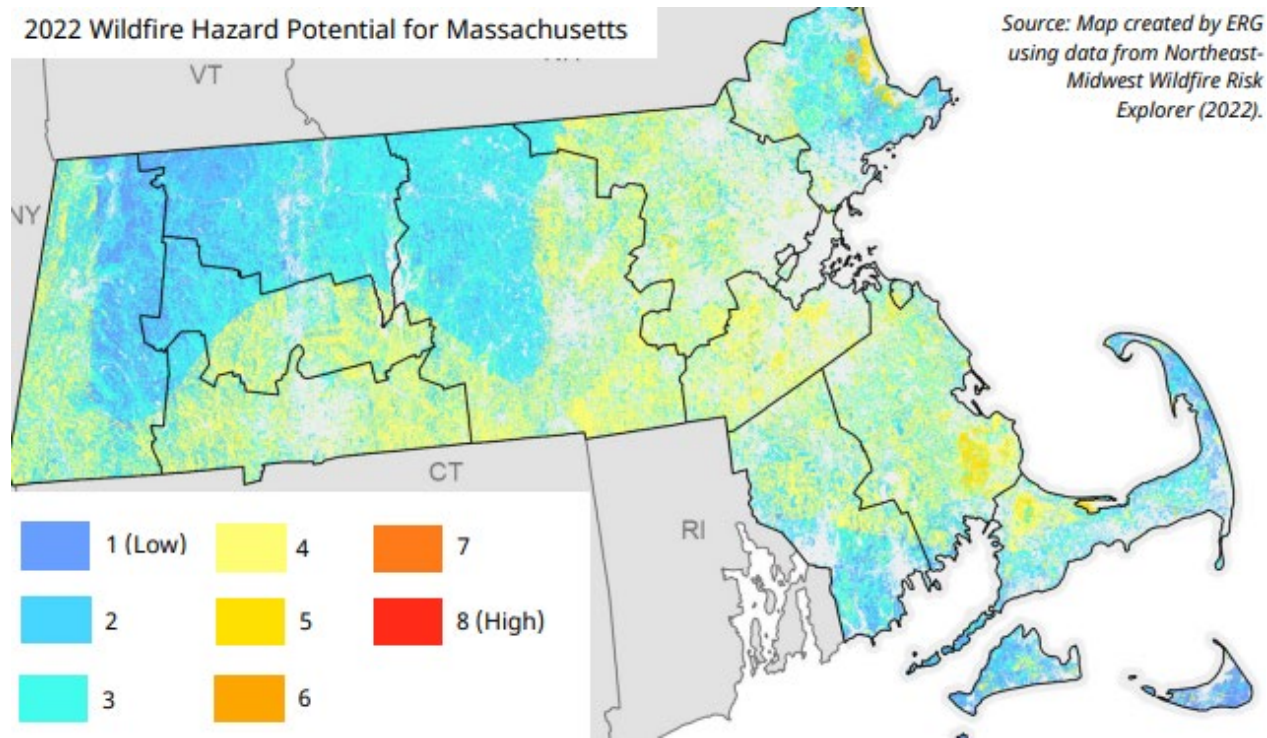


Figure 2: Wildfire Risk Areas for the Commonwealth of Massachusetts.<sup>87</sup>

## 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 73.1% of Berlin’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 I-495 and MA-62 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 24: 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.

<sup>87</sup> "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. <b>NO OUTDOOR BURNING SHOULD TAKE PLACE IN AREAS WITH EXTREME FIRE DANGER.</b>

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.<sup>88</sup> 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. 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.

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<sup>88</sup> "Air Quality Index (AQI) Basics," Airnow.gov, United States Environmental Protection Agency, accessed June 10, 2024, <https://www.airnow.gov/aqi/aqi-basics/>.

**Table 25: 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 people 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**

Berlin has an on-call paid professional fire department providing 24/7 coverage.<sup>89</sup> In addition, Berlin is part of Massachusetts Fire District 8 with 30 other communities.<sup>90</sup> Berlin experienced 74 wildfires between 2011-2020; however, each of these fires were quite small, and altogether they consumed 6.3 acres of brush/wildland.<sup>91</sup> The local HMP planning team noted that on April 14-15,

<sup>89</sup> “About the Berlin Fire & EMS Department,” Townofberlin.com, The Town of Berlin, Massachusetts, accessed February 20, 2025, <https://www.townofberlin.com/berlin-fire-ems/pages/about-berlin-fire-ems-department>.

<sup>90</sup> “Massachusetts Fire District 8,” Massfiredistrict8.com, Massachusetts Fire District 8, accessed February 20, 2025, <https://www.massfiredistrict8.com/#contact>.

<sup>91</sup> “Wildfire Data,” Cmrpc-my.sharepoint.com, Massachusetts Fire Incident Reporting System, accessed February 20, 2025, [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](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).

2023, a wildfire at Mount Pisgah Conservation Area in town burned approximately 25 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 similar to the forests at Mount Pisgah.<sup>92</sup>

The HMP team in town noted that the Town has no reliable means of emergency access to the Mount Pisgah Conservation Area, and that this impedes the ability of town emergency management staff from adequately responding in the case of emergencies in the area. They recommended that access roads to the area, including its middle field, should be constructed, in part to respond to potential future wildfire events.

The Berlin HMP team also noted that a wildfire has occurred in the area of the trails around the Lester G. Ross Dam and that wildfires could occur in this area in the future, but they also noted that the Town has the capacity to manage any wildfires which occur there in the future. They also noted that wildfires have occurred at the solar field along Randall Road as well as along the CSX railroad tracks in town and that there is potential for additional wildfires to occur in these areas in the future.

During a critical drought which occurred across most of Massachusetts in late 2024, at least 661 wildfires which in combination burned at least 4,000 acres occurred in the state.<sup>93</sup> The local HMP planning team noted that the Town's fire department recently has had to shuttle water to fight wildfires at Mount Pisgah due to water from sources near and at Mount Pisgah being dried up; they also noted that the Town has not needed to shuttle water otherwise and was able to contain the wildfires at Mount Pisgah by coordinating with MassDCR to establish backburns.

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## 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.<sup>94</sup> 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.<sup>95</sup> Rising

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<sup>92</sup> "Berlin Trails Committee Notice on the Mount Pisgah Fire," Town.Berlin.ma.us, The Town of Berlin, accessed September 16, 2024,

[https://www.town.Berlin.ma.us/sites/g/files/vyhlf12221/f/alerts/mount\\_pisgah\\_fire\\_041523\\_notice.pdf](https://www.town.Berlin.ma.us/sites/g/files/vyhlf12221/f/alerts/mount_pisgah_fire_041523_notice.pdf).

<sup>93</sup> Massachusetts Emergency Management Agency, "Massachusetts Emergency Management Agency Situational Awareness Statement # 26: Statewide Wildfire Operations," (issue brief), Boston, Massachusetts, November 25, 2024.

<sup>94</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

<sup>95</sup> ResilientMass Maps and Data Center, "Climate Change Projections Dashboard," Resilientma-mapcenter-mass-

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 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 Berlin 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 Berlin (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).

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## IMPACT

While a large wildfire could in theory damage much of the landmass of Berlin, most forested areas in town 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 areas 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; and
- The community through the destruction of property, the loss of life, and/or injuries.

Utilizing the total value of all property, \$984,816,023,<sup>96</sup> and an estimated 5% damage to 1% of all structures, the estimated amount of damage from a wildfire in town is \$492,408.01. 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.<sup>97</sup>

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## EXPOSURE

Certain features within Berlin’s infrastructure, society, and environment may face more exposure to

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eoea.hub.arcgis.com, ResilientMass, accessed July 1, 2024, <https://resilientma-mapcenter-mass-eoea.hub.arcgis.com/#ClimateDashboard>.

<sup>96</sup> Data Analytics and Research Bureau, “Assessed Values by Class”

<sup>97</sup> 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>.

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 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;<sup>98</sup> and
- First responders, especially the Town's firefighters.

Specifically, the following critical infrastructure sites and routes identified in this plan were noted as being especially vulnerable to wildfires / brush fires by CMPRC's GIS analysis:

- Pleasant Street / South Street / River Road West,
- The Railroad Crossings at Jones Road and South Street, Linden Street, Derby Road and West Street, Randall Road and West Street, and Crosby Road and Bellevue Road,
- The CSX Railroad,
- The Wachusett Aqueduct, and
- The Lester G. Ross Dam.

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 (PM<sub>2.5</sub>) – on June 6<sup>th</sup> 2023.<sup>99</sup>

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## 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.<sup>100</sup> 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 Berlin. This increase in wildfires may lead to changes in land use, such as the Town no longer being able to

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<sup>98</sup> 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/>.

<sup>99</sup> “Pre-Generated Data Files,” Aqs.epa.gov, United States Environmental Protection Agency, October 26, 2023, [https://aqs.epa.gov/aqsweb/airdata/download\\_files.html](https://aqs.epa.gov/aqsweb/airdata/download_files.html).

<sup>100</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan”

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 Berlin 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.

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## VULNERABILITY

Based on the above assessment, Berlin 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 Berlin at risk to a greater frequency and ferocity of wildfires, and wildfires outside of Berlin could reduce air quality to dangerous levels in town.

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## MITIGATION STRATEGIES

The Town of Berlin is currently able to effectively respond to wildfires 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 wildfires. The local HMP planning team identified the following strategies which could reduce the threat of wildfires in Berlin:

- Dredge fire ponds which are currently too shallow and dry out quickly during the summer months. This would also help with stormwater collection and help prevent flooding in the areas of the ponds.
- Install air filters, cooling / central air conditioning, and/or dehumidification at emergency shelter locations to ensure the continued viability of these shelters.
- Assess and permanently protect forestland and wetlands in town to ensure reductions in flooding and wildfire damages.
- Control invasive species in both forests and waterways in order to reduce fire loads and improve habitat quality. Research the use of goats for invasive species and poison ivy.
- Investigate the Firewise community certification program and achieve certification in town if interested.
- Coordinate internally to decide what the next steps for improving water access by the Berlin Fire Department will be. These next steps could include creating more fire ponds, constructing more dry hydrants, and/or purchasing a new fire department water truck.
- Effectively communicate bans on outdoor burning to the public.
- Increase public outreach and education about forest health impacts.
- Implement a Tree and Forest Management Plan at the Ball Hill Road Conservation Area and work on expanding this type of planning and implementation to other forested areas. Hire a forester to develop Forestry Management Plans across Berlin and assist in efforts to improve forest health and reduce fire loads in town.

## 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 Berlin 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.<sup>101</sup>

**Table 26: 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	Causes 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.

<sup>101</sup> "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 27: Modified Mercalli Intensity Scale for and Effects<sup>102</sup>**

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

<sup>102</sup> 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](https://www.usgs.gov/programs/earthquake-hazards/modified-mercalli-intensity-scale?qt-science_center_objects=0#qt-science_center_objects).

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## PREVIOUS OCCURRENCES

The last recorded earthquake to cause major damage in New England occurred in 1755,<sup>103</sup> though 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)<sup>104</sup>

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.<sup>105</sup> 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 Berlin, 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.<sup>106</sup> Figure 3 below shows the locations of earthquakes that have occurred across the New England region and beyond from January 1975 through October 2017.

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<sup>103</sup> 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://nsec.org/massachusetts-earthquakes/>.

<sup>104</sup> 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](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>.

<sup>105</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

<sup>106</sup> "New York Earthquakes," NESEC.org, Northeast States Emergency Consortium, accessed September 16, 2024, <https://nsec.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>.

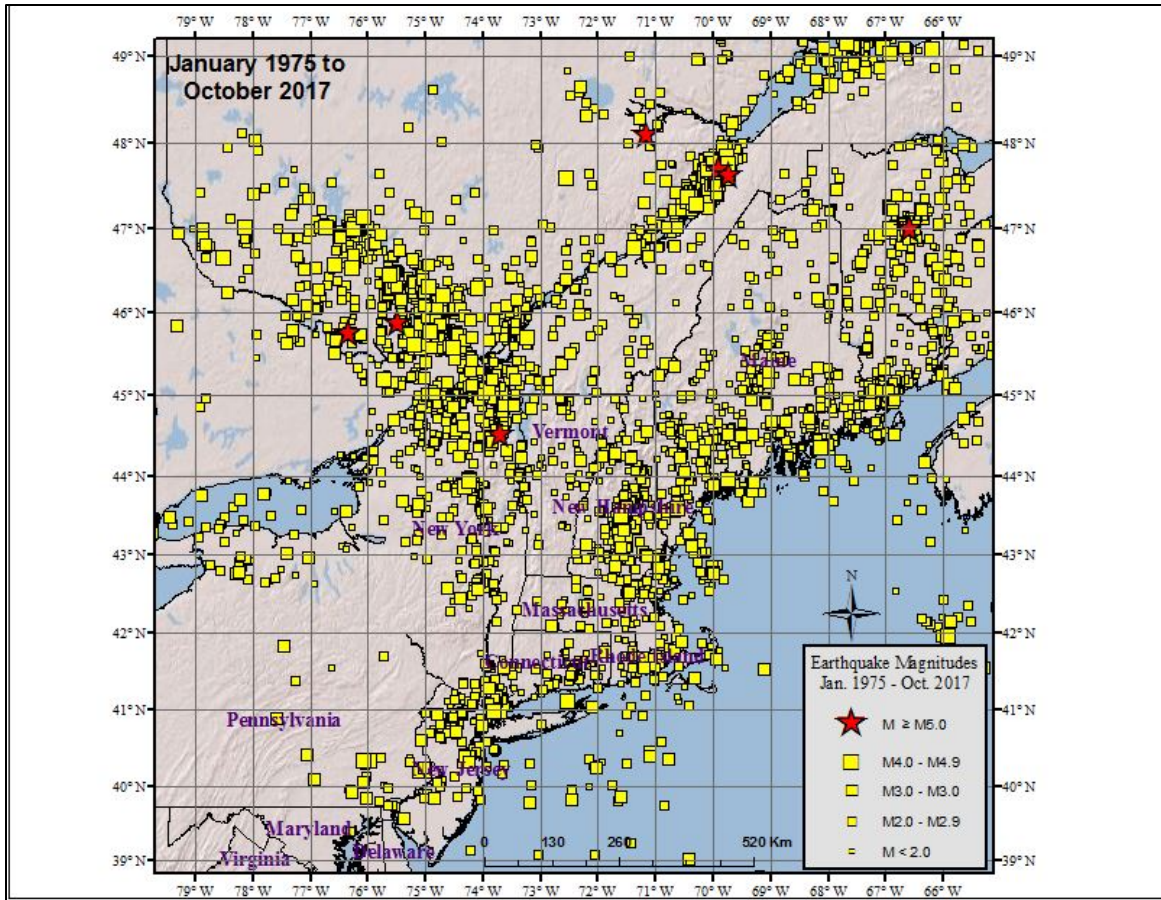


Figure 3: Map of Earthquakes Which Occurred in the Northeastern US and Southeastern Canada, 1975 to 2017.<sup>107</sup>

The local hazard mitigation planning team reports that no earthquakes have recently been felt in Berlin. To determine whether earthquakes have occurred recently near Berlin, earthquake data over the past seven 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

<sup>107</sup> "New York Earthquakes," NESEC.org, Northeast States Emergency Consortium, accessed September 16, 2024, <https://nsec.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 km W of Peabody, 1.4/2.5
- 1/1/2022 – 13 km N of Rockport, 2.3/3.0
- 3/4/2022 – 5 km WSW of Orange, 2.2/2.7
- 11/10/2022 – 12 km NW Of Nantucket, 2.6/3.0
- 11/13/2023 – 208 km E of Chatham, 2.8/3.3
- 12/26/2023 – 52 km ENE of Rockport, 2.2/2.8
- 3/11/2024 – 6 km E of Lawrence, 1.1/2.1
- 11/18/2024 – 6 km ENE of Fitchburg, 1.5/2.4

\*Mn is the Nuttli Magnitude

\*\*Mc is the Coda Duration Magnitude

Each of these earthquakes has been minor. Additionally, earthquakes with a magnitude of about 2.0 or less are usually called “microearthquakes” and are generally only recorded locally.<sup>108</sup>

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 Berlin according to the local HMP planning team.<sup>109</sup>

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## 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%.”<sup>110</sup> 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 occurring 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% probability in any given year) of damaging earthquakes occurring in Berlin.

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## 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 41.1% of the Town’s 1,502 total housing units, according

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<sup>108</sup> New England Seismic Network, “NESN Recent Earthquakes,” Aki.bc.edu, Weston Observatory at Boston College, June 10, 2024, [http://aki.bc.edu/cgi-bin/NESN/recent\\_events.pl](http://aki.bc.edu/cgi-bin/NESN/recent_events.pl).

<sup>109</sup> Northeast States Emergency Consortium and John E. Ebel, PhD. Boston College, Weston Observatory, “Massachusetts Earthquakes,” NESEC.org.

<sup>110</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,” page 5.1-42.

to 2023 American Community Survey 5-year estimates, were constructed in 1979 or earlier.<sup>111</sup> Seismic standards in Massachusetts were upgraded with the 1997 revision of the state building code. Despite its fairly old housing stock, Berlin faces a “minor” impact from earthquakes, 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 28: HAZUS Potential Damages from a Magnitude 5.0 Earthquake with an Epicenter in Berlin**

	Magnitude 5.0
<b>Building Characteristics</b>	
Estimated total number of buildings	1,215
Estimated total building replacement value (2024 \$)	\$ 651,000,000
<b>Building Damages</b>	
# of buildings sustaining slight damage	5
# of buildings sustaining moderate damage	1
# of buildings sustaining extensive damage	0
# of buildings completely damaged	0
<b>Population Needs</b>	
# of households displaced	0
# of people seeking public shelter	0
<b>Debris</b>	
Building debris generated (tons)	0
# of truckloads to clear debris (@ 25 tons/truck)	0
<b>Value of Damages (dollars)</b>	
Total property damage	\$ 150,000
Total losses due to business interruption	\$ 33,600

For more information on the HAZUS-MH software, go to [www.fema.gov/hazus-software](http://www.fema.gov/hazus-software).

<sup>111</sup> “DP04: Selected Housing Characteristics,” Data.Census.gov

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## EXPOSURE

Certain features within Berlin’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.<sup>112</sup>

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## POTENTIAL CLIMATE CHANGE EFFECTS

The 2023 ResilientMass Plan identifies no climate change effects that pertain to earthquake hazards.<sup>113</sup>

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## VULNERABILITY

Based on the above analysis, Berlin has a hazard index rating of “5 – lowest risk” from earthquakes.

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## MITIGATION STRATEGIES

The Town of Berlin 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 Berlin:

- Inventory unreinforced municipally owned 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.
- Participate in Regional Debris Management Planning.

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<sup>112</sup> “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>.

<sup>113</sup> “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.<sup>114</sup> Dam failures may be influenced by storm floodwaters, but most dam failures are caused by structural, mechanical, or hydraulic failures.<sup>115</sup> 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 19<sup>th</sup> 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 (MGL Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00).<sup>116</sup> 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.

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### LOCATION

According to the Massachusetts Office of Dam Safety, there are nine dams in Berlin, of which one is a high hazard potential dam, four are significant hazard potential dams, and one is a low hazard potential dam. The remaining three dams are rated not applicable (N/A). Dams within and/or of concern to Berlin are listed below and are mapped in Appendix A. More information on significant and high hazard dams in town is included in the High Hazard Potential Dams Appendix to this plan. This list includes the high hazard potential Wachusett Reservoir South Dike, which is located in the Town of Clinton but would impact Berlin if it were to fail.

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<sup>114</sup> 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>

<sup>115</sup> “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](https://www.fema.gov/sites/default/files/2020-08/fema_living-with-dams_p-956.pdf).

<sup>116</sup> “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%20public%20review%20of%20the%20performance%20of%20a%20dam>.

**Table 29: Dams in / of Concern Relating to Berlin**

National ID	Dam Name	Owner	Regulatory Authority	Hazard Code	Notes
MA00458 and MA00459	Wheeler Pond Dam	Private – Robin Bonazzoli, Trustee of the Bonazzoli Family Estate	Office of Dam Safety	Significant Hazard	The dam was rated poor in the 2009 inspection / evaluation report for it. In 2023, the Dam continued to show signs of failure. The Dam’s owner partnered with OARS (the Organization for the Assabet, Sudbury, and Concord Rivers) and Interfluve to develop grants to support the design and permitting of this dam’s removal. In February 2025, the Town, OARS, and Interfluve reported that they have received funds through a MA EEA Dam and Seawall Repair or Removal Grant for currently underway permitting for the Dam’s removal. The project’s proponents will seek grant funding for the dam removal project in 2025 and 2026. As funding allows, the Dam’s removal is expected to occur in late 2026 or in 2027. This dam was identified as a dam failure hazard by the local HMP planning team and CMRPC’s GIS analysis; it is also in the 100-year flood zone.
MA00958	Gates Pond Dam	Public – Town of Hudson	Office of Dam Safety	Low Hazard	This dam has been noted as vulnerable by CMRPC’s GIS analysis because it is in the 500-year flood zone. It is also near but not in the high slope (15% and above) hazard area.
MA01229	Lester G. Ross Dam	Public – MA Department of Conservation and Recreation	Office of Dam Safety	High Hazard	This dam is in satisfactory condition according to the June 19 <sup>th</sup> , 2024 inspection / evaluation report for it. It has been noted as vulnerable by CMRPC’s GIS analysis because it is in the 100-year flood zone and a locally identified wildfire hazard area. It is also near but not in the high slope (15% and above) hazard area. The local HMP planning team noted that Mass DCR maintains and mows this dam and the area surrounding it. Despite being in satisfactory condition, it has been identified as vulnerable by the local HMP team because it would have significant negative impacts on people and infrastructure in town if it were to fail after an earthquake or flooding event.

National ID	Dam Name	Owner	Regulatory Authority	Hazard Code	Notes
MA01230	Brewer Brook Dam	Public – MA Department of Conservation and Recreation	Office of Dam Safety	Significant Hazard	This dam is in satisfactory condition according to the July 2023 inspection / evaluation report for it. It has been noted as vulnerable by CMRPC’s GIS analysis because it is in the 100-year flood zone. It is also near but not in the high slope (15% and above) hazard area. Despite being in satisfactory condition, it has been identified as vulnerable by the local HMP planning team because it would have significant negative impacts on people and infrastructure in town if it were to fail after an earthquake or flooding event.
MA02568	Storage Pond Dam / At Berlin	Public – MA Department of Conservation and Recreation	Non-Jurisdictional - Other	N/A	This dam is located near but not in the 100-year flood zone and the high slope (15% and above) hazard area.
MA02738	Storage Pond Dam	Public – MA Department of Conservation and Recreation	Non-Jurisdictional - Other	N/A	This dam has been noted as vulnerable by CMRPC’s GIS analysis because it is in the 100-year flood zone.
MA03377	Highland Commons Pond B Dam & Dike	Private – Benderson Development	Office of Dam Safety	Significant Hazard	This dam is in satisfactory condition according to the December 23 <sup>rd</sup> , 2021 inspection / evaluation report for it. There are plans for another inspection of this dam to occur in 2025. It is located near but not in the high slope (15% and above) hazard area.
MA03263	Wachusett Reservoir South Dike	Public – MA Water Resources Authority and MA Department of Conservation and Recreation	Office of Dam Safety	High Hazard	This dam is located in the neighboring towns of Clinton and Boylston. It is located near but not in the 500-year flood zone and the high slope (15% and above) hazard area.

The Fahey Dam (MA02739, Private, Non-Jurisdictional - Other, N/A) is still included in the MassGIS dams database but was noted by the HMP team in town and the Office of Dam Safety to no longer exist. Massachusetts Department of Conservation and Recreation engineers could not find this dam when they looked for it in the past decade; it was likely removed in the early 1900’s.

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

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#### 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.

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## PREVIOUS OCCURRENCES

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

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## PROBABILITY OF FUTURE EVENTS

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

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## IMPACT

The Town faces a “catastrophic” impact from the dam failure, with there being the possibility of multiple deaths and injuries and more than 50% of property in affected areas being damaged or destroyed in the case of a dam failure event in town.

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.<sup>117</sup>

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## EXPOSURE

Certain features within Berlin’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 Potential

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<sup>117</sup> “About DSS-WISE™ Web,” Dsswiseweb.ncche.olemiss.edu, University of Mississippi, accessed June 10, 2024, <https://dsswiseweb.ncche.olemiss.edu/userpages/about.php>.

Dams;

- Downstream waterway infrastructure; and
- Poorly maintained or inspected dam infrastructure held in public or private hands.

Specifically, the Wheeler Pond Dam was noted as being especially vulnerable to dam failure by the HMP planning team in Berlin and CMPRC's GIS analysis.

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## POTENTIAL CLIMATE CHANGE EFFECTS

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

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## VULNERABILITY

Based on a mostly qualitative assessment, Berlin has a hazard index rating of “4 – low risk” from dam failure. A catastrophic impact on the Town's infrastructure and potentially to the region as a whole may occur in the case that any high and/or significant hazard potential dams in Town fail. However, dam failure events are unlikely in town because the dams that may affect the Town are in satisfactory or good condition or are in the process of being removed.

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## MITIGATION STRATEGIES

The Town of Berlin 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 Berlin:

- Complete work to remove the privately-owned Wheeler Pond Dam; this dam is in failure per the MA Office of Dam Safety. The Town, OARS, and Interfluve have received funds through a MA EEA Dam and Seawall Repair or Removal Grant for currently underway permitting for the Dam's removal. The project's proponents will seek grant funding for the dam removal project in 2025 and 2026. As funding allows, the Dam's removal is expected to occur in late 2026 or in 2027.
- Perform an assessment of all dams in Berlin, with special attention to the Lester Ross Dam and Gates Pond Dam. Evaluate dams and bridges to help the Town become more prepared for the expected increases in flooding and heavy rain events.
- Coordinate with the State to evaluate and repair dams identified by the Office of Dam Safety.
- Enhance coordination with the state to confirm that the Lester G. Ross Dam is properly maintained.
- Enhance coordination with the Town of Hudson to ensure that the Gates Pond Dam is properly managed.

## 4.10 DROUGHT, INCLUDING CHANGES IN GROUNDWATER

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 (including reduced groundwater levels); increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat. Drought impacts, including reduced groundwater levels, can have far-reaching effects throughout the Central Massachusetts region and even the country as a whole.

### LOCATION

Because of this hazard’s regional nature, drought (including reduced groundwater levels) would likely impact the entire community, meaning the location of occurrence within Berlin of this hazard is “large.”

### EXTENT

The National Drought Mitigation Center records information on historical drought occurrences. Unfortunately, drought data is 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 30: National Drought Mitigation Center D0-D4 Scale<sup>118</sup>**

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 and 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.<sup>119</sup> In Massachusetts, the quality of drinking

<sup>118</sup> “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>.

<sup>119</sup> Lee Stanish, “Introducing the National Groundwater Conditions web application,” Waterdata.usgs.gov, United

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.<sup>120</sup> Massachusetts also has a Drought Management Plan which provides an overview of how groundwater levels are monitored in the state;<sup>121</sup> data from groundwater monitoring locations in and near Berlin can be studied to see if groundwater levels in town are fluctuating outside of historically-experienced ranges.

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## 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 (including groundwater) levels caused by drought. The Berlin 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.<sup>122</sup>

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

**Table 31: Peak Drought Severity Data in Massachusetts Per Year Since 2000<sup>123</sup>**

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

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States Geological Survey, accessed April 7, 2025, <https://waterdata.usgs.gov/blog/groundwater-levels-app/>.

<sup>120</sup> "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>.

<sup>121</sup> "Massachusetts Drought Management Plan," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs and Massachusetts Emergency Management Agency, December 2023, <https://www.mass.gov/doc/massachusetts-drought-management-plan/download>.

<sup>122</sup> 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.

<sup>123</sup> "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>.

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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
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	D3 conditions in 47% of the state
2025 (through late February)	D2 conditions in 14% of the state

For more information on historically observed impacts for the different drought categories (D0-D3), see table 33.

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

**Table 32: Peak Drought Severity Data in Worcester County Per Year Since 2018<sup>124</sup>**

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	D3 conditions in 51% of Worcester County
2025 (through late February)	D2 conditions in 58% of Worcester County

As of the writing of this plan, the Town of Berlin and large portions of central and northeastern Massachusetts are currently in critical drought conditions.<sup>125</sup>

<sup>124</sup> Ibid.

<sup>125</sup> “Drought Management in Massachusetts,” Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs Drought Management Task Force, January 1, 2025, <https://www.mass.gov/guides/drought-management-in-massachusetts>.

The local HMP planning team in town noted that, during this drought in fall 2024, private groundwater wells in town were at low levels and the Town’s fire department had to use tankers to shuttle water to fight brush fires due to less water from other sources being available. By early 2025, drought conditions had improved in town with more frequent rain occurring, but the Town still had several sites which were very dry.

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### PROBABILITY OF FUTURE EVENTS

In Berlin, as in the rest of the state, the probability of extreme and exceptional droughts, including those that cause extreme and exceptional reductions in groundwater levels, 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 such as severe reductions in groundwater levels.<sup>126</sup> However, many 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 and resulting reduced groundwater levels, including extreme and exceptional drought and reductions to these groundwater levels, may increase in Berlin due to climate change influences. Specifically, climate change may cause an increase in consecutive dry days over time.

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### IMPACT

The specific impacts of historical droughts and drought-induced reductions in groundwater levels in Massachusetts are categorized by the National Drought Mitigation Center in Table 33 below:

**Table 33: Historic Impacts of Drought in Massachusetts<sup>127</sup>**

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

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<sup>126</sup> “Massachusetts Drought Management Plan,” Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs and Massachusetts Emergency Management Agency, December 2023, <https://www.mass.gov/doc/massachusetts-drought-management-plan/download>.

<sup>127</sup> “State Impacts,” Droughtmonitor.unl.edu, National Drought Mitigation Center, University of Nebraska-Lincoln, accessed June 10, 2024, <https://droughtmonitor.unl.edu/DmData/StateImpacts.aspx>.

	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, its impacts can be exacerbated by human behavior.<sup>128</sup> 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.<sup>129</sup>

Reduced groundwater levels caused by drought can cause public water suppliers to have difficulty in meeting users' demands while also maintaining enough water pressure in their systems to facilitate fire suppression and water quality needs. Decreased firefighting capabilities due to low water availability during drought can increase the community's vulnerability to wildfires and fires caused by lightning strikes. Reduced groundwater levels can also lead to remaining well water having sediment (due to intense pumping into bedrock or the overburden aquifer being needed) and/or pollutants such as nitrates and heavy metals in it, and communities may need to consider drilling deeper wells or re-siting wells to areas less affected by drought if sedimentation and/or contamination occurs.

Berlin may see more drought impacts than surrounding communities, as it has no municipal water system and relies entirely on private wells. The HMP team in town has noted that there has been an increase in the number of dried out wells in town in recent years.

The impact of drought (including reduced in groundwater levels) in Berlin 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.

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## EXPOSURE

Certain features within Berlin's infrastructure, society, and environment may face more exposure to drought (including the reduction in groundwater levels), 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:

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<sup>128</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

<sup>129</sup> Ibid.

- 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.<sup>130</sup>

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## POTENTIAL CLIMATE CHANGE EFFECTS

According to the 2023 ResilientMass Plan, there are two major ways that climate change influences drought frequency and severity.<sup>131</sup>

- 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 becomes 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 as groundwater levels lower during drought events. Berlin is more vulnerable to dried-up wells resulting from drought than other communities in the CMRPC region, as its residents rely on private wells. According to the 2023 ResilientMass Plan, climate change is predicted to affect groundwater availability;<sup>132</sup> 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 Berlin. 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 Berlin.

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## VULNERABILITY

Based on the above assessment, Berlin has a hazard index rating of “3 – medium risk” from drought. Minimal or no loss of or damage to property, injuries, or loss of life is expected from drought in town. In addition, the Town’s current and future assets which rely on private well water are vulnerable to drought impacts such as reduced groundwater levels causing less water availability at private wells. Residents and businesses in town which rely on private wells which are more prone to dry up in the case of drought may face water shortages during drought events.

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<sup>130</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,” pages 5.1-34-5.1-35.

<sup>131</sup> Ibid.

<sup>132</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,” pages 5.1-34-5.1-35.

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## MITIGATION STRATEGIES

The Town of Berlin is currently able to effectively respond to drought, including drought-induced reductions in groundwater levels, 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, including drought-induced reductions in groundwater levels. The local HMP planning team identified the following strategies that could be used to reduce the threat of drought, including drought-induced reductions in groundwater levels, in Berlin:

- Install air filters, cooling / central air conditioning, and/or dehumidification at emergency shelter locations to ensure the continued viability of these shelters.
- Work to protect and enhance the productivity and viability of farmland in town in order to increase the Town's food security and protect farmers' livelihoods from natural hazards; align the Town's efforts to support farmers with the Massachusetts Farmland Action Plan.
- Coordinate internally to decide what the next steps for improving water access by the Berlin Fire Department will be. These next steps could include creating more fire ponds, constructing more dry hydrants, and/or purchasing a new fire department water truck.
- Conduct public education on drought mitigation, especially as it relates to private wells.
- Effectively communicate bans on outdoor burning to the public.
- Investigate and implement public education and outreach programs regarding water conservation and lawn care alternatives. As part of these programs, release public notices about drought and water usage every summer to encourage the reduction of water use in town. Also include the sharing of information on the impacts of herbicides, pesticides, and fertilizers on lawns, well systems, and sewer systems as part of these programs.
- Increase public outreach and education about forest health impacts.
- Implement a Tree and Forest Management Plan at the Ball Hill Road Conservation Area and work on expanding this type of planning and implementation to other forested areas. Hire a forester to develop Forestry Management Plans across Berlin and assist in efforts to improve forest health and reduce fire loads in town.

## 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.<sup>133</sup> Extreme heat in Massachusetts is typically defined as a period of three or more consecutive days with temperatures above 90°F.<sup>134</sup> 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 Berlin are:

**Table 34: Normal Temperatures in the Period Between 1991-2020 in the Area Near Berlin<sup>135</sup>**

	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.

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### LOCATION

Extreme temperatures can be expected to be uniform across Berlin 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.

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### 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:

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<sup>133</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan”

<sup>134</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,” pages 5.2-1-5.2-2.

<sup>135</sup> 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](https://www.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/>.

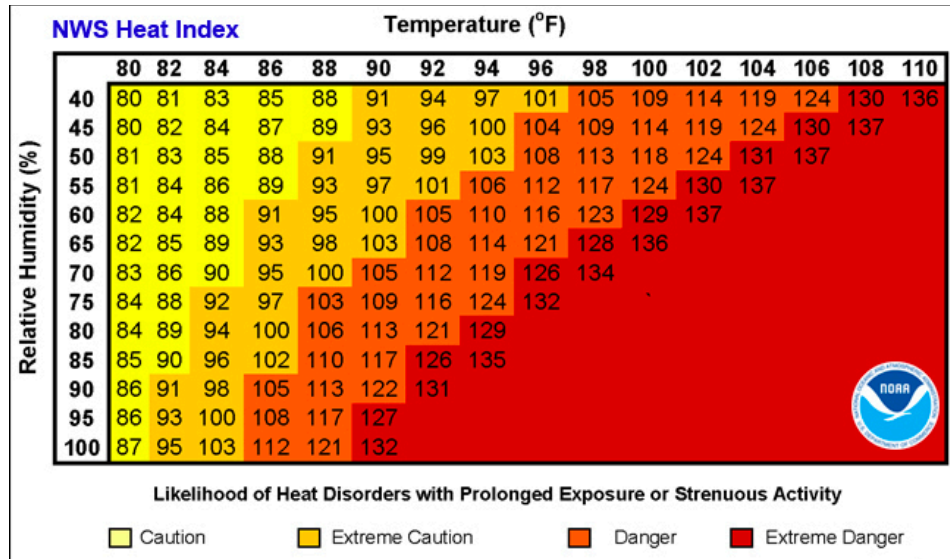


Figure 4: Heat Index<sup>136</sup>

Extreme heat causes more fatalities in the United States than all other weather-related natural hazards combined.<sup>137</sup> Extreme heat can be the underlying cause of death or can worsen other medical conditions like heart disease, hypertension, alcohol poisoning, and drug overdoses.<sup>138</sup> The heat-related mortality rate is higher among males and people aged 65 years and older.<sup>139</sup>

Table 35: 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 35: Heat Effects on the Body<sup>140</sup>

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

<sup>136</sup> 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>.

<sup>137</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,"

<sup>138</sup> 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>.

<sup>139</sup> Ibid.

<sup>140</sup> 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.<sup>141</sup> Prolonged heat can cause power use to spike and in turn can overload the electrical grid, causing outages.<sup>142</sup> Extreme heat and cold can both negatively impact transportation infrastructure; Railroad tracks are of particular concern during extreme heat events because metal rails can kink in high temperatures.<sup>143</sup>

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.<sup>144</sup> 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  $-25^{\circ}\text{F}$  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.

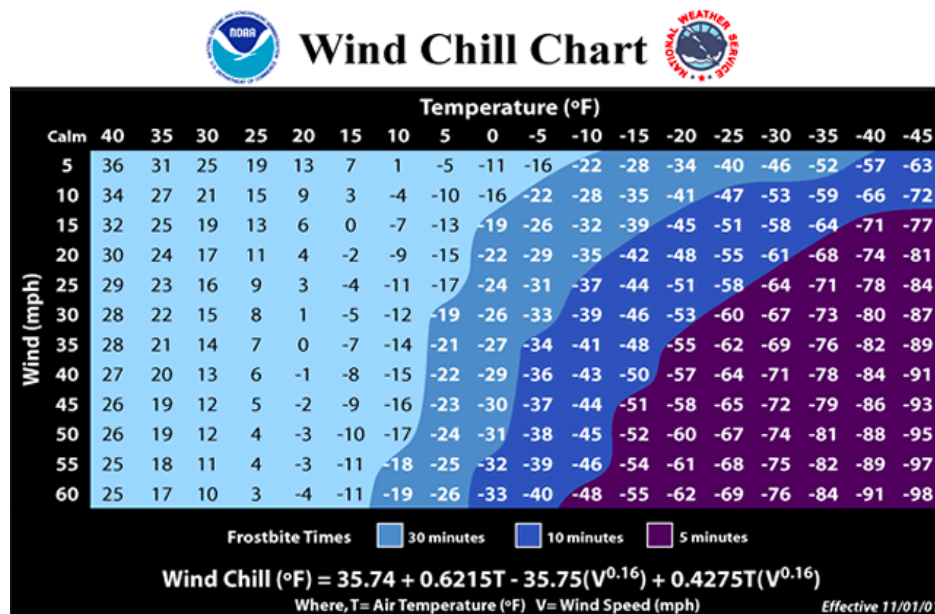


Figure 5: NWS Wind Chill Temperature (WCT) index.<sup>145</sup>

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, and this could further subject them to the cold.<sup>146</sup> Carbon monoxide poisoning is another risk during cold weather, especially when households lack adequate power or heat.<sup>147</sup>

<sup>141</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,"

<sup>142</sup> Ibid.

<sup>143</sup> Ibid.

<sup>144</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-1-5.2-3.

<sup>145</sup> 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>.

<sup>146</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-1-5.2-3.

<sup>147</sup> Ibid.

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## 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.<sup>148</sup> The years from 2010 through 2022 had seven of the ten warmest summers on record in the state.

In 2012 and 2013 there were notably hot summers in Massachusetts<sup>149</sup> In July 2013, a long period of hot and humid weather occurred throughout New England. One fatality occurred on July 6<sup>th</sup>, when a postal worker collapsed as the heat index reached 100°F.<sup>150</sup>

The hottest two summers on record in the Commonwealth were 2020 and 2022.<sup>151</sup> August 2022 was the hottest August ever recorded in the Commonwealth, with temperatures more than 6°F greater than the 20<sup>th</sup> 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 Berlin HMP was developed in 2018:<sup>152</sup>

- 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 20<sup>th</sup> storm drew cold air across Southern New England on January 21<sup>st</sup> 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 21<sup>st</sup> allowing wind chill values to become less extreme, in the teens below zero.

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 Berlin.

The local HMP team noted that the Town has an aging population who are vulnerable to extreme temperature events, and that many older adults in town may not go to warming and cooling centers that the town opens. They also noted that the Town was affected by an extreme cold event in February and March of 2023 and that the Town opened a cooling shelter twice during the summer

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<sup>148</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-7-5.2-8.

<sup>149</sup> Ibid.

<sup>150</sup> Ibid.

<sup>151</sup> Ibid.

<sup>152</sup> "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=%28%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](https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28%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).

of 2024. In addition, they stated that the Town has not experienced power outages due to extreme temperatures in the past but that they are concerned about this occurring in the future.

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### PROBABILITY OF FUTURE EVENTS

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

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### IMPACT

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

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### EXPOSURE

Certain features within Berlin'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 and 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.

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### POTENTIAL CLIMATE CHANGE EFFECTS

According to the 2023 ResilientMass Plan, climate change is already causing more high heat events and fewer extreme cold events to occur in Massachusetts and beyond.<sup>153</sup> 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:<sup>154</sup>

- 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

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<sup>153</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

<sup>154</sup> Ibid.

12.9°F compared to the 1971-2000 baseline.

According to the 2022 Massachusetts Climate Change assessment, by 2030, the summer mean temperature could increase by 3.6°F from the period between 1950 and 2013, worsening stress on electric transmission and utility distribution infrastructure.<sup>155</sup>

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 Berlin. Seasonal temperatures will shift, with spring and summer temperatures extending through more of the year.<sup>156</sup> Winters may also be milder than historical norms.<sup>157</sup> 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.<sup>158</sup>

To respond to climate change-induced changes in temperatures, Berlin 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. Berlin 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.<sup>159</sup>

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## VULNERABILITY

Berlin's vulnerability to extreme heat and cold is considered to be "4 – low risk." The Town operates heating and cooling shelters as is needed at the Public Safety Building and the Berlin Memorial School. Berlin's local ecology, with 73.1% of the Town's total land area being deciduous forest, evergreen forest, forested wetland, scrub/shrub land, or grassland, and its location along the Assabet River and its tributaries also provide natural evaporation and transpiration-related cooling effects to the Town.

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## MITIGATION STRATEGIES

The Town of Berlin 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 Berlin:

- Install air filters, cooling / central air conditioning, and/or dehumidification at emergency shelter locations to ensure the continued viability of these shelters.
- Work to protect and enhance the productivity and viability of farmland in town in order to increase the Town's food security and protect farmers' livelihoods from natural hazards; align the Town's efforts to support farmers with the Massachusetts Farmland Action Plan.
- Conduct public education on drought mitigation, especially as it relates to private wells.

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<sup>155</sup> "2022 Massachusetts Climate Change Assessment," page RS30.

<sup>156</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

<sup>157</sup> Ibid.

<sup>158</sup> Ibid.

<sup>159</sup> Ibid.

- Increase public outreach and education about forest health impacts.
- Implement a Tree and Forest Management Plan at the Ball Hill Road Conservation Area and work on expanding this type of planning and implementation to other forested areas. Hire a forester to develop Forestry Management Plans across Berlin and assist in efforts to improve forest health and reduce fire loads in town.

## 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.”<sup>160</sup> 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.

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### 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.<sup>161</sup> 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. Berlin’s suburban development along with its geography lends itself towards being more vulnerable to invasives. Berlin 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.

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### 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,<sup>162</sup> the Center for Invasive Species and Ecosystem Health’s Early Detection and Distribution Mapping System (EDDMapS) hosted by the University of Georgia,<sup>163</sup> and the Forest Ecosystem Monitoring Cooperative’s Northeastern Forest Health Atlas.<sup>164</sup>

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<sup>160</sup> 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](https://www.doi.gov/sites/doi.gov/files/uploads/isac_definitions_white_paper_rev.pdf).

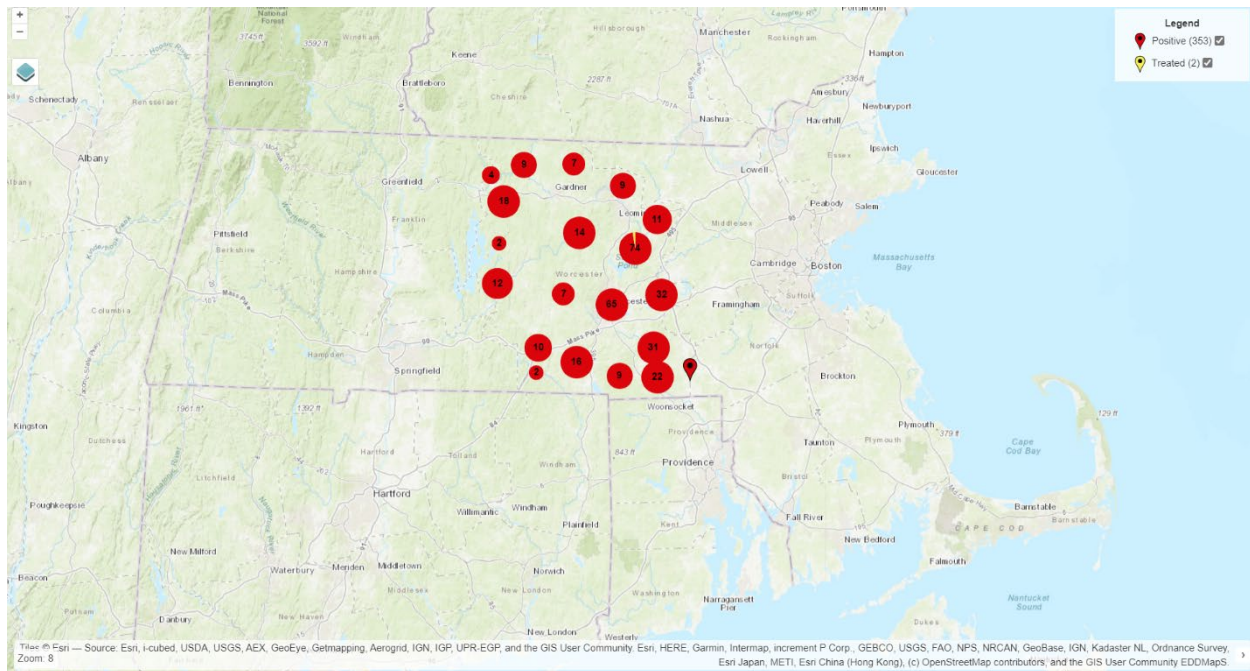
<sup>161</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,” page 5.1-48.

<sup>162</sup> “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>.

<sup>163</sup> “My EDDMapS,” EDDMapS.org, Center for Invasive Species and Ecosystem Health, accessed April 14, 2025, <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>.

<sup>164</sup> “Northeastern Forest Health Atlas,” UVM.edu, Forest Ecosystem Monitoring Cooperative, accessed June 10,

In Worcester County from June 3<sup>rd</sup>, 2017 to April 14<sup>th</sup>, 2025, according to EDDMapS analysis of verified invasive species reporting, there have been 380 records of locations with invasive species; According to this analysis, only 2 invasive species infestations are being treated in the county.<sup>165</sup>



**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 first detected in Berlin in 2021 and Beech Leaf Disease was first detected in town in 2024. 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.<sup>166</sup>

A lack of reporting on invasives may mean that the extent of invasives in Berlin 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 occurred in the past 3 years.<sup>167</sup>

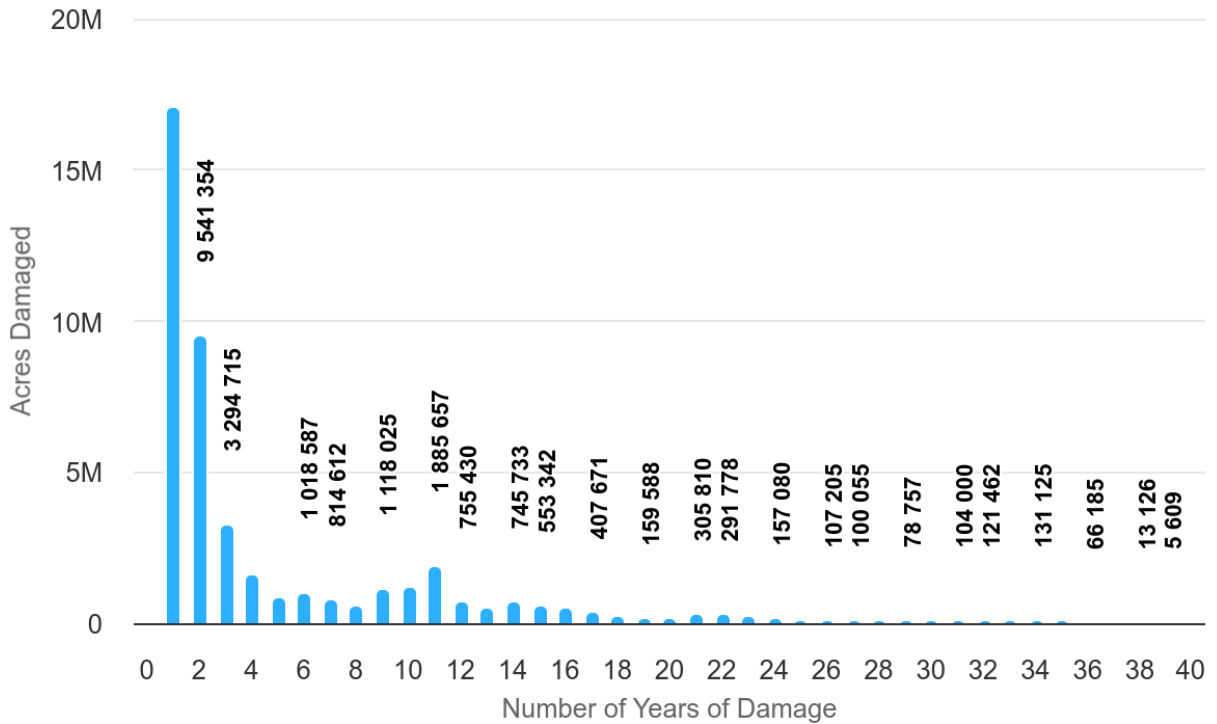
2024, <https://www.uvm.edu/femc/forest-health-atlas>.

<sup>165</sup>“My EDDMapS,” EDDMapS.org.

<sup>166</sup> “MDAR Invasive Pest Dashboard: Emerald Ash Borer (*Agilus 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](https://experience.arcgis.com/experience/a25afa4466a54313b21dd45abc34b62d/page/Page-2/?views=Emerald-Ash-Borer#data_s=id%3AdataSource_3-17f4202b73c-layer-3%3A87).

<sup>167</sup> “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](https://www.uvm.edu/femc/forest-health-atlas?premade=All_Defo).

## Area Damaged by Number of Years of Damage



**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.<sup>168</sup> In 2008, an outbreak of Asian long-horned beetles in Worcester destroyed nearly 30,000 trees.<sup>169</sup>

Berlin 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.

The local HMP team also noted that Japanese Knotweed has infested areas near almost every major road in town, including areas around Lyman Road, Ball Hill Road, Boylston Road, Peach Hill Road, Gates Pond, Linden Street, Turner Road and Derby Road, and Route 62 / West Street. In addition, they noted that Emerald Ash Borer and Beech Tree Disease have infested areas around Lyman Road and that Bittersweet has infested areas around Gates Pond.

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### PROBABILITY OF FUTURE EVENTS

The 2023 ResilientMass Plan notes that increased globalization of trade has created new paths for

<sup>168</sup> Ibid.

<sup>169</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

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 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 Berlin is very high, with a 70% to 100% probability of occurrence in the next year.

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## IMPACT

Specific impacts of invasive species in Berlin 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<sup>170</sup> (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).<sup>171</sup> Invasives are also one of the costliest natural hazards in terms of control efforts, costing the United States and estimated \$21 billion per year.<sup>172</sup> Given what information is known about the extent of invasive species within Berlin, 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.

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## EXPOSURE

Certain features within Berlin'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 them; and
- 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.

Specifically, MA-62 (along its stretches as Boylston Road and West Street) was noted as being especially vulnerable to invasive species by the HMP team in town and CMPRC's GIS analysis.

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<sup>170</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

<sup>171</sup> 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>.

<sup>172</sup> 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>.

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## 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.<sup>173</sup> Already fragile ecosystems, if left unmanaged, will suffer the worst effects of invasive species; native flora and fauna species could be supplanted by invasive species that outperform or directly 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 CO<sub>2</sub> 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.

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## VULNERABILITY

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

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## MITIGATION STRATEGIES

The Town of Berlin 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 Berlin:

- Enhance the level of installation of Bat Boxes in town and install Dragonfly Gardens in town to reduce the public health impact of mosquito-borne illnesses.
- Control invasive species in both forests and waterways in order to reduce fire loads and improve habitat quality. Research the use of goats for the management of invasive species and poison ivy.

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<sup>173</sup> “ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan”

- Work to protect and enhance the productivity and viability of farmland in town in order to increase the Town's food security and protect farmers' livelihoods from natural hazards; align the Town's efforts to support farmers with the Massachusetts Farmland Action Plan.
- Seek out the best practices and funding available to mitigate roadside invasive vegetation species.
- Enhance the Town's work with the Central Massachusetts Mosquito Control Project by sharing notices regarding their services with the public.
- Educate residents about invasive species management using existing and new resources. Explore establishing a regionalized education and abatement program for invasive species management.
- Increase public outreach and education about forest health impacts.
- Implement a Tree and Forest Management Plan at the Ball Hill Road Conservation Area and work on expanding this type of planning and implementation to other forested areas. Hire a forester to develop Forestry Management Plans across Berlin and assist in efforts to improve forest health and reduce fire loads in town.
- Participate in a regional Invasive Species Management and Emergency Response Plan for invasive pest and plant species as well as water invasives, including federally regulated species, that pose a significant risk to the Town.

## 4.13 OTHER HAZARDS

In addition to the hazards identified in previous sections, the Berlin 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 Berlin 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 Berlin 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 Berlin did not identify naturally occurring landslides as having the risk of affecting the Town; therefore, they were omitted from having a full section in this plan. A brief overview of this hazard is included below.

Notably, the SHMCAP hazard of changes in groundwater has been profiled as a sub-hazard of flooding and drought in this plan.

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### 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 Berlin. 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 noted no specific concerns relating to landslides in town. The only concern related to landslides noted by the HMP team in town was a potential landslide risk in an area near Ball Hill Road (which is mapped in Appendix A) stemming from the hauling of material from outside of town to this area; this manmade risk is outside the scope of this natural hazard mitigation plan.

## 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 Berlin 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 does not participate in federal StormReady certification or federal Firewise community certification. The Town has contracted with Onsolve to utilize CodeRed for emergency notifications. The Town plans to research the utility of public awareness and education programs as a result of this planning process.

Berlin 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 policies, and other practices. Berlin 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 Highway Superintendent / Facilities Director, a Building Commissioner, and a Tree Warden. Berlin has several plans relevant to hazard mitigation in place, including a Comprehensive Emergency Management Plan (2021), an Open Space and Recreation Plan (2020), and a Master Plan (2013). Not only does Berlin 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 has opted into fire protection and Highway Department / DPW mutual aid agreements through MEMA and is interested in joining a Regional Emergency Planning Committee. Berlin 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 Berlin. 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 36: Existing Protection Matrix**

Existing Measure	Description	Action	Effectiveness & Recommendations
Participation in the 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.	<p>Berlin has participated in the National Flood Insurance Program since June 18<sup>th</sup>, 1980. As of July 2<sup>nd</sup>, 2024, there are approximately 3 homeowners in town with flood insurance policies.<sup>174</sup> There are no repetitive loss properties in Berlin.</p> <p>The Town’s Building Commissioner 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 8<sup>th</sup>, 2025;<sup>175</sup> this information is noted in the Flood Plain District section of Article 410 of Berlin’s Zoning</p>	<p>Effective</p> <p>Berlin 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. Berlin should also educate its residents about the NFIP.</p> <p>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</p>

<sup>174</sup> “Community Overview: Berlin, Town of,” NFIP Community Information System.

<sup>175</sup> “BERLIN, TOWN OF,” Msc.fema.gov, Federal Emergency Management Agency, accessed December 30, 2025, <https://map1.msc.fema.gov/firm?id=25027C0466G>, <https://map1.msc.fema.gov/firm?id=25027C0467G>, <https://map1.msc.fema.gov/firm?id=25027C0468G>, <https://map1.msc.fema.gov/firm?id=25027C0469F>, <https://map1.msc.fema.gov/firm?id=25027C0486F>, <https://map1.msc.fema.gov/firm?id=25027C0488F>, <https://map1.msc.fema.gov/firm?id=25027C0489F>, <https://map1.msc.fema.gov/firm?id=25027C0631F>, <https://map1.msc.fema.gov/firm?id=25027C0632F>, <https://map1.msc.fema.gov/firm?id=25027C0651F>.

Existing Measure	Description	Action	Effectiveness & Recommendations
Participation in the National Flood Insurance Program (NFIP) (cont.)		<p>Bylaw.<sup>176</sup> The Town’s Flood Plain District, described in this same section of the Zoning Bylaw, includes all special flood hazard areas (SFHAs) designated as Zone A or AE in town and regulates and permits development within these areas.</p> <p>Berlin 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).</p>	at the state level to ensure a post-disaster plan is put in place to employ SI/SD provisions.

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<sup>176</sup>“Berlin Zoning By-law,” Townofberlin.com, the Town of Berlin, 2025, [https://www.townofberlin.com/sites/g/files/vyhlf4156/f/uploads/zoning\\_bylaw\\_-\\_may\\_5\\_2025\\_2.pdf](https://www.townofberlin.com/sites/g/files/vyhlf4156/f/uploads/zoning_bylaw_-_may_5_2025_2.pdf), p. 9.

Existing Measure	Description	Action	Effectiveness & Recommendations
Floodplain Zoning District Bylaw in place	This regulation requires all development to be in compliance with state building code requirements for construction in floodplains.	Berlin has a Flood Plain District which is described in Article 410 of the Town's Zoning Bylaw.	<p>Very Effective</p> <p>The Town is working with FEMA and should make changes to this bylaw which it has flagged relating to the area in the northwest corner of town.</p>
Local Open Space and Recreation Plan	<p>This local plan identifies significant natural resources to ensure their protection.</p> <p>Following Massachusetts Department of Conservation and Recreation guidance for the development of OSRPs, this document does not focus on specific hazards.</p> <p>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.</p>	Berlin's Open Space and Recreation Plan was issued in 2020. This plan helped with recent actions at Mount Pisgah.	<p>Effective</p> <p>Berlin should prepare an OSRP update as per Mass DCR guidance by the time the currently active plan expires. Where allowable, Berlin should integrate hazard mitigation activities and recommendations into this OSRP update.</p>

Existing Measure	Description	Action	Effectiveness & Recommendations
<p>Drainage System Maintenance and Repair Program</p>	<p>This program keeps municipal drainage facilities (storm drains, culverts, etc.) in good order.</p>	<p>Berlin performs street sweeping each year. The Town also usually performs catch basin cleaning to remove leaves, pine needles, and rodents each year, but the truck the Town has was not able to get this catch basin cleaning done in the past year.</p>	<p>Effective</p> <p>Berlin should continue to sweep streets at least once per year to increase stormwater management capacity and properly capture and dispose of debris. The Town should also restart catch basin cleaning for these same purposes once a new truck is purchased and should examine establishing a public education program for residents relating to storm drain clearance and other related best practices.</p>

Existing Measure	Description	Action	Effectiveness & Recommendations
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.	Berlin conducts roadside mowing to remove juvenile trees as well as tree trimming twice a year, from October-December along the entire routes of roadways and from June-July along roadside edges. The Town also removes trees as is needed between November and March. Northern Tree workers trim trees around National Grid's wires/lines in town every one to two years and conduct ground cutting around these wires/lines in town every five years. The Town has experienced no power outages from downed trees in recent times but has experienced a couple of road blockages from downed trees in recent years.	Effective  Berlin should continue its tree trimming program and should continue to remove dead and dying trees as is needed. The Town should also continue to coordinate with National Grid regarding tree trimming.
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; however, the Town has not had funding for this work in recent years.  CMRPC completed the Berlin Culvert Assessment Report in 2024. In addition, a complete assessment of all culverts in town is currently being completed by OARS, and OARS will perform GIS analysis relating to this assessment which it will share with the Town.	Not Effective / Somewhat Effective  Current culvert maintenance and replacement efforts in town are limited due to the Town not having funding for these efforts. The Town should explore culvert replacement grant funding and should consider allocating town funding for culvert maintenance.

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 Berlin Master Plan was adopted in 2013.  The Town is currently updating its Master Plan in phases, with the Town's recently updated Open Space and Recreation Plan, recently updated Housing Production Plan, and recent Village Center Study all scheduled to become part of this plan along with upcoming, yet to be funded chapters on transportation, municipal governance, and town facilities.	Effective  The Town should continue to work on its Master Plan as an organic document. Recommendations relating to hazard mitigation should be incorporated into the Master Plan as different parts of it are completed..
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 Berlin Municipal Vulnerability Preparedness Plan was adopted in 2020. In FY23, Berlin received an MVP Action Grant for the Horseshoe Pond Acquisition Project, in which 100 acres of woodlands across three properties were purchased by the Town to preserve wetlands and upland forest habitats, enhance climate resilience in town, and provide passive recreation in town. <sup>177</sup>	Effective  The Town should continue to utilize its MVP plan to seek grant opportunities related to topics discussed in it, including updating culverts along South Street and to the west of the town center along Route 62 and improving snowstorm roadway treatment to lessen environmental impacts (such as through acquiring brining equipment).

<sup>177</sup> "MVP Action Grant Funded Project Descriptions," Mass.gov, the Massachusetts Executive Office of Energy and Environmental Affairs Municipal Vulnerability Preparedness Grant Program, accessed April 8, 2025, <https://www.mass.gov/doc/mvp-action-grant-project-descriptions/download>.

Existing Measure	Description	Action	Effectiveness & Recommendations
State Building Code	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.	The Town's Planning Board, Zoning Board of Appeals, and Building Inspector work to implement compliance with the state building code. 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 was concurrent with the previous edition through June 30th, 2025.	Effective  The Town should work to continue to foster a successful working relationship between the fire inspector and the building commissioner. It should also negotiate a better price for OpenGov permitting and should update its permitting software.
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 last updated in 2023.	Somewhat Effective  Several aspects of the Town's current zoning bylaw are antiquated and are in conflict with recent state regulations; these aspects of the bylaw should be changed. The Town's Planning Board is currently working with CMRPC to update its zoning regulations through the completion of a zoning diagnostic.

Existing Measure	Description	Action	Effectiveness & Recommendations
Energy Efficiency work	The Town has several active efforts underway relating to making energy efficiency upgrades to buildings in town, in part to help the Town become more resilient to natural hazards.	The Town's Energy Committee has signed a non-binding Memorandum of Understanding with National Grid's Community Solutions Program to provide the Town with technical assistance relating to a facilities study for the Town and updates to the Town's zoning bylaw; this technical assistance is planned to be provided both through the lens of helping the Town become more energy efficient / conserve more energy and through the lens of aiming to help the Town become a Climate Leader Community. The Town has received a grant in collaboration with several other communities to hire a part-time energy management consultant to help with this work. Berlin is also a Massachusetts-designated Green Community and has recently been awarded a grant through this program for energy efficiency upgrades to the Town's municipal building. The Town has also completed lighting upgrades for this building through a National Grid rebate program.	Effective  The Town should continue to work to find funding for the implementation of energy efficiency measures, especially relating to public safety vehicle electrification and measures that increase the Town's resilience to natural hazards.

Existing Measure	Description	Action	Effectiveness & Recommendations
Snow Fences	Snow fences have been installed and maintained to reduce the effects of severe snowstorms and snow drift on roadways in town.	Snow fences in town are installed and replaced as is needed, especially along Linden Street and Barnes Road as well as at the top of Sawyer Hill in the field.	Very Effective
CodeRed	CodeRed is a reverse 911 emergency notifications system which town emergency management can use to contact residents and other stakeholders in town in the case of emergency occurrences.	The Town has contracted with Onsolve to utilize CodeRed for emergency notifications.	Very Effective  The Town has begun to use CodeRed to disseminate non-emergency information and should continue to strategically use it in this way, including to provide educational resources related to hazard mitigation.
Unified Incident Command program	This program provides town staff with guidance regarding how to manage emergency incidents in town.	The Town has much experience with the Unified Incident Command Program, including during actual emergency situations such as gas leaks, home explosions, car crashes, and the 2023 Mount Pisgah wildfire, and continues to move Unified Incident Command work forward.	Effective  The Town needs to raise awareness of this program among different boards and commissions in town.

Existing Measure	Description	Action	Effectiveness & Recommendations
Regulations for New Development (Common Driveway Bylaw and Subdivision Control Bylaws)	These regulations ensure that new developments in town will have roads able to handle emergency vehicles and will have proper drainage infrastructure.	The Planning Board and the Highway Department work to enforce these regulations.	Effective
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.	As part of the SAFE Program, fire safety education is provided to children in Berlin's elementary school. As part of the Senior SAFE Program, seniors in town are provided with fire safety home inspections, smoke detectors, and a "vial of life" which lists their vital information and can be posted on their fridges for use in emergency situations.	Effective
ADA Compliance Efforts in Town	Americans with Disabilities Act (ADA) compliance efforts in town help make sure buildings and facilities in town are accessible to and safe for use by people with disabilities.	The Town has recently completed ADA upgrades at the municipal offices, including for relocating items to proper heights and making accessibility improvements to bathrooms and doors, after having received a \$7,500 FY24 Massachusetts Office on Disability Municipal ADA Improvement Grant. The Town was unsuccessful in a larger FY25 grant application for this program. The Town will be applying for a grant at a similar cost and for similar measures as its FY24 grant for the Town's library and other parts of the municipal offices under the FY26 round of this program.	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 Berlin provided updates on the status of mitigation measures from the Town’s 2018 Hazard Mitigation Plan. Certain measures were incomplete as of 2026 and were deemed as still being relevant; these relevant measures were re-incorporated in the 2026 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 “2026 Notes” column in the table below. These changes in community priorities, including changes in the Town’s plans relating to fire ponds, the Town using CodeRed Reverse 911 instead of Swift Reach as its hazard warning and notification system, and the Town’s planning board now being in charge of the adoption of underground utility requirements and planning to be more involved with discussions of creating a road bylaw in town, have resulted from reassessments of specific hazards-related challenges described in the 2018 plan.

**Table 37: Status of Mitigation Measures from 2018 Plan**

Structure & Infrastructure Strategies			
2018 Task	2026 Status	2026 Notes	Include in 2026 Plan?
Purchase a Utility Vehicle (UTV) for the purpose of monitoring forested area with limited accessibility.	Completed		NO

2018 Task	2026 Status	2026 Notes	Include in 2026 Plan?
<p>Dredge fire ponds which are currently too shallow and dry out quickly during the summer months. This would also help with stormwater collection and help prevent flooding in the area of the ponds</p>	<p>No movement on this action yet</p>	<p>There has not been progress on this mitigation action as of yet in town, but this problem has been identified and dredging could begin within the next year. Dredging fire ponds in the region is usually completed by a company based in a nearby town and is certified through MassDEP. The Town currently has limited capacity for maintenance of the fire ponds; <b>It may be cheaper for the Town to buy another water truck instead of maintaining fire ponds. The Town should selectively choose which parts of town to prioritize the dredging and maintenance of fire ponds in.</b> The HMP team in town sees the benefit of draining the fire pond near the rotary next to the Growing Room of Berlin daycare. The neighboring town of Bolton has around \$20,000 to build new fire ponds, as lots of sediment stemming from construction has washed in the Town; Bolton has used earmarked money to clean up this sediment.</p>	<p>YES</p>
<p>Repair or remove Wheeler Pond Dam, the dam is in failure per the MA Office of Dam Safety</p>	<p>In Progress</p>	<p>The design for the removal of this dam has been funded. The Dam's owner partnered with OARS (the Organization for the Assabet, Sudbury, and Concord Rivers) and Interfluve to develop grants to support the design and permitting of this's dam removal. In February 2025, the Town, OARS, and Interfluve reported that they have received funds for permitting through a MA EEA Dam and Seawall Repair or Removal Grant for currently underway permitting for the Dam's removal. The project proponents will be seeking grant funding in 2025 and 2026 to complete the dam removal project. The Dam's removal is anticipated in late 2026 or 2027, as funding allows. The Town should continue to work with its partners to remove this dam.</p>	<p>YES</p>
<p>Maintain Snow fences, install and when necessary replace damaged fencing along Barnes Hill Road, Linden Street and Mendon Street</p>	<p>Completed / Ongoing</p>	<p>Snow fences in town are installed and replaced as is needed, especially along Linden Street and Barnes Road as well as at the top of Sawyer Hill in the field. This action has been moved to the existing protection measures table in section 5.1.</p>	<p>NO</p>

<b>Preparedness, Coordination &amp; Response Action Strategies</b>			
<b>2018 Task</b>	<b>2026 Status</b>	<b>2026 Notes</b>	<b>Include in 2026 Plan?</b>
Maintain and expand on vegetative debris program and thereby mitigate risk of stormwater flooding, riverine flooding, winter storm damage, etc., such as through the Central Massachusetts Mosquito Control Project	In Progress	No one in town is currently licensed to complete this mitigation action. This strategy has been changed to emphasize that this vegetative debris program should be re-implemented.	YES
Sweep streets at least once per year to increase stormwater management capacity.	Ongoing	Highway department staff in town do a good job sweeping streets. For more information regarding this action, see the existing protection measures table in section 5.1.	NO
Properly clean, at least annually, or more often as required, all stormwater structures and basins.	Ongoing	Highway department staff in town do a good job properly cleaning stormwater structures and basins, but the truck the Town has was not able to get this catch basin cleaning done in the past year. For more information regarding this action, see the existing protection measures table in section 5.1.	NO
Evaluate and repair dams as identified by the Office of Dam Safety	Ongoing	Local emergency management staff reaches out to dam owners and stakeholders on a semi-regular basis to receive updates on emergency action plans, request compliance with codes and statutes, and coordinate dam response activities. The Town's emergency management staff would like to have a better understanding of the current conditions of dams in town and would like to learn more about what they can do to help prevent dams in town from failing. More must be done to encourage coordination between dam owners and stakeholders and local emergency management. The Town is seeing limited improvements in this coordination as part of this hazard mitigation plan update process.	YES

2018 Task	2026 Status	2026 Notes	Include in 2026 Plan?
Continue building a strong relationship with utilities, In the event of an emergency allocate space in the municipal building for the utilities use for coordination of disaster response.	Ongoing, and In Progress	The Town works with National Grid, CSX, and Eversource and has recently met with each of them. The Town met with National Grid and Eversource to discuss potential hazards that could affect these utilities' infrastructure and the emergency response procedures which should occur in the case of hazard occurrences; the Town met with CSX to discuss these topics as well as recent train derailments which have occurred and who the Town should contact in the case of a derailment occurring. The Town is in the process of building some dormitories and space on the second floor of the public safety side of the municipal building that could be used in case of an emergency.	YES
Improve hazard warning system and notifications by fully utilizing social media, town webpages, Swift Reach 911 and other communication methods. Maintain internal instant messaging system, allowing for rapid response of emergency personnel	Ongoing	<b>The Town now uses CodeRed Reverse 911 and does not use Swift Reach anymore.</b> CodeRed has been added as an existing protection measure in the table in section 5.1.	YES
Actively enforce and comply with the state building codes, promote successful working relationship between Fire Marshall and Building Inspector	Ongoing	This mitigation action has been ongoing; the titles of the people with the successful working relationship are the Fire Inspector and Building Commissioner. The Town should negotiate a better price for OpenGov permitting and should update its permitting software. For more information regarding this action, see the existing protection measures table in section 5.1.	NO
Actively enforce and comply with the Massachusetts Wetlands Protection Act. Seek to implement a local wetlands bylaw.	Ongoing, and In Progress	The Town complies with the Massachusetts Wetlands Protection Act but doesn't have a wetlands bylaw yet. The Town's Conservation Commission has been discussing implementing a local wetlands bylaw; a potential bylaw has been brought to Town meeting and hasn't been successful. The Town should also examine establishing enhanced development controls at wetlands to sustain natural barriers to flooding. In tandem with these efforts, the Town should continue to actively enforce and comply with the Massachusetts Wetlands Protection Act.	YES

<b>Education &amp; Awareness Strategies</b>			
<b>2018 Task</b>	<b>2026 Status</b>	<b>2026 Notes</b>	<b>Include in 2026 Plan?</b>
Educate all segments of the community about hazard mitigation and the impacts disasters can have on the community. Also, on water conservation methods.	Ongoing	These educational efforts should be incorporated into the Town's public safety open house and can include educational efforts regarding artesian wells. The Town does not have a public water system or a public sewer system. The Town should revamp education and awareness efforts relating to hazard mitigation and water conservation and should provide outreach on more specific subjects.	YES
Promote available educational material (state/federal) especially to students, regarding disasters at measures they can take to limit risks.	Ongoing	The Town should continue to promote these educational materials.	YES

<b>Local Plan &amp; Regulation Strategies</b>			
<b>2018 Task</b>	<b>2026 Status</b>	<b>2026 Notes</b>	<b>Include in 2026 Plan?</b>
Develop a means for sharing information on a regional basis about successful hazard mitigation planning and programs. Create a feedback loop to improve pre-disaster planning by establishing a formal post-disaster assessment process.	Ongoing	The Town should continue efforts to implement this mitigation strategy.	YES
Monitor implementation of the Hazard Mitigation Plan and update five years after approval of plan	Ongoing, and In Progress	Town officials should meet once a year to discuss progress on the mitigation strategies from this 2026 HMP plan update.	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	In Progress / Ongoing	The Town's Master Plan is being updated, they are completing it one to two sections at a time. The Town's Capital Improvement Plan is updated every year. The Town's Open Space and Recreation Plan was updated in 2020.	YES
Expand the use of the Capital Improvement Program. Encourage new Committee to look at hazard mitigation in their long-term planning for improvements.	In Progress	This action strategy is on hold due to the current economic condition of the Berlin-Boylston Regional School District. The Town's Capital Improvement Committee has worked on implementing this action strategy in the past and should continue to stay on top of implementing it when the economic conditions of the school district allow. The Town has held a meeting recently about the dry hydrant situation in town and would like to improve existing dry hydrants and, if possible, construct a new dry hydrant; the Capital Improvement Committee is not interested in allocating \$30,000-\$40,000 to complete this work at the time of this plan's writing.	YES
Investigate acquiring and preserving properties which will result in mitigation of flooding and other hazards.	Ongoing	The Conservation Commission and Conservation Agent work to buy land and place it in Conservation Restrictions (CRs). They have acquired 100 acres of land at Horseshoe Pond.	YES

2018 Task	2026 Status	2026 Notes	Include in 2026 Plan?
Encourage the adoption of underground utility requirements in local subdivision regulations and retrofitting of existing infrastructure.	Ongoing	Most new subdivisions in town have underground utilities put in. Underground utilities are encouraged by the Town for subdivisions in most cases, but some subdivisions can be approved without them. The Town has also used DLTA funding to contract with CMRPC to complete a zoning diagnostic and has applied for an EEA grant to continue work on re-writing the Town's zoning bylaw. <b>The planning board is in charge of implementing this action strategy.</b>	YES
Integrate hazard mitigation into subdivision site plan review, 40B review and all other zoning reviews. In particular, consider impacts caused by new developments on flooding and downstream flooding, including possible effects across town lines.	Ongoing	CMRPC has worked with the Town on a streamlined, up-to-date template for a subdivision control bylaw which the Town could use. The Town is also working with CMRPC to develop a draft stormwater bylaw that could go to Town Meeting; the Town should also consider joining the Central Massachusetts Regional Stormwater Coalition.	YES
Maintain Unified Incident Command program, continue training local officials in ICS	Ongoing	The Town has much experience with the Unified Incident Command Program, including during actual emergency situations, and continues to move Unified Incident Command work forward. The Town needs to raise awareness of this program among different boards and commissions in town. The Unified Incident Command Program has been added as an existing protection measure in the table in section 5.1.	YES
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.	Ongoing	The Town's emergency shelters are at the public safety building at 23 Linden Street and at the Berlin Memorial School. The Town's resources to implement this mitigation action are limited, but town staff have inventoried the Town's shelter supplies. Many of these supplies are old and need to be updated. This strategy goes hand-in-hand with the strategy described below relating to studying the possibility of creating a regional shelter with a neighboring town. The renovation of the second floor of the public safety side of the municipal building that the Town is actively working on allows for a certified kitchen to be installed in this shelter.	YES

2018 Task	2026 Status	2026 Notes	Include in 2026 Plan?
<p>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.</p>	<p>No movement on this action yet</p>	<p>The HMP team in town is not sure if the Town has a suitable building/site for a regional shelter but is interested in pursuing this mitigation strategy. Boylston may be interested in having a regional shelter with Berlin. The Town should explore feasible options to implement this strategy and should consider that the Town has a lower population density than some surrounding towns when considering the feasibility of different options.</p>	<p>YES</p>
<p>Create a Road Bylaw, ensuring new development will have roads able to handle emergency vehicles and proper drainage infrastructure is built</p>	<p>No</p>	<p>The building and highway departments in town have met to discuss the creation of a road bylaw for the Town. <b>The planning board should be more involved in future discussions relating to this strategy.</b></p>	<p>YES</p>

## 7.0 MITIGATION STRATEGY

The Berlin 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)); and
- HHPD4-b. Describe the criteria used for prioritizing actions related to HHPDs.

Real world considerations were brought into the analysis to inform the priority ranking process for the different mitigation strategies in this plan. 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 has been 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 approximately \$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
- Moderate – between \$50,000 – \$250,000
- Medium – between \$250,000 – \$1,000,000
- High – over \$1,000,000

## 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, Highway Department, 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 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 BERLIN 2026 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));
- 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
- HHPD4-c: Identify the position, office, department or agency responsible for implementing and administering the action related to mitigating hazards to or from HHPDs.

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 Berlin that reduces the loss of people’s lives, property in town, and environmental resources in town as well as 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 38: Town of Berlin 2026 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 currently too shallow and dry out quickly during the summer months. This would also help with stormwater collection and help prevent flooding in the areas of the ponds.	WF, FL, ST	<b>Fire, Highway, State</b>	Federal (FEMA Assistance to Firefighters Grant), State (MVP Action Grant), Local (Fire Department and DPW operating budgets, Conservation Commission)	Low	Medium	Medium	2-3 years
Complete work to remove the privately-owned Wheeler Pond Dam; this dam is in failure per the MA Office of Dam Safety. The Town, OARS, and Interfluve have received funds through a MA EEA Dam and Seawall Repair or Removal Grant for currently underway permitting for the Dam's removal. The project's proponents will seek grant funding for the dam removal project in 2025 and 2026. As funding allows, the Dam's removal is expected to occur in late 2026 or in 2027.	DF, ST, FL	<b>State (Office of Dam Safety), Private Property Owners</b>	State (Dam and Seawall Grant)	Medium	Medium	High	2-3 years

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
<p>Improve town emergency management personnel's access to the Mount Pisgah Conservation Area, including the middle field, so that they can respond in the instances of emergencies. This could be achieved through the construction of new access roads and/or fire trails. Consider seasonal controlled burns at Mt. Pisgah to reduce future wildfire risk. Work with the Conservation Commission and the Select Board to ensure that work which improves emergency management personnel's access to Mount Pisgah does not impede wildlife and conservation efforts.</p>	All	<p>Conservation, <b>Fire / EMS</b>, Police, Highway, Select Board</p>	<p>Local (Conservation Commission), State (MassTrails Grant)</p>	High	High	Medium	2-4 years
<p>Enhance the level of installation of Bat Boxes in town and install Dragonfly Gardens in town to reduce the public health impact of mosquito-borne illnesses.</p>	IS	<b>Conservation</b>	<p>Private donations, Local (Conservation Commission)</p>	Medium	Medium	Low	0-1 years
<p>Install solar panels on the roof of Berlin Memorial School to increase the school's resiliency to natural hazard events. Also consider installing a back-up generator at this school to make it a more viable shelter.</p>	All	<p>Town Administration, <b>PB, Berlin-Boylston Regional School District</b></p>	<p>Local (capital funding), State (Mass Save, Mass CEC)</p>	High	High	Medium	1-3 years
<p>Investigate the feasibility of installing solar panels on town-owned facilities / land such as the town landfill.</p>	All	<p>Town Administration, <b>PB</b></p>	<p>Local (Town Administration and Planning Board operating budgets), State (Mass Save, MVP Action Grant)</p>	Medium	Medium	Low	2-3 years

<b>Actions</b>	<b>Hazards Addressed</b>	<b>Agencies Involved</b>	<b>Potential Funding Sources</b>	<b>Priority</b>	<b>Impact</b>	<b>Estimated Cost</b>	<b>Expected Timeline</b>
Install a back-up generator or alternative source of power as well as EV charging stations at the Town Offices and Public Safety Building Complex.	All	<b>Town Administration, PB</b>	Local (Town Administration and Planning Board operating budgets, capital funding), State (Mass Save, MVP Action Grant)	High	High	Medium	1-3 years
Preserve local farms to increase the Town's food security and protect farmers' livelihoods from natural hazards.	All	<b>Town Administration, PB</b>	Local (Town Administration and Planning Board operating budgets, capital funding, Transfer of Development Rights), State (DLTA, MVP Action Grant, Chapter 61A, Agricultural Preservation Restriction, MDAR Farm Viability Enhancement Program)	Medium	High	High	2-3 years
Retrofit Municipal facilities to improve / strengthen resiliency to natural hazards and increase energy efficiency. Add solar panels, EV charging stations, food pantry facilities, and other equipment for disaster management and resilience.	All	<b>All Town Departments</b>	Local (capital funding), State (MVP Action Grant, Green Communities Grants), Federal (FEMA BRIC grant)	High	High	High	1-5 years, and ongoing
Install air filters, cooling / central air conditioning, and/or dehumidification at emergency shelter locations to ensure the continued viability of these shelters.	DR, XT, WF	<b>All Town Departments</b>	Local (town appropriations), Federal (FEMA BRIC Grant)	High	High	Low / Moderate	0-1 years, and ongoing

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Protect additional open space for hazard mitigation purposes through acquisition or conservation restriction, especially floodplains, riverfront areas, wetlands, steep slopes, and parcels that connect to other protected open spaces. Priority areas should include areas near where EJ and/or vulnerable populations live, trails and shared-use paths, water-based recreational opportunities, and NHESP-identified core habitat and/or critical natural landscapes.	All, especially FL	CC, Town Administration, PB	Local (Conservation Commission, capital funding), State (DCS LAND Grant, Conservation Restriction, Chapter 61), Federal (FEMA BRIC, FMA Grants)	Medium	High	High	0-1 years, and ongoing
Conduct a field inventory of bridges in town and utilize this inventory to rank and prioritize bridge projects for increased flood resiliency and storm-hardening. Design and implement priority bridge/culvert resizing or replacement projects, including for culverts identified in the 2024 Berlin Culvert Assessment Report and the forthcoming culvert assessment being performed by OARS. Fund routine bridge maintenance in town.	FL, ST, SS, HU	Highway, Town Administration, PB	Local (Highway Department, Town Administration, and Planning Board operating budgets, capital funding), State (MVP Action Grant, Mass Works Infrastructure Grant), Federal (FEMA BRIC, FMA Grants)	High	High	High	1-3 years
Protect and restore wetlands as a means of mitigating flooding and stormwater runoff.	FL, ST, HU	CC, Town Administration, PB	Local (Conservation Commission, capital funding), State (MVP Action Grant), Federal (FEMA BRIC, FMA Grants)	Medium	Medium	High	1-3 years, and ongoing

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
<p>Perform a town-wide inventory and drainage assessment of culverts. OARS (the Watershed Organization for the Sudbury, Assabet, and Concord Rivers) is currently performing a complete assessment of all culverts in town and will perform GIS analysis relating to this assessment which it will share with the Town.</p>	<p>FL, ST, HU</p>	<p><b>Highway</b>, Town Administration, PB</p>	<p>Local (Highway Department, Town Administration, and Planning Board operating budgets), State (MVP Action Grant, Mass Works Infrastructure Grant), Federal (FEMA BRIC, FMA Grants)</p>	<p>High</p>	<p>High</p>	<p>Low</p>	<p>0-1 years</p>
<p>Inventory unreinforced municipally owned 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.</p>	<p>EQ</p>	<p><b>Building Department</b></p>	<p>Local (Building Department operating budget), Federal (National Earthquake Hazards Reduction Program's State Assistance Program, FEMA EMPG Grant through MEMA)</p>	<p>High</p>	<p>Medium</p>	<p>Low</p>	<p>0-1 years</p>

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Assess and permanently protect forestland and wetlands in town to ensure reductions in flooding and wildfire damages.	FL, WF	Town Administration, <b>CC</b> , PB	Local (Town Administration and Planning Board operating budgets, Conservation Commission, capital funding), Sudbury Valley Trustees, State (DCS LAND Grant, Conservation Restriction, Chapter 61), Federal (FEMA BRIC, FMA Grants)	Medium	High	Medium / High	1-3 years, and ongoing
Perform an assessment of all dams in Berlin, with special attention to the Lester G. Ross Dam and Gates Pond Dam. Evaluate dams and bridges to help the Town become more prepared for the expected increases in flooding and heavy rain events.	DF	Town Administration, <b>CC</b> , <b>PB</b> , Highway	Local (Planning Board, Town Administration, and Highway Department operating budgets, Conservation Commission, capital funding), State (MVP Action Grant), Federal (FEMA BRIC Grant)	High	High	Moderate	1-2 years
Control invasive species in both forests and waterways in order to reduce fire loads and improve habitat quality. Research the use of goats for the management of invasive species and poison ivy.	IS	<b>CC</b> , Town Administration	Local (Town Administration operating budget, Conservation Commission), State (MVP Action Grant, MassWildlife Habitat Management Grant Program), Federal (FEMA BRIC Grant)	Low	Medium	Low / Moderate	1-2 years

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Acquire and preserve farmland throughout Berlin to maintain the Town's agricultural strength. Purchase development rights for farms and develop a local sustainable farm best practice guide as well as a right to farm 101 registration document to help maintain this strength.	All	Town Administration, <b>PB</b>	Local (Planning Board and Town Administration operating budgets, capital funding, Transfer of Development Rights), State (DLTA, MVP Action Grant, Agricultural Preservation Restriction, Chapter 61A, MDAR Farm Viability Enhancement Program)	Low	Medium	High	3-4 years
Complete upgrades to the South Street Bridge so that it can resume its role as an evacuation route to be used in the case of natural hazard events. The Town has received design funds for and has applied for construction funds for the repair of this bridge.	All	Town Administration, <b>Highway</b> , PB, MassDOT	Local (Highway Department, Town Administration, and Planning Board operating budgets), State (Chapter 90, Mass Works Infrastructure Grant)	High	Medium	High	0-2 years
Purchase brining equipment and utilize it for the Highway Department's road treatment winter operations.	SS	<b>Highway</b>	Local (Highway Department operating budget)	Medium	Medium	Low	0-1 years
Investigate and implement strategies for mitigating potential man-made landslide impacts in an area near Ball Hill Road caused by the moving of material from outside of town to this area. These strategies may include planting cover crops on top of this material and/or installing geotextile fabric to hold this material in place.	LS	<b>Public Safety (Police, Fire / EMS)</b> , Town Administration	Local (Police, Fire, and EMS departments' and Town Administrations' operating budgets, capital funding), State (MVP Action Grant), Federal (FEMA HMGP Grant)	High	Medium	Low	0-2 years

### Preparedness, Coordination & Response Action Strategies

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Re-implement and expand on the Town's vegetative debris program and thereby mitigate the risk of stormwater flooding, riverine flooding, winter storm damage, and other hazard impacts. Investigate working with the Central Massachusetts Mosquito Control Project to implement this strategy.	ST, SS, FL, HU	<b>Highway</b>	Central Massachusetts Mosquito Control Project, Local (Highway Department operating budget)	High	High	Low	0-1 years, and ongoing
Coordinate with the State to evaluate and repair dams identified by the Office of Dam Safety.	DF, ST, FL	<b>State (Office of Dam Safety), Highway, Fire, Town Administration</b>	State (LPA, Dam and Seawall Repair or Removal Program), Local (Highway Department, Fire Department, and Town Administration operating budgets)	High	High	Low	0-1 years, and ongoing
Improve hazard warning system and notifications in town by fully utilizing social media, town webpages, 911, CodeRed, WEA (Wireless Emergency Alerts), and other communication methods. Maintain the Town's internal instant messaging system to facilitate the rapid response of emergency personnel.	All	<b>All Town Departments, FEMA, MEMA</b>	Local (Emergency Management, Fire Department, Police Department, and Health Department operating budgets), Federal (FEMA EMPG grant through MEMA)	High	High	Low	0-1 years, and ongoing
Enhance coordination with CSX to reduce the occurrence of train derailments on their line in town which are induced by natural hazards.	All	<b>Public Safety (Police, Fire / EMS)</b>	Local (Police, Fire, and EMS departments' operating budgets), State / Federal (FEMA EMPG Grant through MEMA for additional training and equipment)	High	High	Low	0-1 years, and ongoing
Join a Regional Emergency Planning Committee.	All	<b>Public Safety (Police, Fire / EMS), MEMA</b>	Local (Police, Fire, and EMS departments' operating budgets)	High	Low / Medium	Low	0-1 years

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Build the Town's capacity to apply for hazard mitigation grants and work on hazard mitigation efforts by establishing shared services with nearby communities.	All	<b>All Town Departments</b>	Local (capital funding), State (Efficiency & Regionalization (E&R) Grant), State / Federal (FEMA BRIC Grant through MEMA)	Medium	High	Low / Moderate	0-1 years
Work to protect and enhance the productivity and viability of farmland in town in order to increase the Town's food security and protect farmers' livelihoods from natural hazards; align the Town's efforts to support farmers with the Massachusetts Farmland Action Plan.	DR, IS, XT	The farming community in town, <b>Board of Health, Conservation</b>	Private, State (MDAR Farm Viability Enhancement Program)	Medium	Medium	Medium / High	3 years, and ongoing
Seek out the best practices and funding available to mitigate roadside invasive vegetation species.	IS	<b>CC</b>	Local (Conservation Commission)	Low	Low / Medium	Low	1-2 years
Improve and maintain emergency services for vulnerable populations such as seniors; this could require increasing emergency transportation options (such as rideshare options), diversifying communications, expanding planning efforts, and ensuring reliable power. The Town has recently received ride share funding through a partnership of the Worcester Regional Transit Authority and MetroWest Regional Transit Authority and has started to take part in the Catch Connect ride share service. Riders of this service in town can travel anywhere within Berlin and Hudson and to several destinations in Marlborough.	All	<b>Public Safety (Police, Fire / EMS)</b>	Local (Police, Fire, and EMS departments' operating budgets, capital funding), State (DLTA, Support and Incentive Grant, MassWorks, MWRTA operating budget), Federal (FEMA BRIC Grant, USDA Communities Facilities Direct Loan and Grant Program, Homeland Security Grant funding through EOPSS and CRHSAC).	High	High	High	0-2 years, and ongoing

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Enhance coordination with the state to confirm that the Lester G. Ross Dam is properly maintained.	DF, ST, FL	State (Office of Dam Safety), Highway, Fire, <b>Town Administration</b>	State (ODS operating budget), Local (Town Administration, Highway Department, and Fire Department operating budgets)	High	High	Low	0-1 years, and ongoing
Enhance coordination with the Town of Hudson to ensure that the Gates Pond Dam is properly managed.	DF, ST, FL	Highway, Fire, <b>Town Administration</b> , Town of Hudson	Local (Town Administration, Highway Department, and Fire Department operating budgets)	High	High	Low	0-1 years, and ongoing
Consider coordinating with Marlborough, Hudson, and/or Boylston and working with the Assabet Valley Regional Technical School to establish a long-term regional sheltering option.	All	Highway, <b>Fire</b> , Town Administration	Local (Fire Department, Highway Department, and Town Administration operating budgets)	High	High	Low	0-1 years, and ongoing
Achieve StormReady certification.	SS, ST, FL, HU	<b>Public Safety (Police, Fire / EMS)</b> , Highway, Town Administration	Local (Police, Fire, and EMS departments', Highway Department, and Town Administration operating budgets)	High	Medium	Low	0-2 years
Investigate the Firewise community certification program and achieve certification in town if interested.	WF	<b>Fire</b>	Local (Fire Department operating budget)	High	Medium	Low	0-2 years
Coordinate internally to decide what the next steps for improving water access by the Berlin Fire Department will be. These next steps could include creating more fire ponds, constructing more dry hydrants, and/or purchasing a new fire department water truck.	WF, DR	<b>Fire</b> , Town Administration	Local (Fire Department and Town Administration operating budgets)	High	Low	Low	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, the impacts disasters can have on the Town, and water conservation methods.	All	Public Safety ( <b>Fire / EMS, Police</b> ), Local Cable Access	Local (Police, Fire, and EMS departments' and Local Cable Access operating budgets), State (DLTA, LPA, MEMA operating budget), Federal (FEMA operating budget)	Medium	High	Low	Yearly and/or as hazards occur
Promote available state and federal educational materials, especially to students, regarding disasters and measures people can take to limit risks.	All	Fire, Police, <b>Schools</b> , Local Cable Access	Local (Fire Department, Police Department, School, and Local Cable Access operating budgets)	Medium	High	Low	Yearly and/or as hazards occur
Conduct public education on drought mitigation, especially as it relates to private wells.	DR, XT	<b>Board of Health</b> , Nashoba Associated Boards of Health, MEMA	Local (Board of Health operating budget), Nashoba Associated Boards of Health operating budget, MEMA operating budget	High	Medium	Low / Moderate	Yearly and/or as hazards occur
Enhance the Town's work with the Central Massachusetts Mosquito Control Project by sharing notices regarding their services with the public.	IS	<b>Town Administration</b>	Local (Town Administration operating budget)	Medium	Low	Low	Yearly and/or as hazards occur
Effectively communicate bans on outdoor burning to the public.	DR, WF	Fire, <b>Town Administration</b>	Local (Town Administration and Fire Department operating budgets)	High	High	Low / Moderate	Yearly and/or as hazards occur

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Educate residents about invasive species management using existing and new resources. Explore establishing a regionalized education and abatement program for invasive species management.	IS	CC	Local (Conservation Commission), State (MVP Action Grant)	Low	Low	Low	Yearly and/or as hazards occur
Educate the public about strategies for preventing basement flooding, such as constructing and maintaining rain gardens or other nature-based and small-scale mitigation strategies.	FL	Town Administration, <b>Building Department</b>	Local (Building Department and Town Administration operating budgets)	Low	Low	Low	Yearly and/or as hazards occur
Join the Central Massachusetts Regional Stormwater Coalition, which can aid the Town in public outreach and in funding drainage improvements.	FL, SS, ST, HU	Highway, Building Dept, <b>Town Administration, CC</b>	Local (Town Administration, Highway Department, and Building Department operating budgets, Conservation Commission), State (LPA)	Low	Low	Low	0-1 years, then ongoing membership
Expand community outreach and engagement efforts to improve information sharing and engagement with hazard mitigation and climate resilience projects in town.	All	<b>All Town Departments</b>	Local (operating budgets for all town departments, Conservation Commission)	Low	Low	Low	0-2 years, and ongoing
Develop a public education initiative to increase awareness of and participation in the CodeRED system, as engagement with the CodeRED system in town is low.	All	Town Administration, <b>Fire, Highway</b>	Local (Fire Department, Town Administration, and Highway Department operating budgets)	High	High	Low	0-1 years, and ongoing

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Investigate and implement public education and outreach programs regarding water conservation and lawn care alternatives. As part of these programs, release public notices about drought and water usage every summer to encourage the reduction of water use in town. Also include the sharing of information on the impacts of herbicides, pesticides, and fertilizers on lawns, well systems, and sewer systems as part of these programs.	DR	Town Administration, CC	Local (Town Administration operating budget, Conservation Commission)	Medium	High	Low	0-1 years, and ongoing
Develop an education campaign to increase support for a Wetlands Protection Bylaw which can provide stronger protection for the Town's water resources and can improve water supply health, improve water retention, and reduce adverse flooding impacts.	FL, HU, SS	Town Administration, CC	Local (Town Administration operating budget, Conservation Commission)	Medium	Medium	Low	0-1 years, and ongoing
Increase public outreach and education about forest health impacts.	WF, DR, XT, IS	Town Administration, CC	Local (Town Administration operating budget, Conservation Commission), State (LPA)	Medium	Medium	Low	0-1 years, and ongoing

### Local Plan & Regulation Strategies

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Develop a means for sharing information on a regional basis about successful hazard mitigation planning and programs. Create a feedback loop to improve pre-disaster planning by establishing a formal post-disaster assessment process.	All	<b>EMD</b> , State (MEMA), REPC (if the Town joins one)	Local (Fire Department operating budget), State (Community Compact IT Grant Program, Efficiency & Regionalization (E&R) Grant), State / Federal (FEMA HMEP Grant through MEMA)	Medium	Low	Low	1-2 years, and ongoing
Monitor implementation of the Town's Hazard Mitigation Plan. On an annual basis at a minimum and/or as hazards occur, review the mitigation strategies in the Plan and assess implementation progress by holding a meeting of the Hazard Mitigation Planning Team.	All	<b>EMD</b> , All Town Departments involved in HMP Planning, MEMA	Local (Fire Department operating budget, operating budgets of departments involved in HMP planning), State (DLTA, MEMA operating budget)	High	High	Low	Yearly and/or as hazards occur, update plan every 5 years
Investigate acquiring and preserving properties which, if preserved, will continue to mitigate the impacts of flooding and other hazards.	FL, ST	<b>CC</b> , Sudbury Valley Trustees	Local (Conservation Commission, CPA), State (DCS LAND Grant), Nonprofit Agencies (Sudbury Valley Trustees operating budget)	Low	Medium	High	1-2 years, and ongoing
Encourage the adoption of underground utility requirements in local subdivision regulations and during the retrofitting of existing infrastructure.	All	<b>PB</b>	Private, Local (Planning Board operating budget), State (DLTA)	Medium	Medium	Low	1 year, and ongoing

<b>Actions</b>	<b>Hazards Addressed</b>	<b>Agencies Involved</b>	<b>Potential Funding Sources</b>	<b>Priority</b>	<b>Impact</b>	<b>Estimated Cost</b>	<b>Expected Timeline</b>
Integrate hazard mitigation into subdivision site plan review, 40B review, and all other zoning reviews. In particular, consider impacts caused by new developments on downstream and other flooding, including possible effects across town lines, during these reviews.	All	<b>PB</b> , Municipal Affordable Housing Trust	Private, Local (Planning Board and Municipal Affordable Housing Trust operating budgets), State (DLTA); the Town has a zoning diagnostic project underway that could lead to future grant applications.	Medium	Medium	Low	0-2 years, and ongoing
Raise awareness of the Town's Unified Incident Command Program among town boards and commissions.	All	<b>All Town Departments</b>	Local (operating budgets for all town departments)	Medium	Medium	Low	0-1 years, and ongoing
Identify if and how the Town's shelters would be impacted by different types of emergencies to help ensure that suitable shelters are available for different types of natural hazards.	All	<b>EMD</b>	Local (Fire Department operating budget)	Low	Low	Low	Yearly and/or as hazards occur
Study the possibility of creating a regional shelter with a neighboring town; this would help limit the expense of maintaining separate shelters, as towns have limited budgets.	All	<b>EMD</b> , neighboring towns	Local (Fire Department operating budget), State (Efficiency & Regionalization (E&R) Grant, DLTA), Federal (USDA Rural Development Community Facilities Grants)	Medium	Medium	Low	1-2 years
Continue actively enforcing and complying with the Massachusetts Wetlands Protection Act.	FL, ST, HU	<b>CC</b>	Local (Conservation Commission)	High	High	Low	0-1 years, and ongoing
Seek to implement a local wetlands bylaw.	FL, ST, HU	<b>CC</b>	Local (Conservation Commission), State (DLTA)	High	High	Low	0-1 years

<b>Actions</b>	<b>Hazards Addressed</b>	<b>Agencies Involved</b>	<b>Potential Funding Sources</b>	<b>Priority</b>	<b>Impact</b>	<b>Estimated Cost</b>	<b>Expected Timeline</b>
Negotiate a better price for OpenGov permitting and update the Town's permitting software for the next permitting contract, which will begin in September 2026.	All	<b>Building Department,</b> Fire, PB, Town Administration	Local (Building Department, Fire Department, Planning Board, and Town Administration operating budgets)	Medium	Low	Low	0-1 years
Implement a Tree and Forest Management Plan at the Ball Hill Road Conservation Area and work on expanding this type of planning and implementation to other forested areas. Hire a forester to develop Forestry Management Plans across Berlin and assist in efforts to improve forest health and reduce fire loads in town.	IS, WF, XT, DR	<b>CC,</b> Tree Warden	State (MA DCR Forest Stewardship Program, MVP Action Grant)	High for Ball Hill Road plan, Medium for new plans	High	Medium	0-1 years, and ongoing, 2-5 years for new areas
Complete a town-wide stormwater management and containment plan, as the Town will likely soon be no longer exempt from the MS4 permit. Promote low-impact development / natural mitigation measures, such as rain gardens, in this plan.	FL, ST, HU	<b>Highway,</b> Town Administration, MassDEP, EPA	Local (capital funding), State (DLTA, LPA, MVP Action Grant)	High	High	Low / Moderate	0-1 years
Hire a Town Planner / Shared Town Planner who can work in part on hazard mitigation grants and projects.	All	<b>Town Administration,</b> Select Board	Local (Town Administration and Select Board operating budgets), State (MVP Action Grant, Efficiency & Regionalization (E&R) Grant)	High	High	Medium	1-2 years
Adopt a stormwater bylaw for the Town and encourage low-impact development measures as part of this bylaw. Draft this new bylaw as part of a forthcoming zoning diagnostic process.	FL, ST, HU	<b>PB</b>	Local (Planning Board operating budget), State (DLTA)	High	High	Low	0-1 years

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Expected Timeline
Participate in Regional Evacuation Planning; where possible, ensure that evacuation routes are outside of hazard areas.	All	Town Administration, <b>PB</b>	Local (Planning Board and Town Administration operating budgets), Federal (Homeland Security Grant funding through EOPSS and CRHSAC)	High	High	Low	1-3 years
Participate in Regional Debris Management Planning.	HU, EQ, SS, ST	Town Administration, <b>PB</b>	Local (Planning Board and Town Administration operating budgets), State (DLTA, LPA, Efficiency & Regionalization (E&R) Grant), Federal (FEMA BRIC Grant)	Medium	Medium	Low	1-3 years
Participate in a regional Invasive Species Management and Emergency Response Plan for invasive pest and plant species as well as water invasives, including federally regulated species, that pose a significant risk to the Town.	IS	Town Administration, <b>PB, CC</b>	Local (Town Administration and Planning Board operating budgets, Conservation Commission), State (EEA Planning Assistance Grant, DLTA, MVP Action Grant), Federal (FEMA BRIC Grant)	Medium	Medium	Low / Moderate	1-3 years

'Hazards Addressed' abbreviations:

DF	Dam Failure	DR	Drought, Including Changes in Groundwater
EQ	Earthquakes	FL	Flooding, Including Changes in Groundwater
HU	Hurricanes	IS	Invasive Species
LS	Landslides (man-made)	OT	Other
SS	Severe Snowstorms / Ice Storms / Nor'easters	ST	Severe Thunderstorms / Wind / Tornadoes
WF	Wildfire	XT	Extreme Temperatures

'Agencies Involved' abbreviations:

CC	Conservation Commission	EMD	Emergency Management Director
EMS	Emergency Medical Services	PB	Planning Board

Note: Mitigation strategies with an ongoing expected timeline after their initial expected timeline are hazard mitigation actions that the Town should continually work on advancing and/or periodically work on once they have begun.

## 8.0 PLAN ADOPTION, IMPLEMENTATION, AND MAINTENANCE

### 8.1 PLAN ADOPTION

A public meeting was held on March 10<sup>th</sup>, 2025 as part of the Select Board's meeting in order to detail the Berlin Hazard Mitigation Plan update process to that date and 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 May 14<sup>th</sup>, 2025 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 Berlin Select Board and certified on March 16<sup>th</sup>, 2026.

### 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 Berlin has taken steps to implement findings from its 2018 Hazard Mitigation Plan into the following plans: the 2021 Berlin Comprehensive Emergency Management Plan, the 2020 Berlin Municipal Vulnerability Preparedness Plan, and the 2020 Berlin Open Space and Recreation Plan. Findings from the 2026 Berlin 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, the Town's Master Plan, and other planning mechanisms and documents.

The implementation of this 2026 plan update began upon its formal adoption by the Select Board and approval by MEMA and FEMA. Town departments and boards are responsible for ensuring the development of policies, ordinance revisions, and programs as described in Sections 6 and 7 of this plan and 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 Berlin Hazard Mitigation Plan were incorporated into other planning mechanisms and policies in town besides this plan update, including the Town's 2021 Comprehensive Emergency Management Plan and the Town's 2020 Municipal Vulnerability Preparedness (MVP) Plan. The Town's 2018 HMP informed the descriptions of past climate-related events which have significantly impacted the Town and potentially vulnerable critical infrastructure in town in the Town's 2020 MVP Plan;<sup>178</sup> It also informed an overall heightened focus on as well as guidance relating to the threat of natural hazards in these planning documents. 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:

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<sup>178</sup> CMRPC, Town of Berlin Core team et al., "Municipal Vulnerability Preparedness: Summary of Findings," <https://cmrpc.org/wp-content/uploads/2024/01/Town-Of-Berlin-MVP-Summery-of-Findings-W-Appendix-9-28-20.pdf>

**Berlin Comprehensive Emergency Management Plan** (particularly the critical infrastructure section) – The critical infrastructure section of this plan, which was most recently updated in 2021, was used to help identify infrastructure components in town that have been identified as crucial to the function of the Town; this plan was also used to identify potentially vulnerable populations and potential emergency response shortcomings in town.

**Regional Evacuation Plan** – Funded by United States Department of Homeland Security via the Commonwealth of Massachusetts and the Central Region Homeland Security Advisory Council (CRHSAC), this regional evacuation plan prepared by CMRPC was used to identify evacuation routes and emergency shelters. This plan will soon be updated by CMRPC.

**Berlin Open Space and Recreation Plan** — This plan, which was updated in October 2020, 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 in Berlin; this information on the Town's natural and infrastructural context was incorporated into this plan to ensure that the Town's future mitigation efforts will be sensitive to the surrounding environment.<sup>179</sup>

**Berlin Zoning Bylaw** — The Berlin Zoning Bylaw, which was updated in May 2023, was used in this planning process to identify the actions that the Town is already taking (such as implementing and enforcing floodplain regulations) to reduce the potential impacts of natural hazards and ensure that this plan's mitigation strategies do not duplicate existing successful efforts.<sup>180</sup>

**Berlin Master Plan** — This plan, adopted in July 2013, was instrumental in identifying the Town's main priorities so that this hazard mitigation plan's strategies could align with these priorities.<sup>181</sup>

**Berlin Village Strategic Plan** — This plan, completed by CMRPC in August 2023, outlines the Town's plans for short-term and long-term sustainable economic development. This plan's insights informed this hazard mitigation plan's descriptions of the Town's future trajectory.<sup>182</sup>

**Berlin Housing Production Plan** — Prepared by Berlin Housing Partnership with CMRPC, this 2023 plan is an update to the Town's 2017 Housing Production Plan. As part of the planning process for this plan, CMRPC staff worked closely with the Berlin Planning Board and Berlin Housing Partnership to assess local housing conditions, gather community input through various platforms, and create strategies to help the Town address the housing needs of both current and future residents. CMRPC has also offered necessary technical support to ensure the successful completion of the Plan's goals.<sup>183</sup>

**Berlin Municipal Vulnerability Preparedness Summary of Findings** — The Town's HMP planning team deemed many of the recommendations from this document, which was last updated in September 2020, important to hazard mitigation and incorporated them into this hazard mitigation plan's

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<sup>179</sup>CMRPC, Town of Berlin Open Space Committee et al., "Town of Berlin Open Space and Recreation Plan – 2020," townofberlin.com, The Town of Berlin, accessed Nov 14, 2024, [https://www.townofberlin.com/sites/g/files/vyhlif4156/f/pages/berlin\\_2020\\_open\\_space\\_and\\_recreation\\_plan\\_appendix.pdf](https://www.townofberlin.com/sites/g/files/vyhlif4156/f/pages/berlin_2020_open_space_and_recreation_plan_appendix.pdf)

<sup>180</sup> "Berlin Zoning By-law," Townofberlin.com, the Town of Berlin, 2025,

[https://www.townofberlin.com/sites/g/files/vyhlif4156/f/uploads/zoning\\_bylaw\\_-\\_may\\_5\\_2025\\_2.pdf](https://www.townofberlin.com/sites/g/files/vyhlif4156/f/uploads/zoning_bylaw_-_may_5_2025_2.pdf).

<sup>181</sup> Brown Walker Planners Inc. with Town of Berlin et al. "Town of Berlin Master Plan - 2013," townofberlin.com; accessed Jan 10, 2025. <https://www.townofberlin.com/planning-board/files/berlin-master-plan>.

<sup>182</sup>CMRPC, Town of Berlin Strategic Planning Committee et al. "Berlin Village Strategic Plan - 2023," townofberlin.com; accessed Jan 10, 2025.

<https://storymaps.arcgis.com/stories/fa6e05d7f1cf449f8f31df5f5afcb0b1>

<sup>183</sup> CMRPC, Housing Production Team, "Town of Berlin Housing Production Plan 2023;" accessed Feb 21, 2025; <https://cmrpc.org/berlin-housing-production-plan-2023/>

mitigation strategies.<sup>184</sup>

**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.<sup>185</sup>

**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 this plan, are consistent with the State's data and priorities.<sup>186</sup>

**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 this plan, are consistent with the State's data and priorities.<sup>187</sup>

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

After this plan has been approved by both FEMA and the Berlin Select Board, a link to this 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 this plan periodically and work to incorporate its contents, especially its mitigation strategies, 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 and/or documents 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 Town's hazard mitigation plan and will encourage them to incorporate information and strategies from this 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 this hazard mitigation plan will also be incorporated into updates of the Berlin Comprehensive Emergency Management Plan.

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<sup>184</sup> CMRPC, Town of Berlin Core team et al., "Municipal Vulnerability Preparedness: Summary of Findings"

<sup>185</sup> "ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

<sup>186</sup> "2022 Massachusetts Climate Change Assessment"

<sup>187</sup> 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>.

## 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 this hazard mitigation plan every five years (with the next plan update starting three-and-a-half years after the adoption of this plan update) through forming an HMP planning team and working with a contractor to complete the update. The planning process for future updates of this plan will be the similar to the planning process for this plan update, will be overseen by the Town’s Emergency Management Director, and will include holding several meetings of the local HMP planning team to review and update the critical infrastructure inventory, hazards descriptions, existing protection measures matrix, and mitigation strategies in the plan, a public presentation, and a public comment period. The Berlin Emergency Management Director will also call meetings of all responsible parties to review, track, and monitor the progress of this plan on a yearly basis at a minimum and/or as is needed based on the occurrence of hazard events. As was previously stated, any substantial revisions made to this plan will be made available for public comment and/or will be presented 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 this 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 this plan:

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### 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?

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### 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?

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#### 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 improvements should be made, they should be incorporated into the Plan.

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#### 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?

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#### REVIEW OF THE PLAN AND INTEGRATION WITH OTHER PLANNING DOCUMENTS

- Is the current process for reviewing this 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, update it with any progress on the strategies which has been made since the plan update was adopted, and 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.

As was previously stated, any substantial revisions to the plan will be made available for public comment and/or will be presented 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 the municipal offices, and copies of the revised Plan will be made available to the public at the municipal offices.

## 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 39: Federal Hazard Mitigation Funding Sources**

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

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

<b>Program</b>	<b>Type of Assistance</b>	<b>Availability</b>	<b>Managing Agency</b>	<b>Funding Source</b>
<b>Emergency Food and Shelter Program (EFSP)</b>	Grant funding for supplemental food & shelter for those experiencing / at risk of experiencing homelessness	Annual	FEMA	FEMA
<b>Public Health Crisis Response Cooperative Agreement (PHCRCA)</b>	Funding to support surge needs of existing public health programs responding to public health emergencies	Annual for approved by unfunded (ABU) roster	CDC	Varies
<b>Army Corp of Engineers Planning Assistance</b>	Water supply, conservation, wetlands, & dam safety funding	Any time (pre & post disaster)	U.S. Army Corps of Engineers	50% Federal / 50% non-federal
<b>Forest Service Community Wildfire Defense Grant (USDA-FSCWDG)</b>	Grant funding to plan for and reduce wildfire risk	Annual	USDA-FS	75% USDA / 25% non-federal
<b>Emergency Watershed Protection Program (EWP)</b>	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)
<b>Agricultural Management Assistance (Drought Mitigation Funding Program) (AMA)</b>	Technical assistance for agricultural producers to manage financial risks	Ongoing	USDA-NRCS	75% USDA / 25% non-federal
<b>USDA Community Facilities Direct Loan &amp; Grant Program (Rural Development) (CFDLGP)</b>	Funding for improving essential community facilities	Annual	USDA-RD	Varies

<b>Program</b>	<b>Type of Assistance</b>	<b>Availability</b>	<b>Managing Agency</b>	<b>Funding Source</b>
<b>National Culvert Removal, Replacement, &amp; Restoration Grant (NCRRRG)</b>	Competitive grant funding to replace, remove, and repair culverts or weirs	Annual	US DOT	Varies
<b>Bridge Investment Program (BIP)</b>	Competitive grant program for improving the conditions of existing bridges	Annual	US DOT	80% FHWA / 20% other
<b>Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT)</b>	Discretionary program which includes Competitive Resilience Improvement Grants and planning grants	Annual	US DOT	Varies (generally, up to 80% federal share)
<b>NOAA Fisheries Restoration Center Grants</b>	Funding that supports restoration projects that use a habitat-based approach to rebuild fisheries, contribute to the recovery and conservation of protected resources, promote healthy ecosystems, and yield community and economic benefits	Varies	NOAA	Varies

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.

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## 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 damage 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)

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The Hazard Mitigation Grant Program Post-Fire (HMGP-PF) is a program aimed at providing financial funding to localities to reduce the 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)

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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](#).

Note: The FEMA BRIC program is currently not being funded as of May 2025.

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## FLOOD MITIGATION ASSISTANCE (FMA)

Flood Mitigation Assistance (FMA) provides funds on an annual basis so that measures can be taken to reduce or eliminate the 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](#).

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## 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

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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](#).

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## 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 \(sba.gov\)](#).

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## 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.

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## 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](#).

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## 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](#).

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## 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](#).

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## 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](#).

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## 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](#).

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## REHABILITATION OF HIGH HAZARD POTENTIAL DAM PROGRAM (STATE DAM SAFETY 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](#).

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## 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](#).

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## 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](#).

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## 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 \(hhs.gov\)](#).

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## 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](#).

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## 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 \(usda.gov\)](#).

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### 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 \(usda.gov\)](#).

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### 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 \(usda.gov\)](#).

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### USDA COMMUNITY FACILITIES DIRECT LOAN & GRANT PROGRAM

The USDA 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 \(usda.gov\)](#).

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### 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 \(dot.gov\)](#).

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### 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 \(dot.gov\)](#).

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## 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 \(dot.gov\)](#).

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## NOAA FISHERIES RESTORATION CENTER GRANTS

NOAA's Restoration Center administers the Community-Based Restoration Program, which has funding that supports restoration projects that use a habitat-based approach to rebuild productive and sustainable fisheries, contribute to the recovery and conservation of protected resources, promote healthy ecosystems, and yield community and economic benefits. For more information, please visit: [NOAA Fisheries Grants](#).

## 8.4.2 STATE FUNDING SOURCES

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

**Table 40: State Hazard Mitigation Funding Sources**

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

<b>Program</b>	<b>Type of Assistance</b>	<b>Availability</b>	<b>Managing Agency</b>	<b>Funding Source</b>
<b><i>Municipal Vulnerability Preparedness (MVP) Action Grants</i></b>	Competitive climate adaptation grants	Annual	EEA	75% EEA / 25% non-state match
<b><i>Planning Assistance Grants (EEA PAG)</i></b>	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
<b><i>Dam and Seawall Repair or Removal Program</i></b>	Competitive grants for dam and seawall repair and removal, as well as construction loans	Annual	EEA	State funding
<b><i>Massachusetts Land &amp; Water Conservation Fund Grant Program (LWCF)</i></b>	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
<b><i>Local Acquisitions for Natural Diversity (LAND)</i></b>	Financial assistance to municipalities for the acquisition of conservation land	Annual	DCS	Reimbursement grant, the reimbursement rate varies per town
<b><i>Drinking Water Supply Protection Grant (DWSP)</i></b>	Competitive grants for protection of drinking water supplies	Annual	DCS	State funding
<b><i>Land and Recreation Grants and Loans</i></b>	Varies, though primarily grant funding for conservation and recreation projects	Varies, generally annually	DCS	Varies

<b>Program</b>	<b>Type of Assistance</b>	<b>Availability</b>	<b>Managing Agency</b>	<b>Funding Source</b>
<b>Land Conservation Assistance Grant Program</b>	Financial assistance for permanently protecting land	Annual (Likely)	DCS	90% state reimbursement / 10% other
<b>Forest Legacy Grant Program (USDA-FS) (FLGP)</b>	Grant funding to protect environmentally important forestland from conversion	Annual	DCR	75% USDA FS / 25% non-federal
<b>Volunteer Fire Capacity (VFC) Program (Formerly VFA)</b>	Grant program that provides technical, financial, and other assistance to fire departments for forest fire-related purposes. Only towns with a population of less than 10,000 people and with an 80% call or volunteer fire department are eligible.	Annual	DCR Bureau of Forest Fire Control and Forestry	Funded by the U.S. Department of Agriculture's Forest Service and administered by DCR on a 50% reimbursement basis, with a maximum reimbursement of \$3,500 per community.
<b>Culvert Replacement Municipal Assistance Grant Program</b>	Competitive grants for replacing an undersized, perched, and/or degraded culvert located in an area of high ecological value	Annual	DER	State funding
<b>Division of Ecological Restoration Priority Project Program</b>	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

<b>Program</b>	<b>Type of Assistance</b>	<b>Availability</b>	<b>Managing Agency</b>	<b>Funding Source</b>
<b><i>Mass Wildlife Habitat Management Grant Program (MWHMGP)</i></b>	Reimbursement grant funding to assist municipalities in enhancing wildlife habitat and increasing recreational opportunities on protected lands	Annual	DFW	USDA NRCS
<b><i>Agricultural Climate Resiliency and Efficiencies Program (ACRE)</i></b>	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
<b><i>Agricultural Preservation Restriction Program (APR)</i></b>	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
<b><i>Hazard Mitigation Grant Program (State) (HMGP)</i></b>	Sub-grant programs for the Hazard Mitigation Grant Program	Annual	MEMA	State funding
<b><i>Community Development Block Grants (CDBG)</i></b>	Competitive community development grants	Annual	EOHLC	US Department of Housing and Urban Development
<b><i>Emergency Solutions Grant (ESG)</i></b>	Competitive grant funding designed to support services that assist those experiencing / at risk of experiencing homelessness	Annual	EOHLC	MA EOHLC
<b><i>Mass Works</i></b>	Competitive infrastructure grants	Annual	EOED	State funding

<b>Program</b>	<b>Type of Assistance</b>	<b>Availability</b>	<b>Managing Agency</b>	<b>Funding Source</b>
<b><i>Community Preservation Act (CPA)</i></b>	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
<b><i>Special appropriations and legislative earmarks</i></b>	Varies	Infrequent, after natural disasters or legislature vote	Massachusetts General Legislature	State funding
<b><i>District Local Technical Assistance (DLTA)</i></b>	Funding to support planning and technical assistance for housing, economic growth, and regional projects	Varies, generally annually	Massachusetts General Legislature, CMRPC	State funding
<b><i>Local Planning Assistance (LPA)</i></b>	Planning and technical assistance	Annual	CMRPC	Planning assistance hours
<b><i>Support and Incentive Grant</i></b>	Reimbursement grant funding designed to assist in providing enhanced 911 service	Annual	MA EOPSS	MA EOPSS
<b><i>Municipal Small Bridge Program</i></b>	Competitive grants for small bridge replacement, preservation, and rehabilitation projects	Annual	MassDOT	State funding
<b><i>Chapter 90 Program (Transportation Capital Improvement Projects) (Chpt. 90)</i></b>	Reimbursable grants to support capital improvements on local public ways	Ongoing	MassDOT	State funding

<b>Program</b>	<b>Type of Assistance</b>	<b>Availability</b>	<b>Managing Agency</b>	<b>Funding Source</b>
<b>State Transportation Improvement Program (STIP)</b>	Competitive funding opportunity for transportation projects along federal-aid roadways	Annually updated five-year programming document	MassDOT	MassDOT
<b>Complete Streets (CS)</b>	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
<b>Drought Resiliency and Water Efficiency Grant Program</b>	Funding for reducing indoor and outdoor water use, improving water loss control, and increasing drought management and planning in public water systems across the state	Annual	EEA	State funding
<b>Massachusetts Environmental Trust (MET) Grant</b>	Grants to organizations whose programs support the protection and conservation of threatened marine animals and the preservation and restoration of river and estuarine ecosystems throughout the Commonwealth	Annual	EEA	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](https://www.mass.gov/info-details/community-grant-finder). The programs listed in the above table are described in more detail below.

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## 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](https://www.mass.gov/info-details/grants-financial-assistance-watersheds-water-quality).

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## 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](#).

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## 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](#).

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## 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 ten 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](#).

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## 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](#).

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## 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](#).

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## 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.

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## 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>.

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## 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](#).

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## LAND & WATER CONSERVATION FUND GRANT PROGRAM (LWCF)

The Land & Water Conservation Fund Grant Program (LWCF) 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](#).

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## 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](#).

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## 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](#).

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## 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](#)

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## 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.](#)

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## 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.](#)

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## VOLUNTEER FIRE CAPACITY (VFC) PROGRAM (FORMERLY VFA)

The Volunteer Fire Capacity (VFC) Program provides financial assistance to towns that have a population of less than 10,000 and have a fire department that is 80% or more volunteer or on-call. This is a reimbursable payment. The fire department funds 100% of the grant project, and they will be reimbursed 50% of the approved award amount up to \$3,500. The program aims to provide funding for selected projects involving training, personal protective equipment, and fire suppression and other equipment purchases. Projects may be for firefighter safety, technology transfer, and rural fire defense. Medical and rescue purchases are not eligible. For more information on this program, please refer to: [Volunteer Fire Capacity \(VFC\) Program | Mass.gov.](#)

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## 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.](#)

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## 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.

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## 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 disproportionately susceptible to climate change. For more information about this program, please refer to: [MassWildlife Habitat Management Grant Program | Mass.gov](#).

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## 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](#).

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## 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](#).

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## 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](#).

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## 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](#).

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## 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](#).

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## 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](#).

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## 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](#).

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## 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.

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## 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](#).

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## 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.

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## 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](#).

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## 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](#).

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## 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](#).

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## 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](#).

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### 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 \(site.com\)](#).

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### DROUGHT RESILIENCY AND WATER EFFICIENCY GRANT PROGRAM

The Drought Resiliency and Water Efficiency Grant Program aims to provide funding for projects that will help the Commonwealth become more climate resilient, specifically by reducing indoor and outdoor water use, improving water loss control, and increasing drought management and planning in public water systems across the state. Target awards are up to \$50,000 per project, with potential for larger awards depending on the number of applications received. This grant program helps implement actions in the State Hazard Mitigation and Climate Adaptation Plan (SHMCAP). For more information about this program, please refer to: [COMMBUYS](#).

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### MASSACHUSETTS ENVIRONMENTAL TRUST (MET) GRANT

The Massachusetts Environmental Trust (MET) is a grantmaking organization housed within the Executive Office of Energy and Environmental Affairs (EEA). Through an annual competitive application process, MET awards grants to organizations whose programs support their mission to protect and conserve threatened marine animals and to preserve and restore river and estuarine ecosystems throughout the Commonwealth. For the 2025-2026 annual cycle, MET's soon-to-be-released RFR will invite proposals for projects that encompass Environmental Advocacy and Educational Activities Related to Aquatic Habitat Improvements and Threatened & Endangered Marine Life Protection & Conservation. For more information, please visit: [New Massachusetts Environmental Trust Grants | Mass.gov](#)

# **APPENDIX A**

## **Maps**

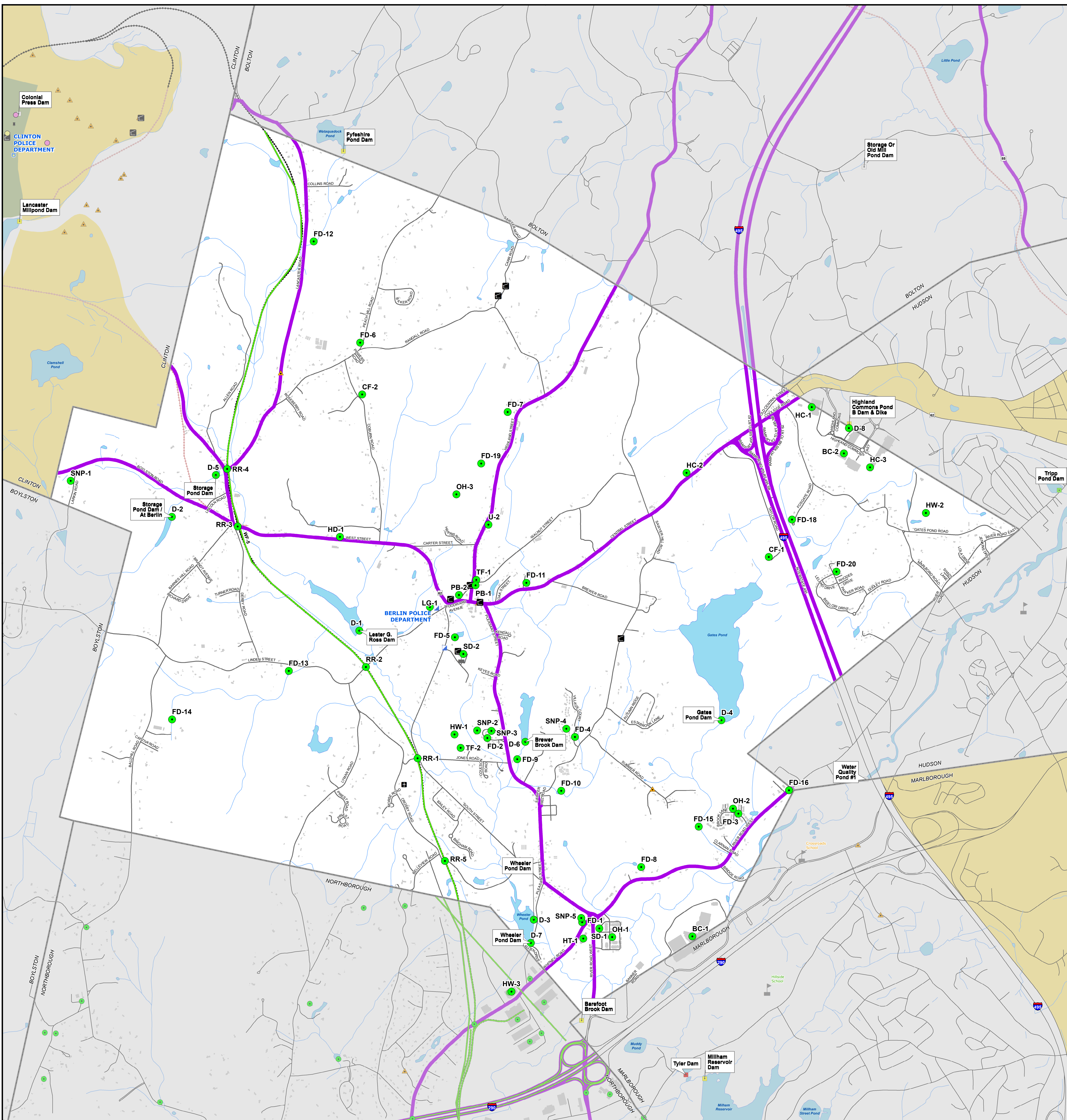
# Hazard Mitigation Plan

## Map 1

### Critical Infrastructure and Facilities

#### Town of Berlin, Massachusetts

March 2025



**Legend**

Assisted Living	Town Halls	MA Environmental Justice Populations 2020
Emergency Shelters	Local Police	Minority
Nursing/Rest Homes	Fire Station	
Daycare	Schools (Pre-K through High School)	
EOC	Active Rail Line	
Airports	Out of Service/Abandoned Rail Line	

Town Boundaries	Streams	Regionwide Evacuation Routes
Structures	Roads	
Water Bodies		

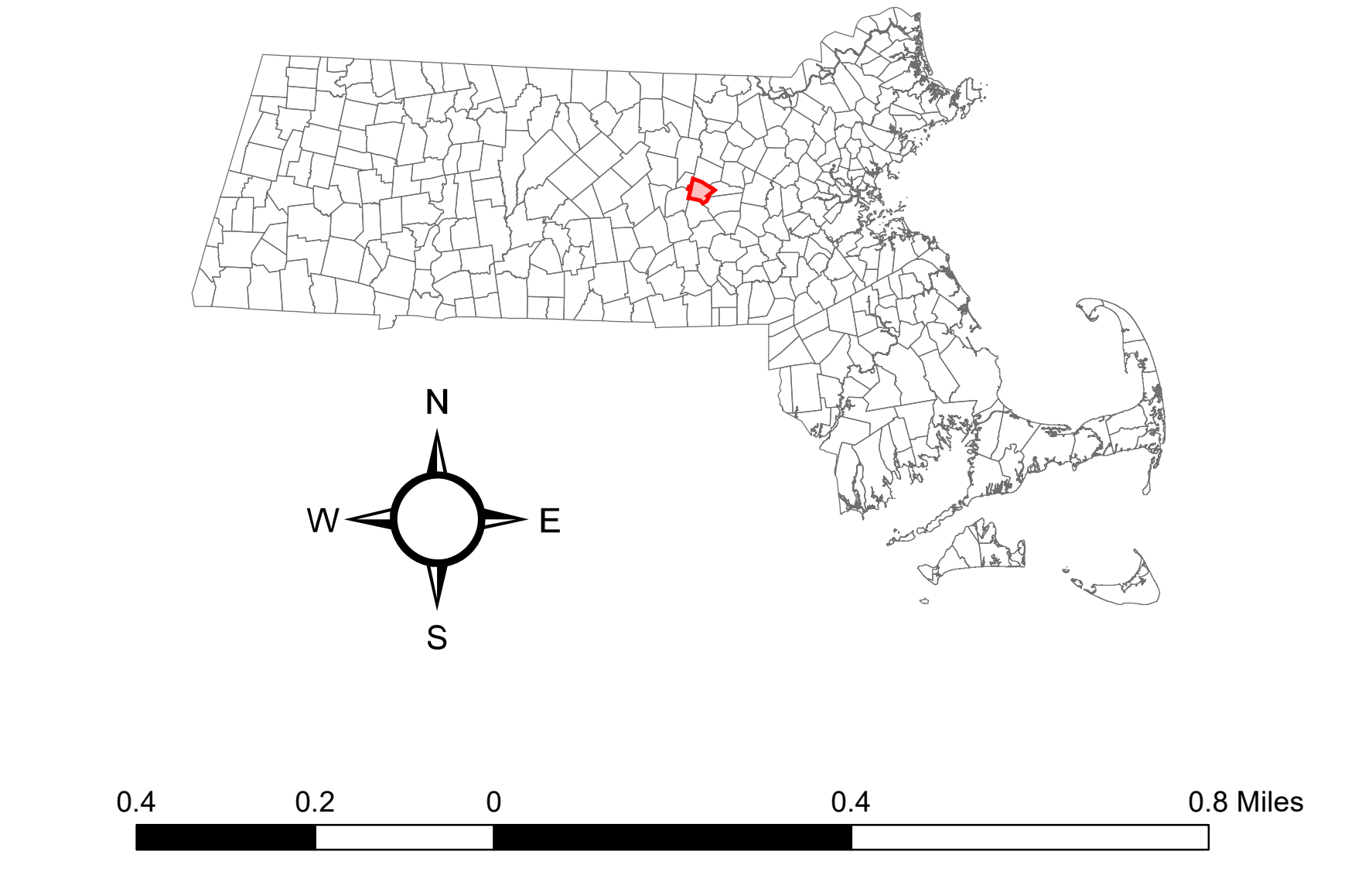
**Dams (2/2012)**

High Hazard	Significant Hazard	Low Hazard
		N/A

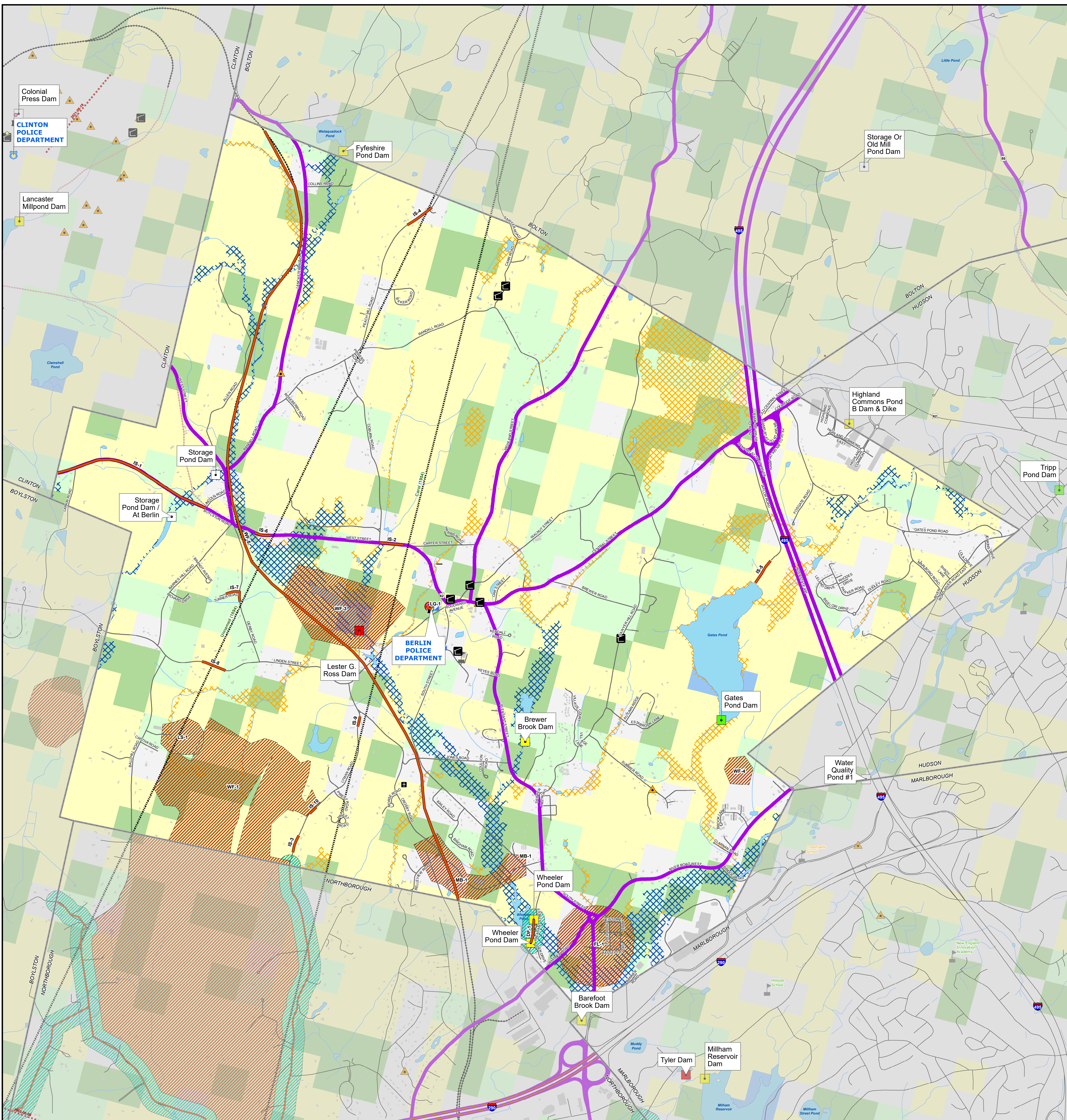
**Locally Defined**

Critical Infrastructure	Critical Infrastructure	Critical Infrastructure
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# Hazard Mitigation Plan

## Map 2 Hazards Town of Berlin, Massachusetts January 2026



### Legend

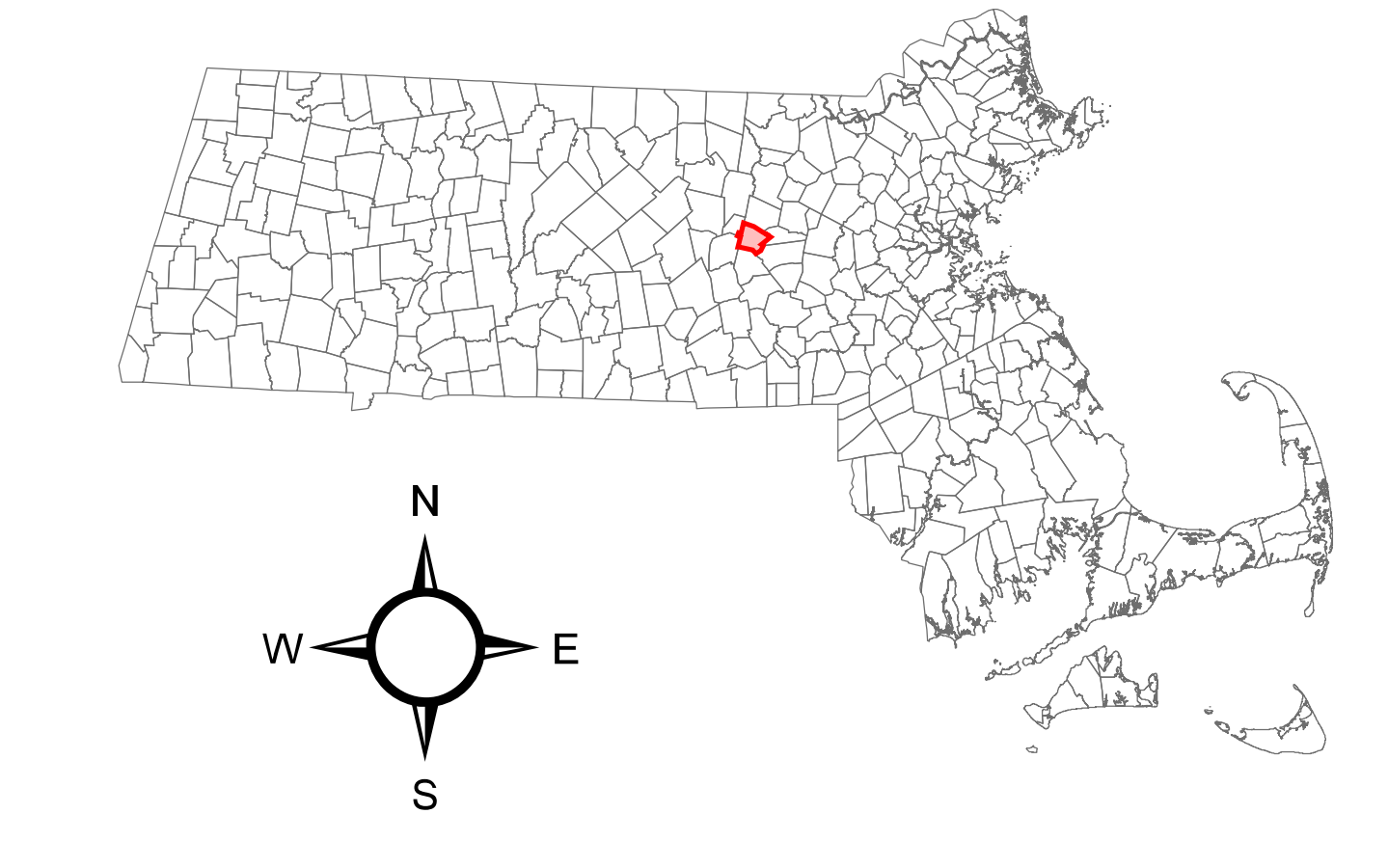
- Assisted Living
- Emergency Shelters
- Nursing/Rest Homes
- Daycare
- EOC
- Airports
- Town Halls
- Local Police
- Fire Station
- Schools (Pre-K through High School)
- Active Rail Line
- Out of Service/Abandoned Rail Line
- Transmission Lines by Type
- Pipeline/Arbitrary Extension
- Town Boundaries
- 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



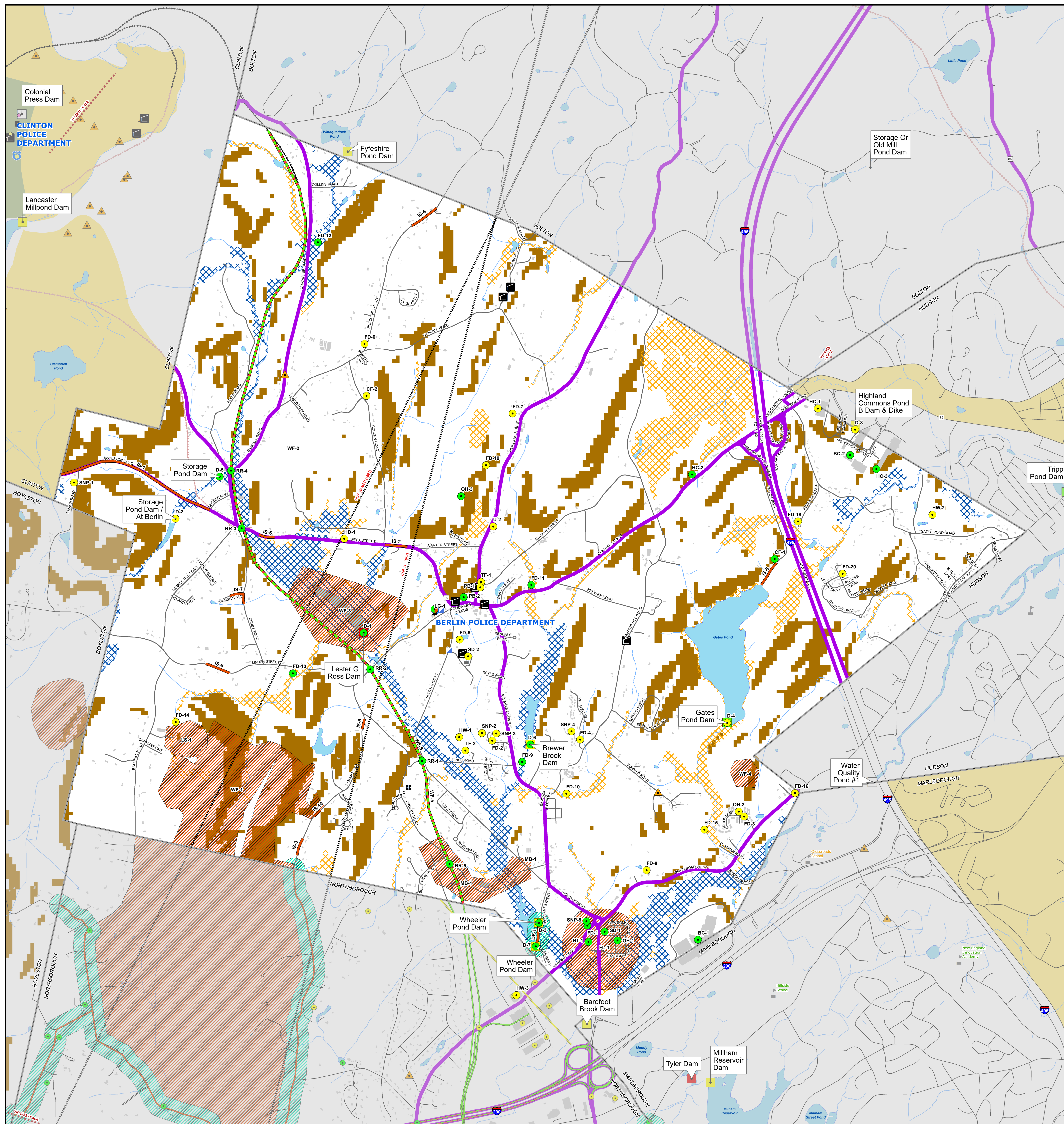
# Hazard Mitigation Plan

## Map 3

### Vulnerable Critical Infrastructure and Facilities

#### Town of Berlin, Massachusetts

January 2026



**Legend**

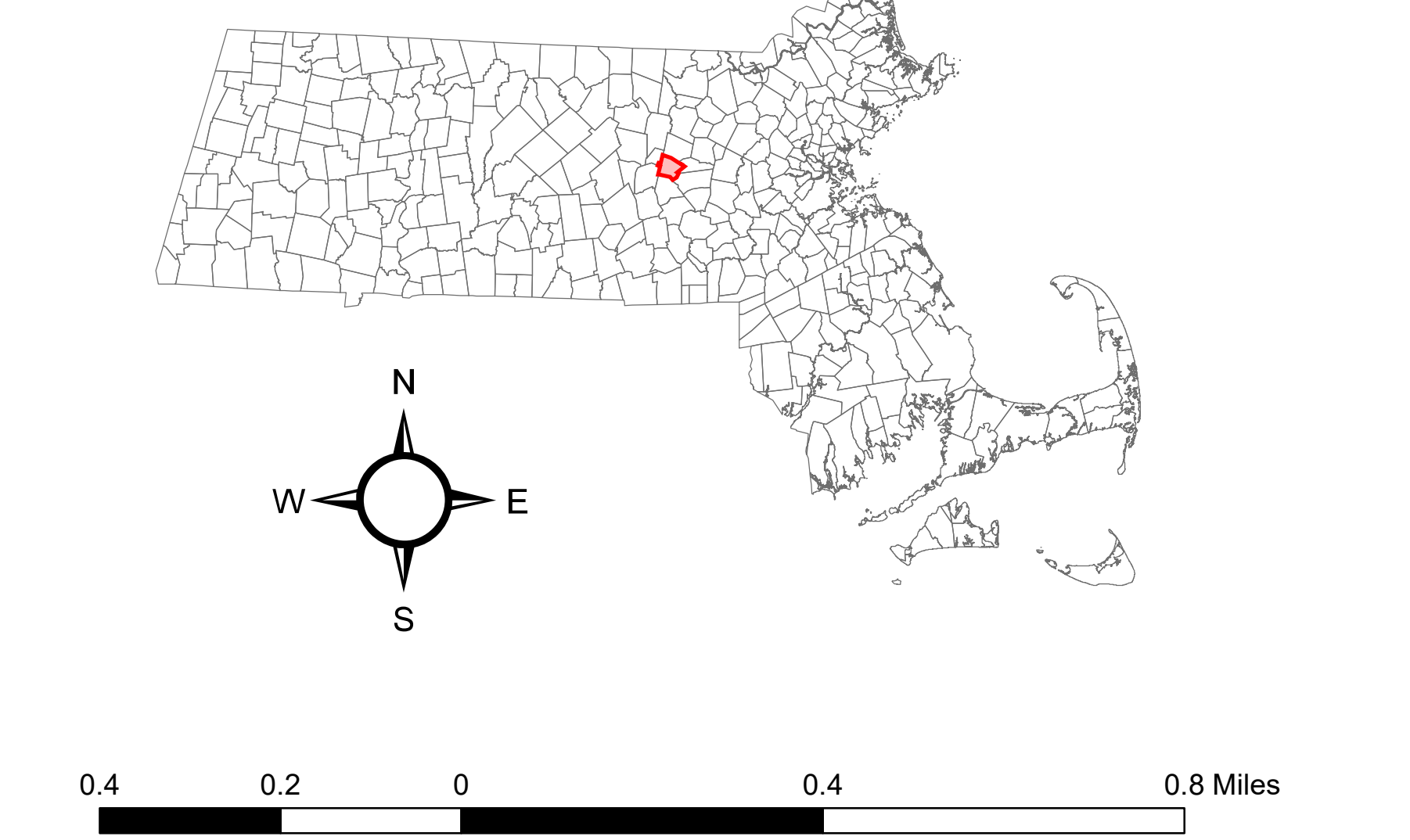
● Assisted Living	🏠 Town Halls	MA Environmental Justice Populations 2020
🏠 Emergency Shelters	🚓 Local Police	Minority
🏠 Nursing/Rest Homes	🚒 Fire Station	
🏠 Daycare	🎓 Schools (Pre-K through High School)	
🏠 EOC	🚆 Active Rail Line	
🏠 Airports	🚆 Out of Service/Abandoned Rail Line	
▭ Town Boundaries	🌊 Streams	🚚 Regionwide Evacuation Routes
▭ Structures	🛣️ Roads	
🌊 Water Bodies		

**Hazards**

🔴 Dams (2/2012)	🌊 FEMA DFIRM Flood Zones	🟠 High Slope (15% and above)
🔴 High Hazard	🟦 1% Annual Chance Flood	🟡 Repetitive Loss Property Areas
🟡 Significant Hazard	🟦 Hazard or Regulatory Floodway	🔴 NOAA Tornado Tracks (as of 9/2021)
🟢 Low Hazard	🟡 0.2% Annual Chance Flood Hazard	
⬜ N/A		
	📍 IBTrACS Historical Hurricane Tracks (1842-2020)	

**Locally Defined**

🔴 Hazard	🟠 Hazard	🟦 Possible Flood Area
🟢 Vulnerable Critical Infrastructure	🟢 Vulnerable Critical Infrastructure	🟡 Hazard
🟢 Vulnerable Critical Infrastructure/Hazard	🟢 Vulnerable Critical Infrastructure/Hazard	🟢 Vulnerable Critical Infrastructure
🟡 Non-vulnerable Critical Infrastructure	🟡 Non-vulnerable Critical Infrastructure	🟡 Non-vulnerable Critical Infrastructure
🟡 Non-vulnerable Critical Infrastructure/Hazard		



**Key to Locally Identified Hazards and Critical Infrastructure**

<b>Facility/Infrastructure/Hazard</b>	<b>Type</b>	<b>Map ID</b>	<b>Vuln. GIS</b>	<b>Vuln. Town</b>
Berlin Highway Dept - 112 West St	CI	HD-1		
Repeater Site - Near field at end of Taylor Rd	CI	CF-1		
Repeater Site - Coburn Rd	CI	CF-2		
Emerson Urgent Care at Hudson - 38 Highland Common E.	CI	HC-1		
Vet Hospital	CI	HC-2	Y	Y
Acton Medical Associates - 36 Highland Common East	CI	HC-3	Y	
Cistern - Whitney Rd	CI	FD-1	Y	
Cistern - Pleasant St	CI	FD-2		
Cistern - Brook Lane	CI	FD-3		
Cistern - Village Lane	CI	FD-4		
Dry Hydrant - South St	CI	FD-5		
Dry Hydrant - Peach Hill Rd	CI	FD-6		
Drafting Site - 116 Highland	CI	FD-7		
Dry Hydrant - River Rd	CI	FD-8		
Dry Hydrant - Pleasant St	CI	FD-9	Y	
Dry Hydrant - Sawyer Hill Rd	CI	FD-10		
Dry Hydrant - Central St	CI	FD-11	Y	
Dry Hydrant - Lancaster Rd	CI	FD-12	Y	
Dry Hydrant - Linden St	CI	FD-13	Y	
Dry Hydrant - Ball Hill Road	CI	FD-14		
Dry Hydrant - Brook Lane	CI	FD-15		
Hydrant - River Rd W	CI	FD-16		
Drafting Site - Dead end of Fosgate Road	CI	FD-18		
Cistern - Wheeler Hill Rd	CI	FD-19		
Cistern - 1 Parker Rd	CI	FD-20		
Library	CI	TF-1		
Transfer Station - Jones Road	CI	TF-2		
Carter Community Center	CI	PB-1		
Old Town Hall-1870	CI	PB-2	Y	
RR Crossing - Jones Rd & South St	CI	RR-1	Y	
RR Crossing - Linden St	CI	RR-2	Y	
RR Crossing - Derby Rd & West St	CI	RR-3	Y	
RR Crossing - Randall Rd & West St	CI	RR-4	Y	
RR Crossing - Crosby Rd & Belleview Rd	CI	RR-5	Y	
Rockwell Apartments	CI	OH-1	Y	Y
Meadowbrook Village	CI	OH-2	Y	
Highland Ridge - 32 Campbell Rd	CI	OH-3	Y	
Uncapped Landfill	CI	HW-1		

Hudson Landfill	CI	HW-2		
STERIS (in Northborough)	CI	HW-3		
Dam - Lester G. Ross	CI	D-1	Y	Y
Dam - Storage Pond Dam / At Berlin	CI	D-2		
Dam - Wheeler Pond	CI	D-3	Y	Y
Dam - Gates Pond	CI	D-4		
Dam - Storage Pond Dam	CI	D-5	Y	
Dam - Brewer Brook	CI	D-6	Y	Y
Dam - Wheeler Pond	CI	D-7	Y	Y
Dam - Highland Commons Pond B Dam & Dike	CI	D-8		
Group Home - Larkin Rd	CI	SNP-1		
Northbrook Village Senior Housing 1	CI	SNP-2		
Northbrook Village Senior Housing 2	CI	SNP-3		
Sawyer Hill EcoVillage Co-Housing - 40B	CI	SNP-4		
Autism Behavior Center - 1 Whitney Rd	CI	SNP-5	Y	
Solomon Pond Mall	CI	BC-1		
Highland Commons	CI	BC-2	Y	
Daycare - The Growing Room of Berlin	CI	SD-1	Y	
Berlin Memorial School (emergency shelter)	CI	SD-2		
CSX Railroad	CI	U-1	Y	Y
Verizon Central Office - 23 Highland Street	CI	U-2		
Homewood Suites by Hilton Boston Marlborough	CI	HT-1	Y	Y
River Road Area Flooding	H	FL-1	N/A	N/A
Crosby Windshear Microburst	H	MB-1	N/A	N/A
Lightning - Berlin Police Station, Fire Headquarters, and Municipal Offices (emergency shelter) - 23 Linden St	CI/H	LG-1	Y	Y
Dam Failure - Wheeler Pond Dam. State order to fix	H	DF-1	N/A	N/A
Boylston Road Japanese Knotweed	H	IS-1	N/A	N/A
West Street Japanese Knotweed	H	IS-2	N/A	N/A
Lyman Road Emerald Ash Borer	H	IS-3	N/A	N/A
Peach Hill Road Japanese Knotweed	H	IS-4	N/A	N/A
Gates Pond Japanese Knotweed and Bittersweet	H	IS-5	N/A	N/A
West Street Japanese Knotweed (2)	H	IS-6	N/A	N/A
Turner Road and Derby Road Japanese Knotweed	H	IS-7	N/A	N/A
Linden Street Japanese Knotweed	H	IS-8	N/A	N/A
Lyman Road Japanese Knotweed	H	IS-9	N/A	N/A

Lyman Road Japanese Knotweed (2)	H	IS-10	N/A	N/A
Mount Pisgah Potential Man-made Landslide Area	H	LS-1	N/A	N/A
Mount Pisgah	H	WF-1	N/A	N/A
Randall Road Solar Farm	CI/H	WF-2	Y	Y
SuAsCo / Lester Ross Dam Area	H	WF-3	N/A	N/A
Solar Farm - River Rd West	H	WF-4	N/A	N/A

Critical Infrastructure Acronym Codes:

- EO: Emergency Operations
- FD: Fire Department
- CF: Communication Facilities
- HD: Highway Department
- RR: Railroad
- HC: Hospitals and Clinics
- TF: Town Facilities
- U: Utilities
- HW: Hazardous Waste Sites
- D: Dams
- SNP: Special Needs Populations
- PB: Public Buildings
- SD: Schools and Daycare
- BC: Business Centers
- OH: Other Housing
- HT: Hotels

Hazards Acronym Codes:

- FL: Flooding
- MB: Microburst
- LG: Lightning Strike
- DF: Potential for Dam Failure
- IS: Invasive Species
- LS: Potential for Man-made Landslide
- WF: Wildfire

# **APPENDIX B**

## **Public Survey**

### **Materials and**

### **Results**

*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))*



## Berlin Hazard Mitigation Plan Community Survey

### Berlin Hazard Mitigation Plan

**In August of 2024, the Town of Berlin 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 Berlin.**

**By participating in this survey, you will help the Town of Berlin understand the current and future natural hazards that residents are most concerned about. Survey responses will be accepted through November 10, 2024.**

1. Check all that apply.

- I live in Berlin.
- I work in Berlin.
- I frequently visit Berlin.

2. Has your family or property, in Berlin, been impacted by any of the following natural hazards? Select all that apply:

- I have not been impacted by natural hazards in Berlin
- Winter Storms / Ice
- Thunderstorms, Microbursts, and/or Extreme Wind
- Tornadoes
- Flooding
- Extreme Heat / Extreme Cold
- Drought
- Wildfire / Brushfire
- Hurricanes
- Earthquakes
- Poor Air Quality
- Other (please specify)

3. Where have you observed hazard impacts in Berlin, 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 Berlin (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 Berlin? Rank the responses below in order from most concerned (1) to least concerned (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 Berlin take to cultivate local resilience to natural hazards?

*Examples: increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects; improve storm water management; provide more education and outreach about how climate change could impact my life; encourage planting climate-resilient tree species; continue to encourage cutting/trimming dead trees beside/hanging over roads; etc.*

10. If you would like to stay informed about other opportunities to participate in Berlin's Hazard Mitigation planning process, please enter your E-mail address below.

Small notices on the top left bulletin board.

COMMERCIAL TRUCK ASSIGNMENTS  
BY THE CHIEF OF POLICE  
AND THE CHIEF OF THE FIRE DEPARTMENT  
IN  
MAYORAL OFFICE

Small notice on the top right bulletin board.

TO CONTACT POLICE, FIRE & EMS  
DISPATCH  
Pick up the phone and the phone will  
automatically dial Dispatch

PARA CONTACTAR A POLICIA &  
BOMBEROS  
Pegar o telefono e ele discar  
automaticamente para Dispatch



Stacks of orange and white papers on the desk.

White paper with text and a QR code, likely a document or form.

White paper titled 'Berlin Howard Mitigation Plan' with a QR code and a list of items.



Town of Berlin, MA

18 hours ago · 🌐

<https://www.townofberlin.com/.../berlin-hazard-mitigation...>



TOWNOFBERLIN.COM

## Berlin Hazard Mitigation Plan Survey Responses Needed | Berlin MA

Please help the Town of Berlin update its Hazard Mitigation Plan. We need your input!

13



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# Berlin Hazard Mitigation Plan Survey Responses Needed

POSTED ON: OCTOBER 16, 2024 - 7:56PM

Please help the Town of Berlin update its Hazard Mitigation Plan. We need your input! Click [here](#) for more information and the [link](#) to the survey.





# Berlin Hazard Mitigation Plan

## Survey Responses Needed!

The Town of Berlin is updating its Hazard Mitigation Plan (HMP) and is looking to gather feedback from residents. An updated HMP will help the Town to identify strategies to reduce community vulnerability to natural hazards such as flooding, winter storms, and drought, as climate change may shift the extent and severity of certain natural hazards, including those that already impact Berlin. By participating in this survey, you will help the Town of Berlin to understand current and future natural hazards that residents are most concerned about. Survey responses will be accepted through November 10, 2024. Physical copies of the survey are available at Berlin's Municipal Offices, 19 Carter, Berlin General Store, the transfer station, Meadowbrook Village Community Center, Highland Ridge Community Center, and Northbrook Village Community Center. Please navigate to [www.surveymonkey.com/r/QR2G85](https://www.surveymonkey.com/r/QR2G85) to take the community survey online.

## We want to hear from you about:

- How you have been affected by natural hazards in and around town;
- Which natural hazards you are most concerned about;
- How you think climate change and natural hazards will affect Berlin and/or
- Your suggestions for mitigating the effects of climate change and natural hazards to Berlin.



Answer the survey through November 10, 2024 using the QR code below:

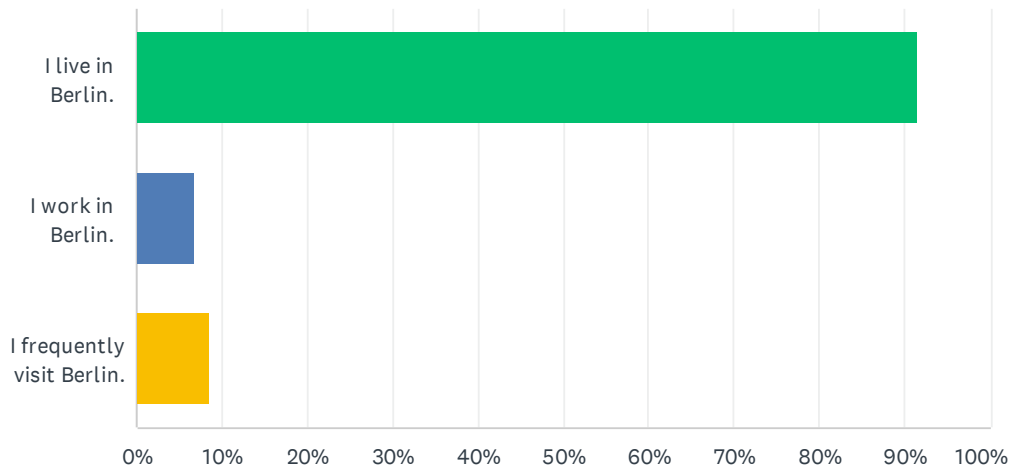


TIP: Open your phone camera, point at QR code, and click on pop-up link to take the survey, OR type the link below into your web browser:

**Link to survey: <https://www.surveymonkey.com/r/QR2G85>**

## Q1 Check all that apply.

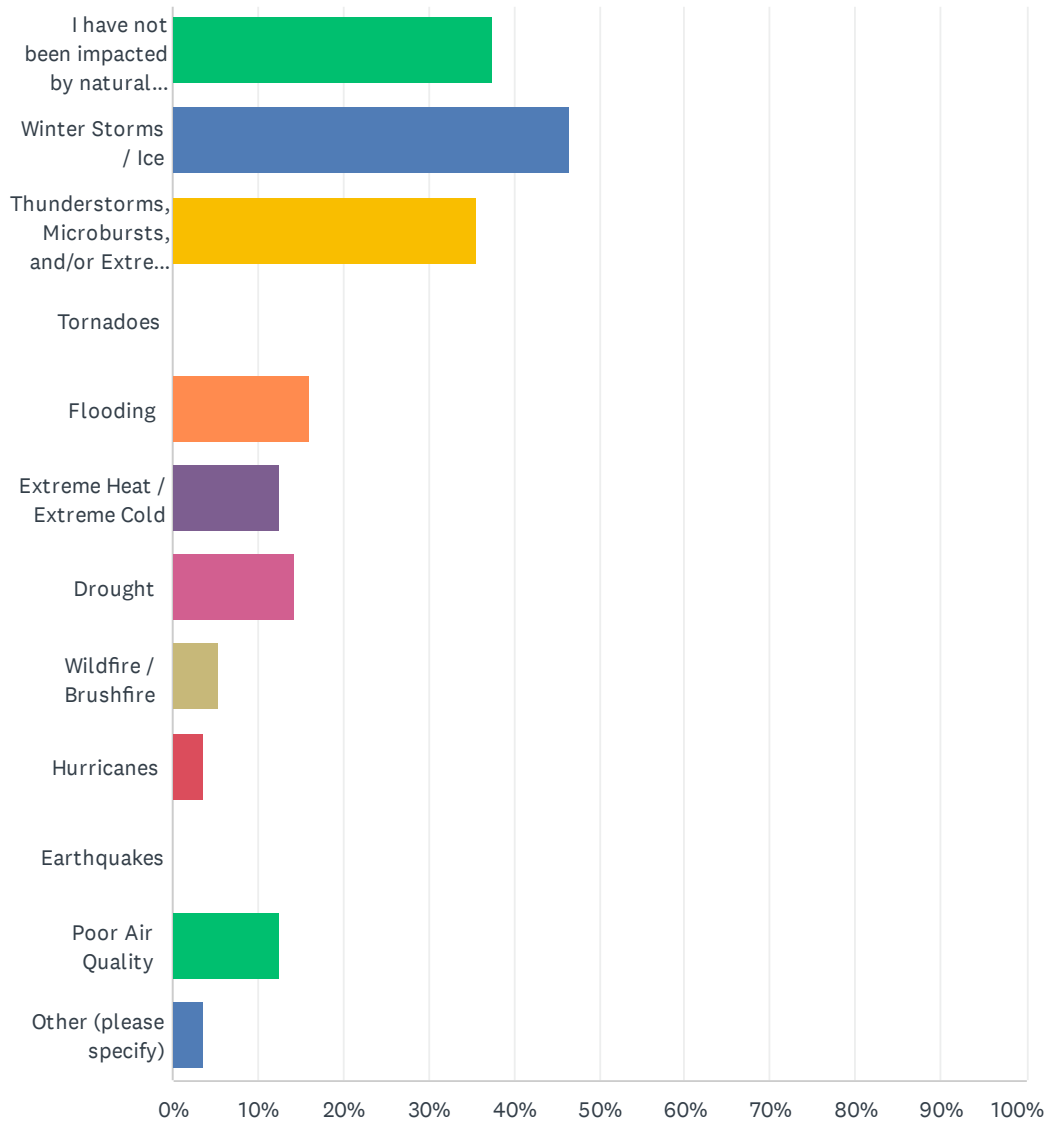
Answered: 59 Skipped: 0



ANSWER CHOICES	RESPONSES
I live in Berlin.	91.53% 54
I work in Berlin.	6.78% 4
I frequently visit Berlin.	8.47% 5
Total Respondents: 59	

## Q2 Has your family or property, in Berlin, been impacted by any of the following natural hazards? Select all that apply:

Answered: 56 Skipped: 3



## Berlin Hazard Mitigation Plan Community Survey

ANSWER CHOICES	RESPONSES	
I have not been impacted by natural hazards in Berlin	37.50%	21
Winter Storms / Ice	46.43%	26
Thunderstorms, Microbursts, and/or Extreme Wind	35.71%	20
Tornadoes	0.00%	0
Flooding	16.07%	9
Extreme Heat / Extreme Cold	12.50%	7
Drought	14.29%	8
Wildfire / Brushfire	5.36%	3
Hurricanes	3.57%	2
Earthquakes	0.00%	0
Poor Air Quality	12.50%	7
Other (please specify)	3.57%	2
Total Respondents: 56		

#	OTHER (PLEASE SPECIFY)	DATE
1	(respondent wrote "how do you define this?" with an arrow to the word impacted)	11/10/2024 5:18 PM
2	Falling trees	10/19/2024 12:34 PM

**Q3 Where have you observed hazard impacts in Berlin, 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.**

Answered: 37 Skipped: 22

#	RESPONSES	DATE
1	(respondent crossed out this answer box)	11/15/2024 5:08 PM
2	Large trees crashing on buildings and shutting down elec. power for weeks	11/15/2024 5:02 PM
3	I have not.	11/11/2024 11:09 AM
4	Trees down	11/11/2024 10:46 AM
5	Down leaves & branches	11/11/2024 10:37 AM
6	Flooding from dams water supply (next to question 2, the respondent wrote "I lived in town for over 10 yrs. My daughter owns her grandfather's home.")	11/11/2024 10:34 AM
7	Frequent power outage on River Rd. Flooding land from Assabett.	11/11/2024 10:28 AM
8	Flooding Colburn Rd Randall Rd	11/10/2024 5:45 PM
9	Several years ago many power outages High winds, tree branches on wires National Grid with tree trimming led to fewer outages!!!	11/10/2024 5:37 PM
10	I have not observed any hazard impacts in Berlin.	11/10/2024 5:18 PM
11	flooding on South St.	11/10/2024 5:08 PM
12	N/A	11/10/2024 4:58 PM
13	No impacts so far.	11/10/2024 4:54 PM
14	Concern about Lester Ross dam, depending on where you live you are connected to different power grids, while some of town is fine, others are not	11/10/2024 4:34 PM
15	In the 15 yrs we have been here, there has been a significant increase in wind. We've also had basement flooding during extreme rain events.	11/10/2024 4:22 PM
16	Highland Street	11/10/2024 4:13 PM
17	Flooding REDACTED on South Street	11/9/2024 4:47 PM
18	Our current drought is preventing outdoor fires at a time of year they would typically be common.	11/7/2024 9:58 PM
19	South Street Bridge over the North Brook. Bridge near the Community Gardens over tributary to Assabet River.	11/7/2024 6:11 PM
20	power outages, road flooding, smoke from wildfires	11/6/2024 1:40 PM
21	None	10/31/2024 3:06 PM
22	Where marlboro road ends at river road E. Too many accidents due to people not stopping. even a 4 way stop sign or flashing yellow light could save injury for some poor victims.	10/31/2024 2:01 PM
23	Trees down on walking paths after ice or wind storms, road shoulder/sidewalks impassible after ice or snow storms, poor air quality during Canadian wildfires made it hard to cool my house in summer by opening windows, driving up my AC costs and power use	10/29/2024 10:35 AM
24	Trees falling across roads during bad thunderstorms. Or a lot of tree damage from the 08 ice	10/19/2024 4:35 PM

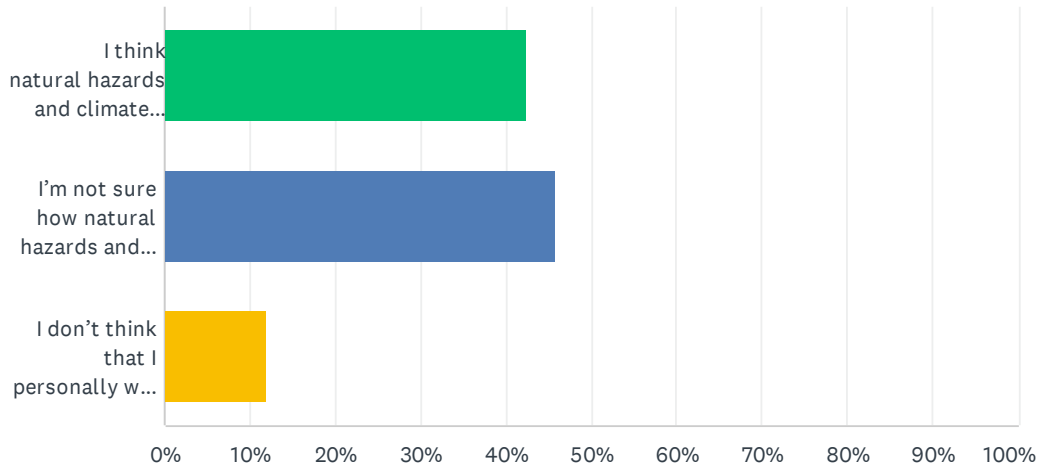
## Berlin Hazard Mitigation Plan Community Survey

storm. Trees hitting power lines and knocking things out. But the ice storm was the worst. Without having chainsaws, we would have been really trapped and at the mercy of outside help.

25	Trees down across roads Erosion from heavy rains	10/19/2024 12:34 PM
26	trees down on Coburn Rd.	10/18/2024 11:51 AM
27	End of Oak St flooding and extended power outage after a hurricane.	10/17/2024 6:38 PM
28	April 2023: Pisgah Fire. August 7th, 2022: Wind damage, many down trees. Many times: Random train derailments. Oct 31st 2011 snow storm: lost power for several days.	10/17/2024 4:41 PM
29	Trees down. On Ball Hill Rd in particular.	10/17/2024 2:03 PM
30	downed trees, debris in the road(s)	10/17/2024 9:26 AM
31	4 day power outages due to ice storms and hurricane winds.	10/17/2024 8:25 AM
32	There are ALOT of old, tall, robust trees - even clearly dead ones - near roadways and thus power lines that are hazard to come down during different weather events (wind, ice, weight of snow).	10/16/2024 11:35 PM
33	Lyman Road, Mt. Pisgah, and areas surrounding property	10/16/2024 10:03 PM
34	Well issues Crop failure	10/16/2024 9:07 PM
35	Extended power outages, drainage issues from rain events	10/16/2024 8:39 PM
36	Trees down on power lines. Propane fire/combustion. House fires. Auto accidents.	10/16/2024 8:17 PM
37	Baker Rd has extended power outages due to small number of homes affected. Tree branch power outages all over town during storms.	10/16/2024 8:08 PM

### Q4 How much do you think the impacts of natural hazards and climate change will threaten your personal health, safety, or property?

Answered: 59 Skipped: 0



ANSWER CHOICES	RESPONSES	
I think natural hazards and climate change will negatively impact my life.	42.37%	25
I'm not sure how natural hazards and climate change will impact my life.	45.76%	27
I don't think that I personally will be impacted by natural hazards and climate change.	11.86%	7
<b>TOTAL</b>		<b>59</b>

**Q5 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**

Answered: 42 Skipped: 17

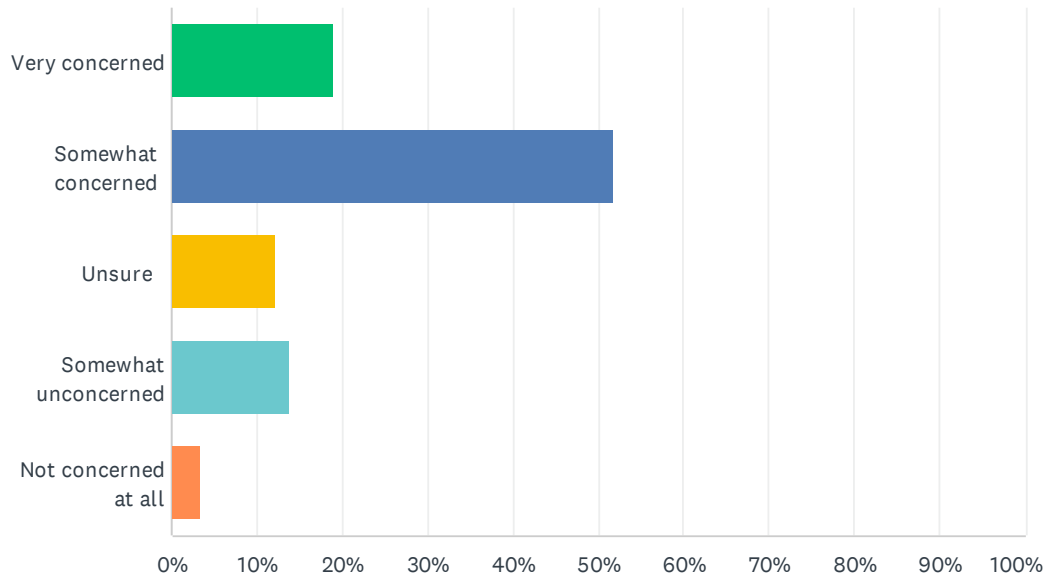
#	RESPONSES	DATE
1	Forest Fires (respondent underlined "fires")	11/15/2024 5:08 PM
2	Food supply and damage to residence due to falling trees	11/15/2024 5:02 PM
3	(respondent circled "wells drying out" and "contamination of wells" and wrote "and/or" between them)	11/11/2024 11:09 AM
4	Wells drying out	11/11/2024 10:59 AM
5	ability to grow food / excessive heat (respondent wrote and circled "Hudson" under where it says "Berlin" for question 6)	11/11/2024 10:52 AM
6	Flooding & winds & tornados	11/11/2024 10:37 AM
7	The earth -	11/11/2024 10:34 AM
8	House damage from extreme weather. Septic + well problems	11/11/2024 10:28 AM
9	No specific worry	11/10/2024 5:56 PM
10	(Respondent circled "wells drying out / contamination of wells, ability to grow food")	11/10/2024 5:52 PM
11	(respondent underlined "wells drying out" and "ability to grow food")	11/10/2024 5:45 PM
12	Lack of water, i.e. dry wells.	11/10/2024 5:42 PM
13	Long term drought (respondent drew an arrow from "long term drought" to "wells drying out" and circled "wells drying out") Very tall trees close to our building Very high winds, tornado leading trees falling onto our building (After "very concerned" for question 6, respondent wrote "about long term drought could lead to fires in the woods around town")	11/10/2024 5:37 PM
14	Extremes of heat, cold & drought.	11/10/2024 5:23 PM
15	Lose of electricity	11/10/2024 5:12 PM
16	wells going dry	11/10/2024 5:08 PM
17	Lack of clean water. Road washouts.	11/10/2024 4:54 PM
18	(respondent circled and numbered 1. and 2., respectively, "wells drying out" and "contamination of wells")	11/10/2024 4:42 PM
19	wells, drought, impact to farms	11/10/2024 4:34 PM
20	basement flooding well contamination extreme weather events → all of it	11/10/2024 4:22 PM
21	Drinking water supply - contamination + drought	11/10/2024 4:13 PM
22	Basement and yard flooding	11/9/2024 4:47 PM
23	Well drying out, basement flooding, wildfires fueled by drought	11/7/2024 9:58 PM
24	Bridge Failures, Possible Dam overtopping and failure.	11/7/2024 6:11 PM
25	water supply, disease from ticks/mosquitos	11/6/2024 1:40 PM
26	Dealing with extreme heat in summer.	10/31/2024 3:06 PM

## Berlin Hazard Mitigation Plan Community Survey

27	1. (highest concern) Well water source. With increased housing developments, many families consolidated in small area, (in particular near river road West), i'm concerned with whether we are taking into consideration the type of Aquifer. That is: "To properly manage an aquifer its properties must be understood. Many properties must be known to predict how an aquifer will respond to rainfall, drought, pumping, and contamination. " See the below <a href="#">/wiki/Aquifer#:~:text=To%20properly%20manage%20an%20aquifer%20its%20properties%20must%20be%20understood.%20Many%20properties%20must%20be%20known%20to%20predict%20how%20an%20aquifer%20will%20respond%20to%20rainfall%2C%20drought%2C%20pumping%2C%20and%20contamination.</a>	10/31/2024 2:01 PM
28	Well drying out due to drought and overuse of groundwater from other wells in area, power outages during extreme heat/being unable to cool my house, mosquito and tick diseases	10/29/2024 10:35 AM
29	Thankfully we have a house that is sturdy, on the side of a hill, and likely plenty of water. It's more concern about contaminants of water. Or just demolition of the nature around that helps to keep things healthy. There's not as much greenery before. And there's a massive increase in traffic by the house. Also contaminants spills is a concern from tractor trailers and the railroad - especially the railroad as they've had multiple derailments. Also worried about with climate change - an increase in mosquitos and ticks and all the nasty diseases they carry. And how attempts to curb mosquitos and ticks will impact the environment.	10/19/2024 4:35 PM
30	Well water quality Erosion from heavy rains	10/19/2024 12:34 PM
31	electricity going out in winter	10/18/2024 11:51 AM
32	Probably not what you are looking for but I am mostly concerned about invasive plant and insect species, specifically Japanese Knotweed, which I see growing all around Berlin, and Ailanthus altissima trees, which I have near me on Pleasant St and they attract Spotted Lanternflies.	10/17/2024 10:13 PM
33	Forest fires if we get dry weather like 2023.	10/17/2024 4:41 PM
34	Tree health along side the roads	10/17/2024 11:14 AM
35	Availability of electric power, flooding and road hazards	10/17/2024 9:26 AM
36	Well drying out, septic overflowing	10/17/2024 12:14 AM
37	Rising costs of heat and electricity for home heating/cooing. Basement flooding due to rain events with large volumes in a short time.	10/16/2024 11:35 PM
38	Property flooding, well drying out, brush fires, fallen trees, power outages, internet outages	10/16/2024 9:26 PM
39	Flooding, losing electricity, well drying out	10/16/2024 9:01 PM
40	Well contamination, basement flooding loss of perishable food from power loss	10/16/2024 8:39 PM
41	Extreme weather brining trees down on my home or power lines. Japanese knotweed spreading quickly across the town choking out native flora.	10/16/2024 8:17 PM
42	Storm damage from large trees falling	10/16/2024 8:08 PM

### Q6 How concerned are you about the impacts that natural hazards and climate change will have on the Town of Berlin (the local infrastructure, economy, environment, and/or town residents)?

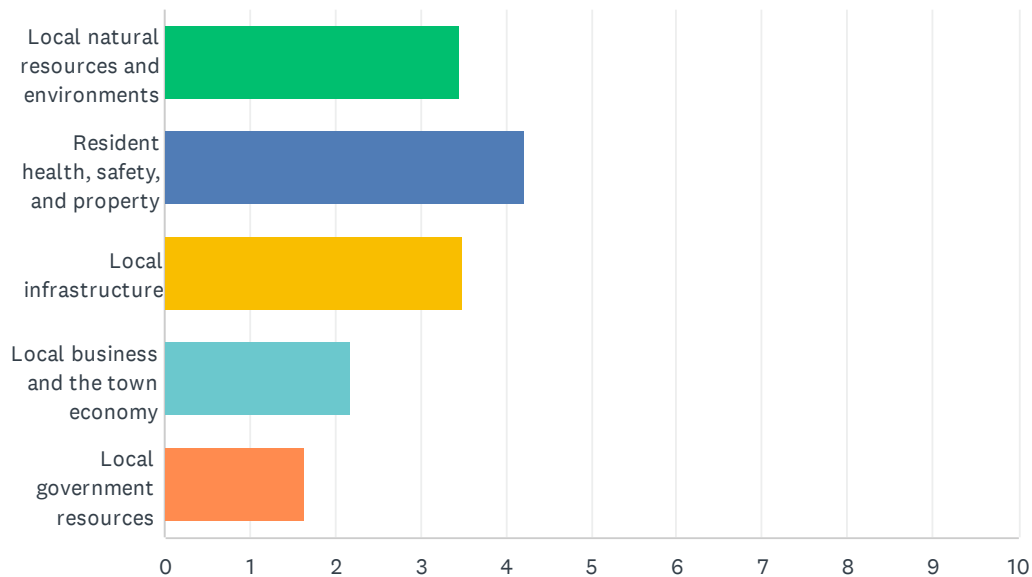
Answered: 58 Skipped: 1



ANSWER CHOICES	RESPONSES	
Very concerned	18.97%	11
Somewhat concerned	51.72%	30
Unsure	12.07%	7
Somewhat unconcerned	13.79%	8
Not concerned at all	3.45%	2
<b>TOTAL</b>		<b>58</b>

**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 Berlin? Rank the responses below in order from most concerned (1) to least concerned (5).**

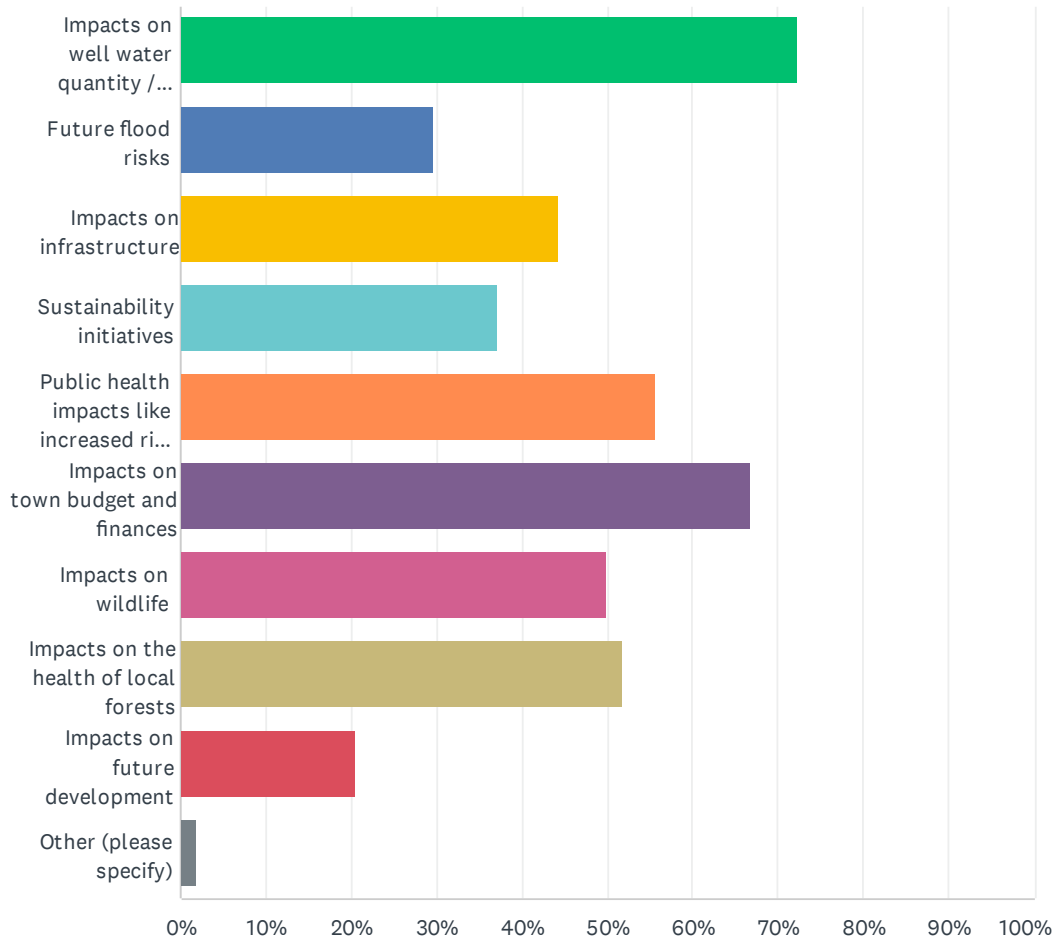
Answered: 49 Skipped: 10



	1	2	3	4	5	TOTAL	SCORE
Local natural resources and environments	26.53% 13	26.53% 13	22.45% 11	14.29% 7	10.20% 5	49	3.45
Resident health, safety, and property	53.06% 26	24.49% 12	16.33% 8	4.08% 2	2.04% 1	49	4.22
Local infrastructure	16.33% 8	36.73% 18	34.69% 17	4.08% 2	8.16% 4	49	3.49
Local business and the town economy	2.04% 1	8.16% 4	18.37% 9	48.98% 24	22.45% 11	49	2.18
Local government resources	2.04% 1	4.08% 2	8.16% 4	28.57% 14	57.14% 28	49	1.65

### 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: 54 Skipped: 5



## Berlin Hazard Mitigation Plan Community Survey

ANSWER CHOICES	RESPONSES	
Impacts on well water quantity / quality	72.22%	39
Future flood risks	29.63%	16
Impacts on infrastructure	44.44%	24
Sustainability initiatives	37.04%	20
Public health impacts like increased risks of vector-borne disease (ex. Lyme disease, West Nile Virus, EEE - Eastern equine encephalitis)	55.56%	30
Impacts on town budget and finances	66.67%	36
Impacts on wildlife	50.00%	27
Impacts on the health of local forests	51.85%	28
Impacts on future development	20.37%	11
Other (please specify)	1.85%	1
Total Respondents: 54		

#	OTHER (PLEASE SPECIFY)	DATE
1	Too much residential development creates hazards	11/10/2024 4:13 PM

**Q9 What actions should the Town of Berlin take to cultivate local resilience to natural hazards? Examples: increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects; improve storm water management; provide more education and outreach about how climate change could impact my life; encourage planting climate-resilient tree species; continue to encourage cutting/trimming dead trees beside/hanging over roads; etc.**

Answered: 34 Skipped: 25

#	RESPONSES	DATE
1	(respondent underlined "increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects" and drew an arrow to the answer box)	11/15/2024 5:08 PM
2	(respondent underlined and drew an arrow to "continue to encourage cutting/trimming dead trees beside/hanging over roads") plus harvests large pines near homes See attached (text from attached document is below) "Hazard Mitigation Plan The most damaging impact of climate change on Berlin will result from the arrival of the One Hundred Year Storm. The last one was the hurricane of 1938. Due to climate change, the next hundred-year storm will come well before 2038. Since 1938, there has been tremendous growth in both the amount and size of trees in eastern Massachusetts. This represents a sleeper issue. Berlin has the most forested land with the largest trees since colonial times. In the early nineteenth century ¾+, of Berlin was open pasture. The woodlands previously had been harvested for logs and firewood and consisted of new, small growth (6" dia., 40' tall trees). In the mid twentieth century (~15 years after the hurricane of 1938) I witnessed trees uprooted and decaying on the ground throughout Berlin's wooded areas. Plus, many areas, now wooded, were open fields (There were twenty-three dairy farms in Berlin in 1953.). Such was the landscape. Now there are huge oaks and pines along the roads and amongst homes. Note the tall pines in the Brigham and Bailey Roads and other neighborhoods. Tall, heavy trees hang over the wires along stretches of River, Central, and most other streets. There are more and much larger trees now than in 1938. When the next hurricane hits, power will be out for weeks; homes will be severely damaged; many will be injured; and emergency vehicles will be severely restricted if not immobilized for days. The most urgent preventative measure needed to prepare for the hazards that climate change will spawn is to remove hazardous trees ASAP. -- A forestry department should be formerly established, staffed, and funded in the Highway Department. In addition, the Selectboard should go on written record with Berlin's electricity supplier that substantially more trees that overhang power lines must be trimmed or removed."	11/15/2024 5:02 PM
3	(respondent drew arrows from "continue to encourage cutting/trimming dead trees beside/hanging over roads" to the answer box)	11/11/2024 11:09 AM
4	maintain open and woodlands.	11/11/2024 10:46 AM
5	education -	11/11/2024 10:34 AM
6	Water safety + access to public water in emergencies	11/11/2024 10:28 AM
7	all of the above.	11/10/2024 5:52 PM
8	No idea	11/10/2024 5:45 PM
9	Removal of dead trees in woods around town. Help prevent fires in woods that might reach homes. (respondent circled "continue to encourage cutting/trimming dead trees beside/hanging over roads") Does the Town have a plan to supply drinking water to residents if a long term drought leads to dry wells	11/10/2024 5:37 PM
10	Cutting & trimming all trees over roads.	11/10/2024 5:23 PM

## Berlin Hazard Mitigation Plan Community Survey

11	Controlled burns to make forest areas more wildfire resistant.	11/10/2024 5:18 PM
12	Education on how climate change could impact our lives.	11/10/2024 5:12 PM
13	all of the above	11/10/2024 5:08 PM
14	All of the above	11/10/2024 5:03 PM
15	cutting/trimming dead trees clean water supplies climate resistant foliage	11/10/2024 4:58 PM
16	Trim roadside trees Flood risk management Secure power grid	11/10/2024 4:54 PM
17	Encourage planting climate resilient tree species	11/10/2024 4:45 PM
18	All of the above (respondent drew arrows to and underlined "improve storm water management", "provide more education and outreach about how climate change could impact my life", "continue to encourage cutting/trimming dead trees beside/hanging over roads")	11/10/2024 4:42 PM
19	all of that, plus don't allow developers to clear cut trees + pay close attn to them during the construction process.	11/10/2024 4:22 PM
20	Keep more land in conservation restriction. Limit housing growth	11/10/2024 4:13 PM
21	Education and outreach would be helpful -- what can we each do within our own homes / properties and around town to help mitigate issues due to climate change	11/7/2024 9:58 PM
22	increase local capacity to apply for hazard mitigation grant funding and implement hazard mitigation projects; Review 2014 Re-evaluation of North Brook Flood Control Project (original design in the 1960s.)	11/7/2024 6:11 PM
23	encourage solar and battery backup; dead tree trimming; apply for hazard grant mitigation	11/6/2024 1:40 PM
24	Simply stay vigilant and be proactive. My biggest concern is the water supply and the load we put on it with increased housing going up. I don't know the details of the aquifers (confirmed/unconfirmed) but for the people already on these systems we owe it to them to know these and plan and approve new housing with the knowledge of what the impact.	10/31/2024 2:01 PM
25	All of the above examples. More transparency about what the town has planned, has done, and is doing about these things would be nice. Less development in town. We have seen such a massive surge in population but I don't think necessary planning has gone into it - mitigating the effects on the environment thereof.	10/19/2024 4:35 PM
26	Improve storm water management- I live on a hill and water runs down from above via land and streets - eroding the property and likely contributing to trees falling	10/19/2024 12:34 PM
27	start growing trees as replacements when trimming dead trees, to keep the Berlin look and feel.	10/18/2024 11:51 AM
28	Funding for management of invasive species	10/17/2024 10:13 PM
29	Improve storm water management and removing invasive plant species, especially along the roads. Also preserving open space.	10/17/2024 8:38 PM
30	Plans to help contain large brush fires. Keep all trees trimmed along power lines.	10/17/2024 4:41 PM
31	Determine where issues could arise, research options, make moves to implement the options	10/17/2024 9:26 AM
32	Encourage tree removal Invest in solar infrastructure Improve high speed internet service/access - FIOS. Our current vendor has poor infrastructure, low speeds, high costs - internet is a necessity to enable work from home options during adverse weather conditions or emergency situations	10/16/2024 11:35 PM
33	Storm water management, trimming dead trees, underground electrical lines	10/16/2024 9:01 PM
34	Look at hardened or buried power lines	10/16/2024 8:17 PM

## 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))*



**Berlin Hazard Mitigation Plan Update Local  
Planning Team Kickoff Meeting**

**Date/Time: August 6<sup>th</sup>, 2024, 1:30pm**

**Location: Berlin Town Administrator / Select Board Office, 23 Linden Street, Berlin, MA**

**AGENDA**

**I. Introductions**

**II. Plan Background**

- Review Contract
- Roles and Responsibilities
- Estimated Timeline

**III. Project Phases**

<b><u>Phase</u></b>	<b><u>Completion</u></b>
○ Assembly of local planning team, kickoff	August 2024
○ Information gathering	
○ Natural hazards	
○ Critical infrastructure and facilities	
○ Mitigation strategy development	
○ Stakeholder and public involvement	
○ Plan narrative development	
○ Plan submission (initial)	
○ Plan adoption	

**IV. Local Planning Team Meetings/Council Presentations**

- Meeting #1 (kickoff)
- Meeting #2 (hazards and critical infrastructure/facilities) (can be two meetings)
- Meeting #3 (existing protection measures and public survey planning)
- Meeting #4 (public survey review and mitigation strategies)
- Meeting #5 (finalize mitigation strategies) (if needed)
- Meeting #6 (public / community lifeline comment period review, final meeting before plan submission) (if needed)
- Presentation #1 (summary of draft plan – setting is flexible)
- Presentation #2 (final plan and request for adoption @ Select Board) (optional)

**V. Review of Mitigation Strategies**

- 2018 HMP Mitigation Strategies

**VI. Next Meeting – Natural Hazards or Natural Hazards and Critical Infrastructure**

- Date/location
- What to prepare

Name

Role

Email

Kristen Rubin  
Abigail Vianna  
Michael McQuilla  
ERIC SCHARNER  
Richard Hanks  
June Poland  
Will Talbot

Town Administrator  
Administrative Assistant  
Fire Chief  
POLICE CHIEF  
Building Commissioner  
Town Accountant  
CMRPC

townadmin@townofberlin.com  
avianna.ds@townofberlin.com  
firechief@townofberlin.com  
ESCHARTNER.PD@TOWNOFBERLIN.COM  
buildingins@townofberlin.com  
Accountant@TownofBerlin.com  
wtalbot@cmrpc.org



**Meeting Name:**  
 Berlin Hazard Mitigation Plan  
 Kickoff Meeting

**Community:** Berlin

**Date:** August 6<sup>th</sup>, 2024

**Location:** Berlin Town Administrator /  
 Select Board Office, 23 Linden Street  
 Berlin, MA

**Meeting Time:** 1:30 PM

<b>Participant Name</b>	<b>Organization</b>	<b>Title</b>	<b>E-mail</b>
Kristen Rubin	Administration	Town Administrator	townadmin@townofberlin.com
Abigail Vianna	Fire / Police	Administrative Assistant	aviannads@townofberlin.com
Michael McQuillen	Fire / EMS	Fire Chief	firechief@townofberlin.com
Eric Schartner	Police	Police Chief	eschartner.pd@townofberlin.com
Richard Hanks	Inspectional Services	Building Commissioner	buildinginsp@townofberlin.com
June Poland	Accounting	Town Accountant	accountant@townofberlin.com
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org
Sarah Plutnicki	CMRPC	Associate Planner	splutnicki@cmrpc.org



**Berlin Hazard Mitigation Plan Update Local  
Planning Team Natural Hazards and Critical  
Infrastructure Meeting**

**Date/Time: September 12<sup>th</sup>, 2024, 2pm**

**Location: Berlin Town Administrator / Select Board Office, 23 Linden Street, Berlin, MA**

**AGENDA**

**I. Introductions**

**II. Meeting #1 Recap**

- Review last page of mitigation strategies from the 2018 plan

**III. Community Lifelines**

**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

**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

**X. Next Meeting – Existing Protection Measures Review, Community Survey Planning**

- Date/location
- What to prepare



Meeting Name:  
Berlin Hazard Mitigation Plan  
Natural Hazards and Critical  
Infrastructure Meeting

Community: Berlin

Location: Berlin Town Administrator /  
Select Board Office, 23 Linden Street  
Berlin, MA

Date: September 12<sup>th</sup>, 2024

Meeting Time: 2 PM

Participant Name	Organization	Title	E-mail
Abby Vanna	Public Safety Admin. Assist.		avianna.ds@townofberlin.com
Michael McQuillen	Fire EMS/EMD	Fire Chief	firechief@townofberlin.com
Richard Hanks	Bldg. Comm.		buildinginsp@townofberlin.com
ERIC SCHARNER	POLICE	CHIEF	ESCHARNER.PD@TOWNOFBERLIN.COM
Kristen Rubin	TA		townadmin@townofberlin.com
Fred Cummings Jr.	Highway	sopt	fcummings@townofberlin.com



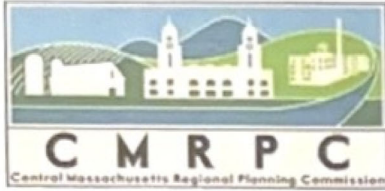
**Berlin Hazard Mitigation Plan Update Local**  
**Planning Team Meeting #3**

**Date/Time:** October 9, 2024, 1:00pm

**Location:** Berlin Town Administrator / Select Board Office, 23 Linden Street, Berlin, MA

**AGENDA**

- I. Introductions**
- II. Natural Hazards and Critical Infrastructure Meeting Recap**
- III. Community Lifelines**
- IV. Reference Documents**
- V. Community Survey Planning**
  - a. Review Example
  - b. Discuss Format/Timeline
- VI. National Flood Insurance Program (NFIP)**
  - a. Review/Discuss
- VII. Existing Protection Measures Review**
  - a. Review/Update the Existing Protection Measures Matrix
- VIII. Next Meeting**
  - a. Date/Location
  - b. What to prepare



Meeting Name:  
Berlin Hazard Mitigation Plan  
Meeting #3

Community: Berlin

Location: Berlin Town Administrator /  
Select Board Office, 23 Linden Street  
Berlin, MA

Date: October 9th, 2024

Meeting Time: 1:00 PM

Participant Name	Organization	Title	E-mail
Fred Cummings, Jr.	Highway	Superintendent	fcummings@townofberlin.com
ERIC SCHARTNER	POLICE DEPT.	CHIEF OF POLICE	ESCHARTNER.PD@TOWNOFBERLIN.COM
Abigail Vianna	Public Safety	Admin Assist.	avanna.ds@townofberlin.com
Kristen Rubin	Admin	TOWN Admin	townadmin@townofberlin.com
Michael McQuillen	Fire (EMT)	Chief of Dept	firechief@townofberlin.com
Will Talbot	CMRPC	Asst. Planner	wtalbot@cmrpc.org
Sarah Plutnicki	CMRPC	Associate Planner	splutnicki@cmrpc.org



**Berlin Hazard Mitigation Plan Update Local  
Planning Team Meeting #4**

**Date/Time:** November 13, 2024, 1:00pm

**Location:** Berlin Town Administrator / Select Board Office, 23 Linden Street, Berlin, MA

**AGENDA**

- I. Introductions**
- II. Critical Infrastructure Info Clarifications**
- III. Q&A Session with Community Lifelines**
- IV. Community Survey Review**
  - a. Brainstorm new mitigation strategies from community survey results
- V. Public Presentation Planning**
  - a. Purpose
  - b. Format
  - c. Date/Time/Location
  - d. Outreach
- VI. Next Meeting**
  - a. Date/Location
  - b. What to prepare

Name	E-Mail	Affiliation
Linda White	white1310@gmail.com	Highland Ridge
Fred Cummings Jr.	fcummings@townofberlin.com	Highway Dept.
Kristen Rubin	<del>krubin</del> townadmin@tbl.com	TA
Richard Hanker	richardhankerp@townofberlin.com	Building Committee
Ray Ferris	Raymond.Ferris@Mass.gov	MEMA
Jan Paulino	Fireprevention@TownofBerlin.com	Fire Dept.
Abigail Vianna	avianna.ds@TownofBerlin.com	Public Safety
ERIC SCHARNER	ESCHARNER.PD@TOWNOFBERLIN.COM	POLICE



**Meeting Name:**  
 Berlin Hazard Mitigation Plan  
 Meeting #4

**Community:** Berlin

**Location:** Berlin Town Administrator /  
 Select Board Office, 23 Linden Street  
 Berlin, MA

**Date:** November 13th, 2024

**Meeting Time:** 1:00 PM

<b>Participant Name</b>	<b>Organization</b>	<b>Title</b>	<b>E-mail</b>
Linda White	Highland Ridge		whitelin310@gmail.com
Fred Cummings Jr.	Highway Dept	Superintendent	fcummings@townofberlin.com
Kristen Rubin	Admin	TA	townadmin@townofberlin.com
Richard Hanks	Inspectional Services	Building Commissioner	buildinginsp@townofberlin.com
Ray Ferrin	MEMA	Local Coordinator	raymond.ferrin@mass.gov
Jon Paulino	Fire Dept.		fireprevention@townofberlin.com
Abigail Vianna	Public Safety	Admin Assist.	avianna.ds@townofberlin.com
Eric Schartner	Police	Chief of Police	eschartner.pd@townofberlin.com
Sarah Plutnicki	CMRPC	Associate Planner	splutnicki@cmrpc.org
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org



**Berlin Hazard Mitigation Plan Update Local  
Planning Team Meeting #5**

**Date/Time:** December 18<sup>th</sup>, 2024, 1:00pm

**Location:** Berlin Town Administrator / Select Board Office, 23 Linden Street, Berlin, MA

**AGENDA**

- I. Introductions**
- II. Meeting #4 Recap**
- III. Community Lifelines**
- IV. Community Survey Review**
  - a. Review survey responses
  - b. Brainstorm new mitigation strategies from community survey results
- V. Discussion of Mitigation Strategies**
  - a. Review of current draft mitigation strategies
  - b. Review of CMRPC example mitigation strategies
  - c. Review of recommendations from the Berlin MVP
  - d. Discussion of vulnerable populations and facilities
  - e. Development of new mitigation strategies
- VI. Public Presentation Planning**
  - a. Purpose
  - b. Format
  - c. Date/Time/Location
  - d. Outreach
- VII. Next Meeting**
  - a. Date/Location
  - b. What to prepare



Meeting Name:  
Berlin Hazard Mitigation Plan  
Meeting #5

Community: Berlin

Location: Berlin Town Administrator /  
Select Board Office, 23 Linden Street  
Berlin, MA

Date: December 18th, 2024

Meeting Time: 1:00 PM

Participant Name	Organization	Title	E-mail
TARU	CMRPC	Principal Planner	taru@cmrpc.org
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org
Michael M'Quillan	Berlin	Fire Chief	fire chief@townofberlin.com
Kristen Rubin	Berlin	JA	<del>townofberlin</del> townadmin@townofberlin.com
Abigail Vianna	Berlin	Admin. Assist.	avianna.ds@townofberlin.com
Ray Ferrin	MCMA	local coordinator	Raymond.Ferrin@MASS.gov
FRED COMMINGS, JR.	BERLIN	HIGHWAY SUPT.	fcummings@townofberlin.com



**Berlin Hazard Mitigation Plan Update Local**  
**Planning Team Meeting #6**

**Date/Time:** January 25, 2025, 4:30pm

**Location:** Berlin Town Administrator / Select Board Office, 23 Linden Street, Berlin, MA

**AGENDA**

- I. Introductions**
- II. Community Lifelines**
  - See a summary at page 2 and a list of contacts at page 3
- III. Meeting #6 Recap**
  - a. A brief overview of findings from the survey (see page 4)
  - b. Discussion of relevant recommendations with the planning board (see page 6) and conservation committee (see page 10)
  - c. Any additional discussion on Draft mitigation strategies (see page 14 )
- IV. Discussion of Mitigation Strategies**
  - a. Review of CMRPC example mitigation strategies (see page 22)
  - b. Review of recommendations from the Berlin MVP (see page 27)
  - c. Discussion of vulnerable populations and facilities (see map and page 32)
  - d. Development of new mitigation strategies
- V. Public Presentation Planning**
  - a. Purpose
  - b. What to prepare
  - c. Format
  - d. Date/Time/Location
  - e. Outreach
- VI. Next Steps**



Meeting Name:  
Berlin Hazard Mitigation Plan  
Meeting #6

Community: Berlin

Location: Berlin Town Administrator /  
Select Board Office, 23 Linden Street  
Berlin, MA

Date: January 15, 2025

Meeting Time: 4.30 PM

Participant Name	Organization	Title	E-mail
TARU	CMRPC	Principal Planner	taru@cmrpc.org
Tom Wheeler	Planning Bd		twheeler@berlin.ma.gov
ERIC SCHARTNER	BERLIN PD	CHIEF OF POLICE	eschartner.pd@townofberlin.com
Carolyn Macdonald	Berlin CC	Chair	conservation@berlin.com
Mattie VandenBoom	Berlin Conservation	Conservation Agent	conservation@townofberlin.com
Kristen Rubin	TA - Berlin		townadmin@townofberlin.com
Anna Via	Public Safety Admin		anna.ds@townofberlin.com
Fred Cummings Jr	Highway Dept.	Superintendent	fcummings@townofberlin.com
Michael McQuillen	Berlin FD	Chief of Department	firechief@townofberlin.com
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org



**Berlin Hazard Mitigation Plan Update Local  
Planning Team Meeting #7**

**Date/Time:** February 4th, 2025, 4pm

**Location:** Zoom – link: <https://us02web.zoom.us/j/89102795771>

**AGENDA**

- I. Introductions**
- II. Meeting #6 Recap**
  - Review of any questions relating to the draft mitigation strategies matrix
- III. Discussion of High Hazard Potential Dams Appendix**
  - Review of High Hazard Potential Dams Requirements from FEMA
  - Review of rough draft Berlin HMP High Hazard Potential Dams Appendix
- IV. Next Steps**
  - Select Board Presentation on draft plan
    - Scheduled for March 10<sup>th</sup>, 2025 at 6:30pm
  - Public and community lifeline comment period
  - 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:**  
**Berlin Hazard Mitigation Plan**  
**Meeting #7**

**Community: Berlin**

**Location: Zoom - link:**

<https://us02web.zoom.us/j/89102795771>

**Date: February 4th, 2025**

**Meeting Time: 4:00 PM**

<b>Participant Name</b>	<b>Organization</b>	<b>Title</b>	<b>E-mail</b>
Taru	CMRPC	Principal Planner	taru@cmrpc.org
Marc Granato	CMRPC	Resiliency Planner	mgranato@cmrpc.org
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org
Eric Schartner	Berlin Police	Police Chief	eschartner.pd@townofberlin.com
Fred Cummings	Berlin Highway	Superintendent	fcummings@townofberlin.com
Kristen Rubin	Berlin Administration	Town Administrator	townadmin@townofberlin.com
Michael McQuillen	Berlin Fire/EMS	Fire Chief	firechief@townofberlin.com
Tim Wheeler	Berlin Planning Board	Member	thwheeler@indianheadfarm.com
Mattie VandenBoom	Berlin Conservation	Conservation Agent	conservation@townofberlin.com
Brian Harrington	Hudson Fire	Deputy Fire Chief	bharrington@townofhudson.org
Kristina Johnson	Hudson Planning & Community Development	Director	kjohnson@townofhudson.org



**Meeting Name:**  
 Berlin Hazard Mitigation Plan  
 Meeting #7

**Community:** Berlin

**Location: Zoom - link:**  
<https://us02web.zoom.us/j/89102795771>

**Date:** February 4th, 2025

**Meeting Time:** 4:00 PM

<b>Participant Name</b>	<b>Organization</b>	<b>Title</b>	<b>E-mail</b>
Jeff Zukowski	MEMA	Hazard Mitigation Planner	jeffrey.zukowski@mass.gov
Shelly O'Toole	MEMA	Hazard Mitigation Supervisor	Michelle.OTOole@mass.gov
Ray Ferrin	MEMA	Local Coordinator	raymond.ferrin@mass.gov
Paula Davison	MA DCR	Regional Engineer	paula.davison@mass.gov
Ngala Shofola	MA DCR	Civil Engineer 2	Ngala.D.Shofola@mass.gov
Matt Brown	OARS	Executive Director	mbrown@oars3rivers.org
Heather Conkerton	OARS	Ecological Restoration Coordinator	hconkerton@oars3rivers.org
Sarah Widing	Interfluve	Senior Water Resources Engineer	swiding@interfluve.com
Joseph Bibbo	MWRA	Program Manager	joseph.bibbo@mwra.com
Matthew Oates	Benderson Development	Engineering Director	MattOates@benderson.com



**Berlin Hazard Mitigation Plan Update Local  
Planning Team Meeting #8**

**Date/Time:** March 4<sup>th</sup>, 2025, 2 pm

**Location:** Microsoft Teams, link

<https://teams.microsoft.com/meet/225033657297?p=6MpnaAJwcvWkbe5IqS>

Meeting ID: 225 033 657 297

Passcode: Z9RA68EV

**AGENDA**

- I. Discussion about the presentation at the March 10<sup>th</sup> Select Board meeting**
  - Discussion of outreach for before the meeting (the flyer for this outreach is attached)
  - Review slideshow and handout
  - Discussion of the logistics for the meeting
- II. Follow-up discussion on the draft report**
  - Discussion of the list of questions CMRPC has prepared (the list is attached to this agenda)
- III. Hazardous Dams Appendix discussion**
- IV. Discussion about logistics for the public and community lifeline comment period and continued editing of the plan**
- V. Next Steps**
  - Select Board Presentation on draft plan
    - Scheduled for March 10<sup>th</sup>, 2025 at 6:30pm
  - Public and community lifeline comment period
  - 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:**  
 Berlin Hazard Mitigation Plan  
 Meeting #8

**Community:** Berlin

**Date:** March 5th, 2025

**Location:** Microsoft Teams - link:  
[https://teams.microsoft.com/meet/225033657297?  
 p=6MpnaAJwcwWkbe5IqS](https://teams.microsoft.com/meet/225033657297?p=6MpnaAJwcwWkbe5IqS)

**Meeting Time:** 2:00 PM

Participant Name	Organization	Title	E-mail
Taru	CMRPC	Principal Planner	taru@cmrpc.org
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org
Kristen Rubin	Berlin Administration	Town Administrator	townadmin@townofberlin.com
Michael McQuillen	Berlin Fire/EMS	Fire Chief	firechief@townofberlin.com



**Berlin Hazard Mitigation Plan Update Local  
Planning Team Meeting #9**

**Date/Time:** March 26<sup>th</sup>, 2025, 11 am

**Location:** Microsoft Teams, link:

[https://teams.microsoft.com/l/meetup-join/19%3ameeting\\_OGZiZDBhOWltMzkwYi00MmY2LTk0MzYtNzg2Y2FkOWUwMmM3%40thread.v2/0?context=%7b%22id%22%3a%22db4c1181-1b49-4f2a-9443-a68c564de0e4%22%2c%22oid%22%3a%22941d5253-7750-4e94-9a0d-79af96b35870%22%7d](https://teams.microsoft.com/l/meetup-join/19%3ameeting_OGZiZDBhOWltMzkwYi00MmY2LTk0MzYtNzg2Y2FkOWUwMmM3%40thread.v2/0?context=%7b%22id%22%3a%22db4c1181-1b49-4f2a-9443-a68c564de0e4%22%2c%22oid%22%3a%22941d5253-7750-4e94-9a0d-79af96b35870%22%7d)

Meeting ID: 267 877 460 672

Passcode: 22Qn7zi3

**AGENDA**

- I. Discussion regarding culverts in town**
- II. Follow-up discussion on the draft report and Select Board presentation**
  - Discussion of the list of questions CMRPC has prepared
- III. Discussion about logistics for the two-week public and community lifeline comment period and continued editing of the plan**
- IV. Hazardous Dams Appendix discussion**
- V. Next Steps**
  - Two-week public and community lifeline comment period
  - 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:**  
**Berlin Hazard Mitigation Plan**  
**Meeting #9**

**Community: Berlin**

**Date: March 26th, 2025**

**Location: Microsoft Teams - link:**

[https://teams.microsoft.com/l/meetup-join/19%3ameeting\\_OGZiZDBhOWitMzkwYi00MmY2LTk0MzYtNzg2Y2FkOWUwMmM3%40thread.v2/0?context=%7b%22Tid%22%3a%22db4c1181-1b49-4f2a-9443-a68c564de0e4%22%2c%22Oid%22%3a%22941d5253-7750-4e94-9a0d-79af96b35870%22%7d](https://teams.microsoft.com/l/meetup-join/19%3ameeting_OGZiZDBhOWitMzkwYi00MmY2LTk0MzYtNzg2Y2FkOWUwMmM3%40thread.v2/0?context=%7b%22Tid%22%3a%22db4c1181-1b49-4f2a-9443-a68c564de0e4%22%2c%22Oid%22%3a%22941d5253-7750-4e94-9a0d-79af96b35870%22%7d)

**Meeting Time: 11:00 AM**

<b>Participant Name</b>	<b>Organization</b>	<b>Title</b>	<b>E-mail</b>
Taru	CMRPC	Principal Planner	taru@cmrpc.org
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org
Zack Blais	CMRPC	Principal Planner	zblais@cmrpc.org
Kristen Rubin	Berlin Administration	Town Administrator	townadmin@townofberlin.com
Michael McQuillen	Berlin Fire/EMS	Fire Chief	firechief@townofberlin.com



**Berlin Hazard Mitigation Plan Update Local  
Planning Team Meeting #10**

**Date/Time:** April 24<sup>th</sup>, 2025, 2pm

**Location:** Microsoft Teams, link: [https://teams.microsoft.com/l/meetup-join/19%3ameeting\\_YjkxNGEwMmEtZDlmMS00NjY3LThiMWQtZWwYzc3YmJhYzJl%40thread.v2/0?context=%7b%22Tid%22%3a%22db4c1181-1b49-4f2a-9443-a68c564de0e4%22%2c%22Oid%22%3a%2282308d5f-1eb8-4ed8-8bfe-66ef961f3260%22%7d](https://teams.microsoft.com/l/meetup-join/19%3ameeting_YjkxNGEwMmEtZDlmMS00NjY3LThiMWQtZWwYzc3YmJhYzJl%40thread.v2/0?context=%7b%22Tid%22%3a%22db4c1181-1b49-4f2a-9443-a68c564de0e4%22%2c%22Oid%22%3a%2282308d5f-1eb8-4ed8-8bfe-66ef961f3260%22%7d)

Meeting ID: 222 161 415 060 1

Passcode: Bc394S35

**AGENDA**

- I. Discussion of final edits to the draft plan narrative to be made before the start of the two-week public and community lifeline comment period**
  - Updated list of mitigation strategies in the draft plan
  - Who is the National Flood Insurance Program coordinator in town?
  - Is the Town eligible for the Volunteer Fire Capacity Program?
- II. Discussion of final edits to the High Hazard Potential Dams Appendix to be made before the start of the comment period**
  - Assessment of the risk of and potential impact of dam failure hazards in town
  - Additional funding sources
- III. Discussion about logistics for the comment period**
  - Contact information for Meadow Brook Village
  - Post on the town website
  - Outreach materials
- IV. Next Steps**
  - Two-week public and community lifeline comment period
    - Revisions to the plan to reflect any comments received are made as are needed
  - 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:**  
**Berlin Hazard Mitigation Plan**  
**Meeting #10**

**Community: Berlin**

**Date: April 24th, 2025**

**Location: Microsoft Teams - link:**

[https://teams.microsoft.com/l/meetup-join/19%3ameeting\\_YjkkNGEwMmEtZDlmMS00NjY3LThiMWQtZWwYzc3YmJhYzJl%40thread.v2/0?context=%7b%22Tid%22%3a%22db4c1181-1b49-4f2a-9443-a68c564de0e4%22%2c%22Oid%22%3a%2282308d5f-1eb8-4ed8-8bfe-66ef961f3260%22%7d](https://teams.microsoft.com/l/meetup-join/19%3ameeting_YjkkNGEwMmEtZDlmMS00NjY3LThiMWQtZWwYzc3YmJhYzJl%40thread.v2/0?context=%7b%22Tid%22%3a%22db4c1181-1b49-4f2a-9443-a68c564de0e4%22%2c%22Oid%22%3a%2282308d5f-1eb8-4ed8-8bfe-66ef961f3260%22%7d)

**Meeting Time: 2:00 PM**

Participant Name	Organization	Title	E-mail
Taru	CMRPC	Principal Planner	taru@cmrpc.org
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org
Kristen Rubin	Berlin Administration	Town Administrator	townadmin@townofberlin.com
Michael McQuillen	Berlin Fire/EMS	Fire Chief	firechief@townofberlin.com

**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))*

**Town of Berlin, Natural Hazard Mitigation Plan**  
**Public Presentation: March 10<sup>th</sup>, 2025**

**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 Berlin 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 Berlin’s Select Board adopted the Town’s last natural hazard mitigation plan in April 2018, and this plan expired in April 2023.

**What natural hazards pose the greatest risks to Berlin?**

- Largest risks: winter storms, severe thunderstorms and wind
- Moderate risks: flooding, tornadoes, invasive species, drought
- Lower risks: dam failures, extreme temperatures, hurricanes, wildfires, earthquakes

**Local partners**

Local knowledge is essential to the mitigation planning process. Partners in Berlin to date include:

Chief and Emergency Management Director Michael McQuillen and Lieutenant / Fire Prevention Officer Jon Paulino, Fire Department; Town Administrator Kristen Rubin, Town Administration; Superintendent Fred Cummings, Highway Department; Chief Eric Schartner, Police Department; Administrative Assistant Abigail Vianna, Public Safety Department; Member Tim Wheeler, Planning Board; Conservation Agent Mattie VandenBoom and Chair Carolyn MacDonald, Conservation Commission; Building Commissioner Richard Hanks, Inspectional Services; Town Accountant June Poland; and several local partners outside of the local government.

**Planning timeline**

- Information gathering via mapping, research, and local input      August 2024 - present
- Draft plan development      January - February 2025
  - Public comments/questions are requested within two weeks of the draft plan being posted on the town website following this presentation.
- Public presentation #1      March 2025
- MEMA review      Anticipated Spring 2025
- FEMA approval and local adoption      Anticipated Summer/Fall 2025
- 5-year update      2030

**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
- Participation in the National Flood Insurance Program (NFIP)
- Compliance with the state building code
- Dam monitoring
- Tree trimming program
- Snow removal
- CodeRed hazard warning system / notifications
- Education and outreach
- Plans, regulations, and studies

**Recommended high priority mitigation strategies in the DRAFT plan****A. Structure and Infrastructure Strategies**

- Improve town emergency management personnel's access to the Mount Pisgah Conservation Area, including the middle field, so that they can respond in the instance of an emergency. This could be completed through the construction of new access roads and/or fire trails. Consider seasonal controlled burns at Mt. Pisgah to reduce future wildfire risk.
- Retrofit Municipal facilities to improve/ strengthen resiliency to natural hazards and increase energy efficiency. Add solar panels, EV charging, food pantry, and other equipment for disaster management and resilience.
- Install air filters, cooling/central air conditioning, and/or dehumidification at the emergency shelter locations to ensure the continued viability of shelters.

**B. Preparedness, Coordination, and Response Strategies**

- Re-implement and expand on vegetative debris program and thereby mitigate risk of stormwater flooding, riverine flooding, winter storm damage, etc., such as through the Central Massachusetts Mosquito Control Project
- Coordinate with the state to evaluate and repair dams as identified by the Office of Dam Safety.
- Improve hazard warning system and notifications by fully utilizing social media, town webpages, 911, CodeRed, WEA (Wireless Emergency Alerts), and other communication methods. Maintain internal instant messaging system, allowing for rapid response of emergency personnel.
- Enhance coordination with CSX to reduce the incidence of train derailments on their line in town which are induced by natural hazards.
- Join a Regional Emergency Planning Committee.

**C. Education and Awareness Strategies**

- Conduct public education on drought mitigation, especially as it relates to private wells.
- Effectively communicate bans on outdoor burning to the public.

**D. Local Plan and Regulation Strategies**

- Monitor implementation of the Town's Hazard Mitigation Plan. On an annual basis and/or as hazards occur, review the mitigation strategies in the plan and assess implementation progress by holding a meeting of the Hazard Mitigation Planning Team.
- Continue actively enforcing and complying with the Massachusetts Wetlands Protection Act.
- Seek to implement local wetlands bylaw.
- Implement a Tree and Forest Management Plan at Ball Hill Road and work on expanding the planning and implementation to other forested areas. Hire a forester to develop Forestry

Management Plans across Berlin and assist the efforts to improve forest health and reduce fire loads in the town.

- Complete a town-wide stormwater management and containment plan, as the Town will likely soon be no longer exempt from the MS4 permit. Promote low-impact development / natural mitigation measures, such as rain gardens, in this plan.
- Hire a Town Planner / Shared Town Planner who can work in part on hazard mitigation grants and projects.
- Adopt a stormwater bylaw for the Town and encourage low-impact development measures as part of this bylaw. Draft this new bylaw as part of a forthcoming zoning diagnostic process.

---

The draft plan with the full list of mitigation strategies will be available shortly on Berlin's town website.

Comments and questions should be directed to Will Talbot ([wtalbot@cmrpc.org](mailto: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 2021 Hazard Mitigation grant from the Federal Emergency Management Agency through the Massachusetts Emergency Management Agency*



# TOWN OF BERLIN HAZARD MITIGATION PLAN



Berlin Select Board  
**March 10th, 2025**

Taru, Principal Planner

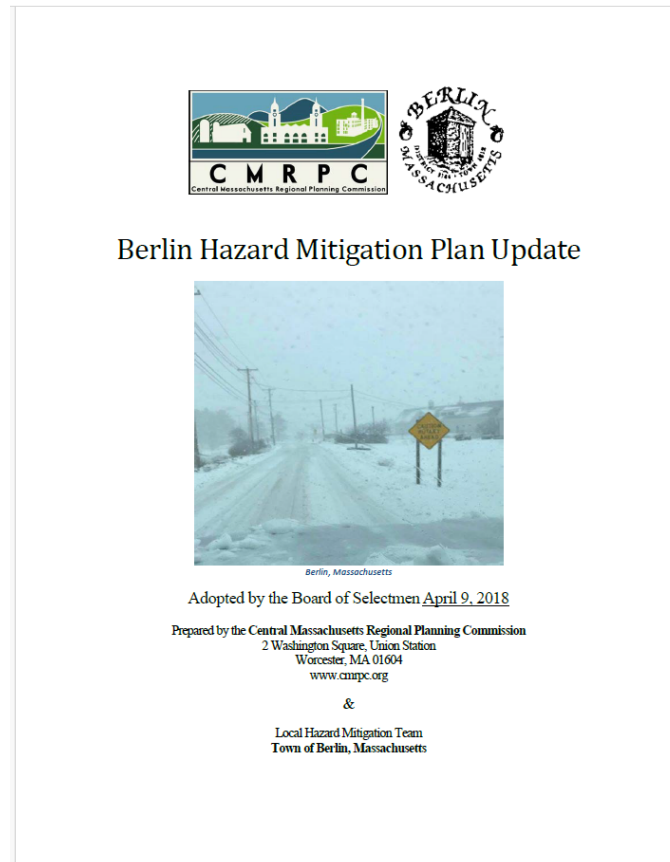
Will Talbot, Assistant Planner

Central Massachusetts Regional Planning Commission



# WHY IS BERLIN 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.
- Berlin's last HMP update was approved in April 2018 and expired in April 2023.



# 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*

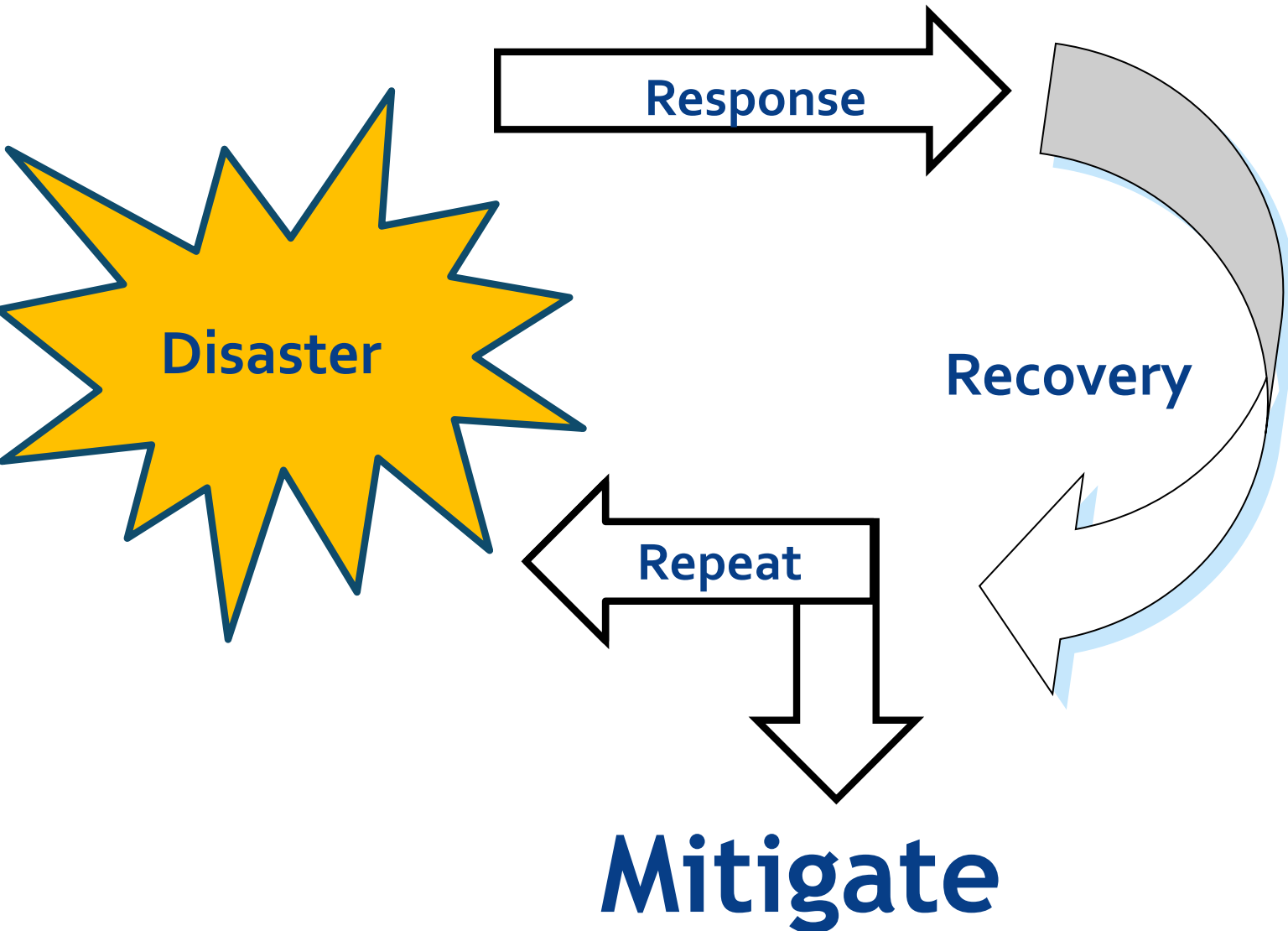
# WHAT IS HAZARD MITIGATION?

- *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 <i>*BCR numbers in this study have been rounded</i>		Beyond Code Requirements	Federally Funded
<b>Overall Hazard Benefit-Cost Ratio</b>		<b>\$4:1</b>	<b>\$6:1</b>
 <b>Riverine Flood</b>		<b>\$5:1</b>	<b>\$7:1</b>
 <b>Hurricane Surge</b>		<b>\$7:1</b>	Too few grants
 <b>Wind</b>		<b>\$5:1</b>	<b>\$5:1</b>
 <b>Earthquake</b>		<b>\$4:1</b>	<b>\$3:1</b>
 <b>Wildland-Urban Interface Fire</b>		<b>\$4:1</b>	<b>\$3:1</b>

# 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

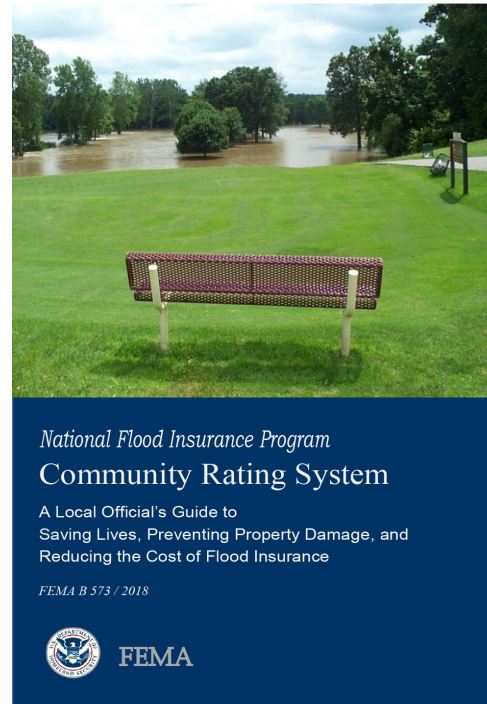
- Prevent floodwaters from reaching properties
- Man-made structures to control water flows
- Culverts, dams, storm drainage facilities, pumping facilities



the  
Lester  
G. Ross  
dam

# PREPAREDNESS AND RESPONSE

- National Flood Insurance Program
- Evacuation Planning
- Community Rating System
- Facilitate and coordinate the administration, enforcement and collaboration



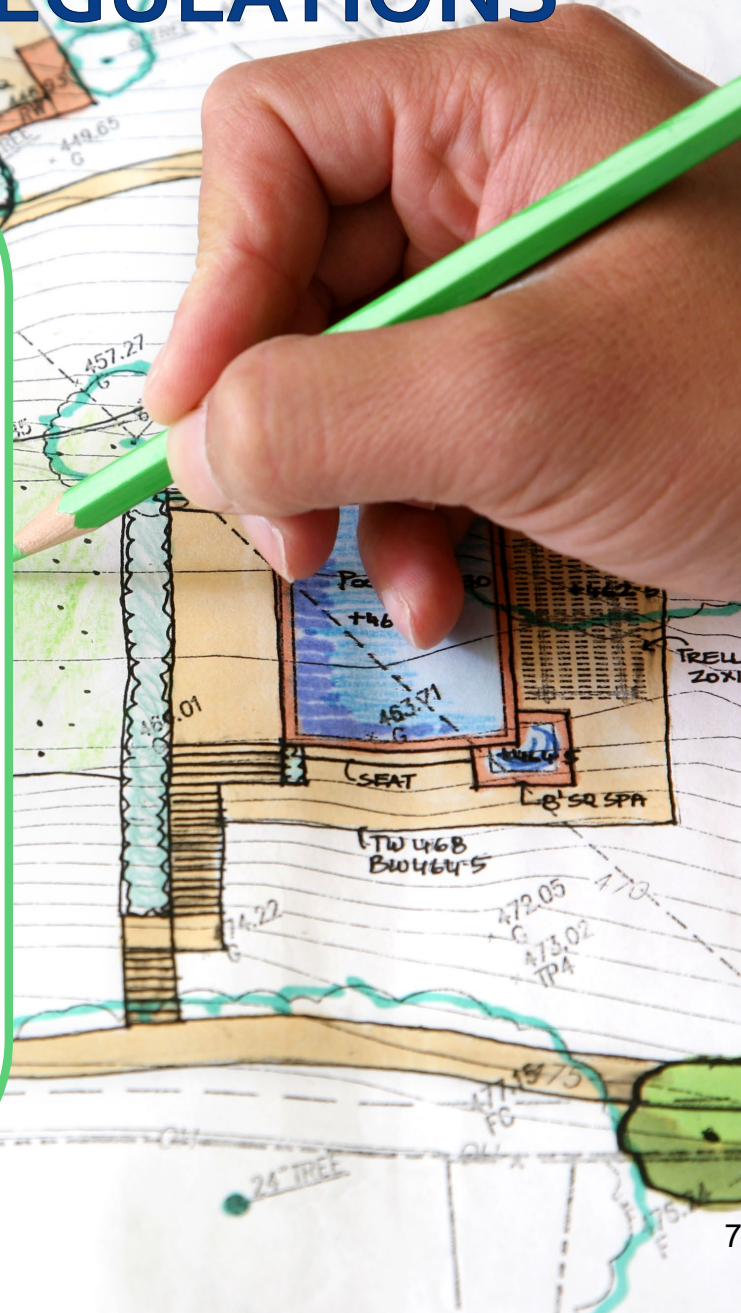
# EDUCATION AND AWARENESS

- 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 Codes
- Master Plans
- MVP Plans



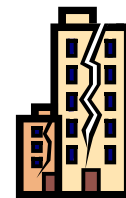
# PLANNING PROCESS

- 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 Berlin 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

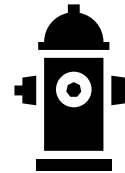
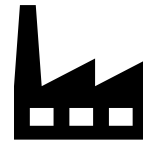


# IDENTIFY CRITICAL FACILITIES

Database & GIS maps of critical facilities, infrastructure

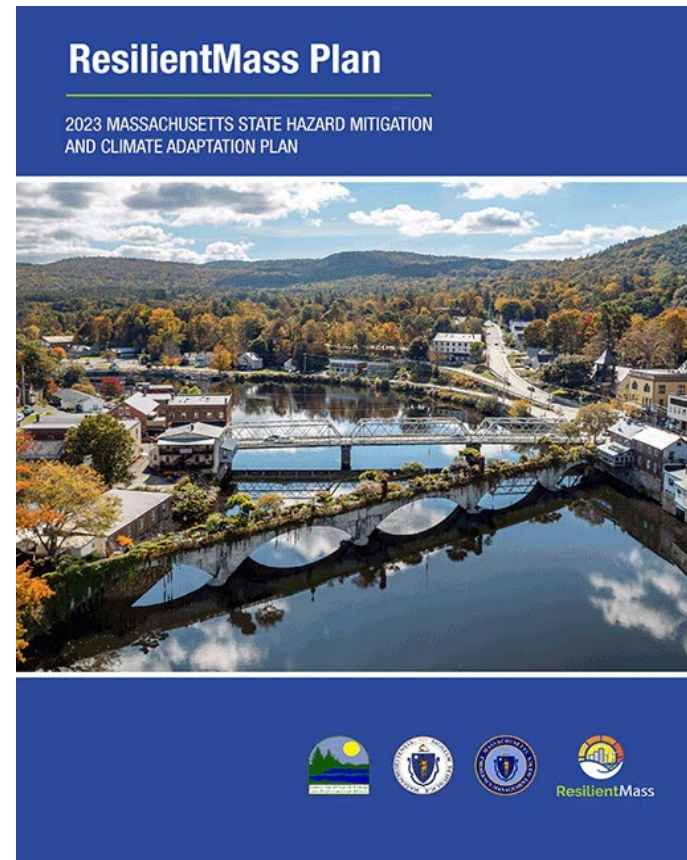
## Sites identified include:

- Emergency Response Facilities
- Water and Sewer Facilities, Town Facilities, Utilities, and Hazardous Waste Sites
- Dams
- Facilities and populations to protect



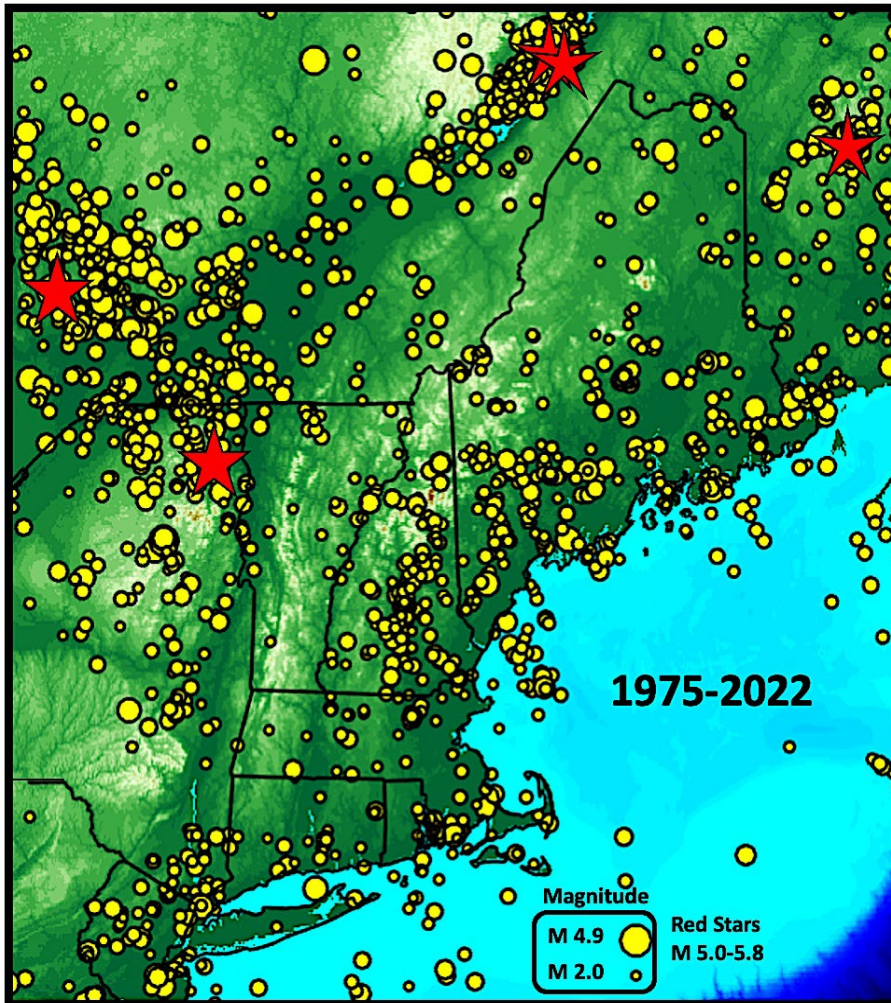
# HAZARD IDENTIFICATION & MAPPING

- 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



# GEOLOGIC, WIND, FLOODING & SNOW HAZARDS

## Earthquakes from 1975 to 2022, 2+ Magnitude



## Recent Declared Hurricanes, Flooding, & Snow Disasters in MA

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 Storms and Flooding	05/15/24	09/11/23 - 09/13/23	DR-4780-MA
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
			75

# SELECT LOCALLY-IDENTIFIED HAZARD AREAS

- Flooding
  - The area around the intersection of River Road West, South Street, and Whitney Road
- Wildfire
  - Mt. Pisgah
  - The area near the Lester G. Ross Dam
  - The Randall Road and River Road West solar farms
- Invasive Species
  - Boylston Road
  - West Street
  - Lyman Road



# PUBLIC SURVEY – Fall 2024

- 59 total responses
- Hazards of greatest concern: winter storms / ice, thunderstorms / microbursts / extreme wind, flooding, and drought
- The survey was promoted through the town website and the town Facebook page.
  - Survey flyers and paper copies were also posted at several high traffic locations in town.



# EXISTING MITIGATION MEASURES

## MULTIHAZARD

- Comprehensive Emergency Management Plan (CEMP)
- Compliance with the state building code
- Education and outreach
- CodeRed hazard warning system / notifications
- Plans, regulations, and studies

## 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

- DCR dam safety regulations
- Dam monitoring

## WIND-RELATED HAZARDS

- Tree trimming program

## WINTER-RELATED HAZARDS

- Salting and sanding of roads and plowing / snow removal

## WILDFIRE / BRUSH FIRE RELATED HAZARDS

- Permits for outdoor burning

# BERLIN MITIGATION STRATEGIES

- Where are the GAPS?
- What actions will further reduce vulnerability?
- Where are the PRIORITIES?



# DRAFT PLAN SELECT HIGH-PRIORITY MITIGATION MEASURES

- Improve town emergency management personnel's access to the Mount Pisgah Conservation Area, including the middle field, so that they can respond in the instance of an emergency.
- Join a Regional Emergency Planning Committee.
- Conduct public education on drought mitigation, especially as it relates to private wells.
- Implement a Tree and Forest Management Plan at Ball Hill Road and work on expanding the planning and implementation to other forested areas.

# 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 Berlin town website.

Please send any comments on or questions about the plan to [wtaibot@cmprc.org](mailto:wtaibot@cmprc.org) within two weeks of the draft plan being posted on the town website.

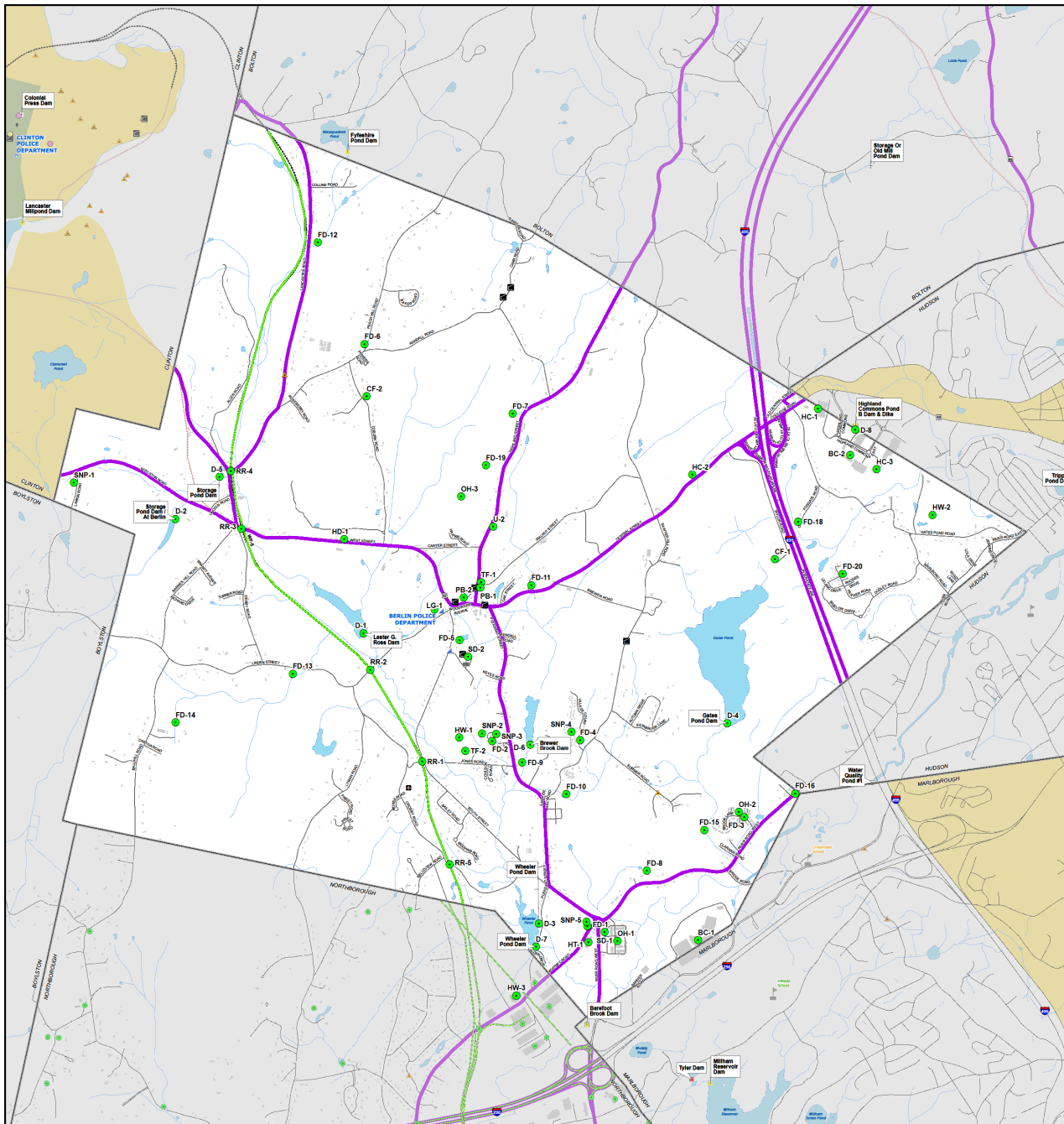
# Hazard Mitigation Plan

## Map 1

### Critical Infrastructure and Facilities

#### Town of Berlin, Massachusetts

March 2025



### Legend

● Assisted Living	● Town Halls	MA Environmental Justice Populations 2020
● Emergency Shelters	● Local Police	Minority
● Nursing/Rest Homes	● Fire Station	
▲ Daycare	▲ Schools (Pre-K through High School)	
● EOC		
■ Airports	● Active Rail Line	● Out of Service/Abandoned Rail Line

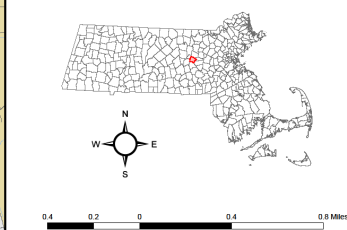
▭ Town Boundaries	▬ Streams	▬ Regionwide Evacuation Routes
▭ Structures	▬ Roads	
▭ Water Bodies		

Dams (2/2012)		
■ High Hazard	■ Significant Hazard	■ Low Hazard
		■ N/A

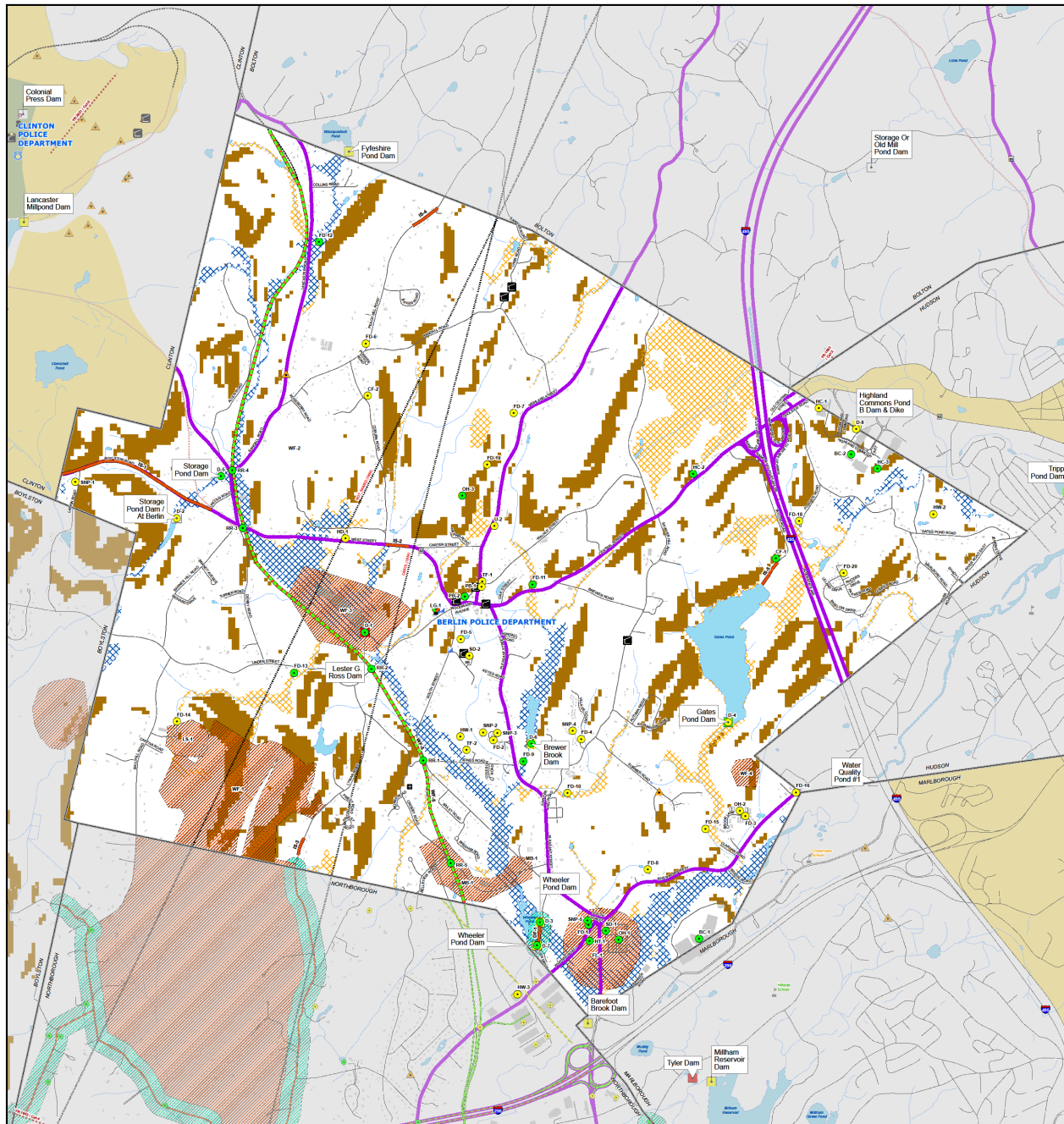
Locally Defined		
● Critical Infrastructure	▬ Critical Infrastructure	▨ Critical Infrastructure



Data provided by participating municipalities, CMRPC, massDOT, MassGIS, FEMA and NOAA.  
 Information displayed on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or professional analysis. Use at your own risk.  
 Prepared by the Central Massachusetts Regional Planning Commission  
 One Merrimack St., Suite 205, Worcester, MA 01099  
 Date: 03/2025 | Document Path: I:\Projects\01\_25\_HazMitigation\Map\_01\_Map\_Crit\_Inf\_03/24/2025



# Hazard Mitigation Plan Map 3 Vulnerable Critical Infrastructure and Facilities Town of Berlin, Massachusetts March 2025



**Legend**

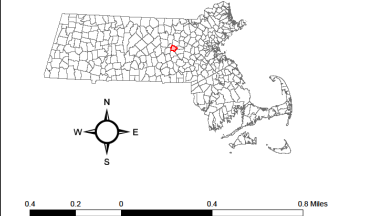
● Assisted Living	■ Town Halls	MA Environmental Justice Populations 2020
■ Emergency Shelters	● Local Police	Minority
● Nursing/Rest Homes	● Fire Station	● Schools (Pre-K through High School)
● Daycare	● EOC	● Active Rail Line
● Airports	● Out of Service/Abandoned Rail Line	● Streams
▭ Town Boundaries	▭ Structures	▭ Roads
▭ Water Bodies	▭ Regionwide Evacuation Routes	

**Hazards**

■ Dams (2/2012)	■ FEMA DFIRM Flood Zones	■ High Slope (15% and above)
■ High Hazard	■ 1% Annual Chance Flood Hazard or Regulatory Floodway	■ Repetitive Loss Property Areas
■ Significant Hazard	■ 0.2% Annual Chance Flood Hazard	■ NOAA Tornado Tracks (as of 9/2021)
■ Low Hazard	■ IBTRACS Historical Hurricane Tracks (1842-2020)	
■ N/A		

**Locally Defined**

● Hazard	▨ Possible Flood Area
● Vulnerable Critical Infrastructure	▨ Hazard
● Vulnerable Critical Infrastructure/Hazard	▨ Vulnerable Critical Infrastructure
● Non-vulnerable Critical Infrastructure	▨ Non-vulnerable Critical Infrastructure
● Non-vulnerable Critical Infrastructure/Hazard	



Data provided by participating municipalities: CMRPC, MassDOT, MassGIS, FEMA and NOAA.  
 Information supplied on this map is for planning purposes only. The information is not intended to be used for engineering, regulatory interpretation, or permit-based analysis. Use caution regarding potential accuracy.  
 Prepared by the Central Massachusetts Regional Planning Commission.  
 Date Issued: 15 March 2025. Worksheet: H411158.  
 3/8/2025 Document Path: I:\Projects\M4ES\_GIS\Map\Map\Map3\_Vul\_Crit\_Infra\_3044.cxd





Meeting Name:  
Berlin Hazard Mitigation Plan Select  
Board Meeting Public Presentation

Community: Berlin

Location: Berlin Municipal Offices  
Room 227, 23 Linden Street, Berlin,  
MA, and via Zoom

Date: March 10th, 2025

Meeting Time: 7:00 PM

Participant Name	Organization	Title	E-mail
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org
Michael McGuire	Berlin Fire	Chief	firechief@townofberlin.com
ERIC J SCHARNER	BERLIN PD	CHIEF	ESCHARNER.PD@TOWNOFBERLIN.COM
Frank Brewer	Berlin Fire	Fire Sighter	frankbrewer@charter.net
Sue Therrien	resident		
Tom Wheeler	Planning Bd.	member	twheeler@indianhead
ROBIN BERRY	ConCom	MEMBER	robinberry822@gmail.com Tamu.com
Carolyn MacDonald	ConCom	Chair	conservation@townofberlin.com
William Brookings	BOH	Agent	nabh@townofbolton.biz
PAUL MUKERK	BOH	CHAIR	PAULMUKERK@GMAIL.COM
Taru	CMRPC	Principal Planner	taru@cmrpc.org



Meeting Name:  
 Berlin Hazard Mitigation Plan Select  
 Board Meeting Public Presentation

Community: Berlin

Location: Berlin Municipal Offices  
 Room 227, 23 Linden Street, Berlin,  
 MA, and via Zoom

Date: March 10th, 2025

Meeting Time: 7:00 PM

Participant Name	Organization	Title	E-mail
Margaret Stone	Berlin Selectboard	Select Board Member	pstone@townofberlin.com
SCOTT HAWKINS	BERLIN Selectboard	"	SHAWKINS@TOWNOFBERLIN.COM
Kristen Rubin	TA Berlin		townadmin@townofberlin.com

**APPENDIX E:  
Public Comment  
Period and  
Community  
Lifeline  
Comment  
Period 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))*

## **Community Lifeline Comments on Draft Berlin Hazard Mitigation Plan**

Sarah Widing, Interfluve

“I can give you a status update on the work related to the Wheeler Pond Dam:

In 2025, the owner of the Wheeler Pond Dam, OARS, and the design consultant began applying for permits to remove the Wheeler Pond Dam. The project proponents will be seeking grant funding in 2025 and 2026 to complete the construction project. Construction is anticipated in late 2026 or 2027, as funding allows.”



Town of Berlin, MA is with Berlin Fire & EMS Department and Berlin Police Department.

20h · 🌐

🔴 Berlin Needs YOUR Input! 🔴

Help shape our town's future by reviewing the Draft Hazard Mitigation Plan 🚒🚒🚒🔥

📅 14 Comments due by May 28, 2025

✉️ Send your feedback to: [wtalbot@cmrpc.org](mailto:wtalbot@cmrpc.org)

📖 Read the plan: <https://www.townofberlin.com/.../berlin-draft-hazard...>

Let's work together to make Berlin safer and more prepared. Your voice matters! 🗣️✅ #BerlinMA #CommunityInput #HazardMitigation #PublicSafety



TOWNOFBERLIN.COM

### Berlin Draft Hazard Mitigation Plan For Public Comment | Berlin MA

Read the Draft HMP here. Please send all comments to Will Talbot at [wtalbot@cmrpc.org](mailto:wtalbot@cmrpc.org) by May 28, 2025.

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Home



# Berlin Draft Hazard Mitigation Plan For Public Comment

POSTED ON: MAY 13, 2025 - 4:19PM

Read the Draft HMP [here](#). Please send all comments to Will Talbot at [wtalbot@cmrpc.org](mailto:wtalbot@cmrpc.org) by May 28, 2025. Your input is important and appreciated.



**APPENDIX F:  
High Hazard  
Potential Dams  
Appendix**

## HIGH HAZARD POTENTIAL DAMS APPENDIX

This appendix to the Berlin Hazard Mitigation Plan specifically looks at the risks posed by hazardous dams in town and expands upon section 4.9 of the plan on dam failure hazards.

### SECTION 1: DEFINITIONS, CLASSIFICATIONS, AND REGULATIONS

High Hazard Potential Dams (HHPDs) are dams that, if they were to fail, would likely cause loss of life and serious damage to homes, industries, commercial facilities, public utilities, main highways, or railroad infrastructure. Hazard potential dams are classified by the Massachusetts Office of Dam Safety (ODS), the chief regulatory body for dams in Massachusetts. The ODS classifies the hazard potential of dams under three categories: high hazard, significant hazard, and low hazard.

**Table 1: Dam Hazard Potential Classification Table from Office of Dam Safety (302 CMR 10.06(3))<sup>1</sup>**

Hazard Potential	Description
High Hazard Potential (Class I)	Dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s), or railroad(s)
Significant Hazard Potential (Class II)	Dams located where failure may cause loss of life and damage to home(s), industrial or commercial facilities, secondary highway(s), or railroad(s), or cause interruption of use or service of relatively important facilities
Low Hazard Potential (Class III)	Dams located where failure may cause minimal property damage; Loss of life is not expected

The ODS takes into account the size of each dam, the number of dams upstream and/or downstream from each dam, and the potential for damage caused by dam failure in each dam's classification. For the purposes of this appendix, we will be focusing primarily on high hazard and significant hazard potential dams.

In addition to hazard potential classification, dams are also rated by condition. A dam's condition rating is a qualitative assessment that is based on the overall condition of the dam structure or structures as well as the overall condition of the areas immediately surrounding the dam structure or structures that could affect the dam's ability to function.

<sup>1</sup> 302 CMR 10.00: DAM SAFETY (2017).

**Table 2: Dam Condition Assessment Table Based on the National Inventory of Dams' Data Dictionary<sup>2</sup>**

Dam Condition	Definition	Typical Circumstances
Satisfactory	<p>No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (including static, hydrologic, and seismic) in accordance with the minimum applicable state or federal regulatory criteria or tolerable risk guidelines.</p>	<p>No existing deficiencies or potentially unsafe conditions are recognized, with the exception of minor operational and maintenance items that require attention.</p> <p>Safe performance is expected under all loading conditions including the design earthquake and design flood.</p> <p>Permanent risk reduction measures (reservoir restrictions, spillway modifications, operating procedures, etc.) have been implemented to eliminate identified deficiencies.</p>
Fair	<p>No existing dam safety deficiencies during normal operating conditions are recognized. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range under which further action needs to be taken.</p> <p>Note: Rare or extreme events are defined by dam regulatory agencies based on their minimum applicable state or federal criteria.</p>	<p>Lack of maintenance requires attention to prevent safety concerns from developing.</p> <p>Conditions may exist that require remedial action greater than routine maintenance work and/or secondary studies or investigations.</p> <p>Interim or permanent risk reduction measures may be under consideration.</p>

<sup>2</sup> USACE. (n.d.). Condition Assessment. *National Inventory of Dams Data Dictionary August 2024* (pp. 11–12). Retrieved October 10, 2024, from [https://usace-cwbi-prod-il2-nld2-docs.s3.us-gov-west-1.amazonaws.com/46b33023-6872-4096-bd4c-f1651fa91c45/NID%20Data%20Dictionary%20August%202024.pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIALJKNXPVPLAZKRFNA%2F20241010%2Fus-gov-west-1%2Fs3%2Faws4\\_request&X-Amz-Date=20241010T231203Z&X-Amz-Expires=60&X-Amz-Signature=be422d22d9e94dcc612d796b67a4f4782dc8aced5fc1c70ec66ca0b6d9582fa2&X-Amz-SignedHeaders=host](https://usace-cwbi-prod-il2-nld2-docs.s3.us-gov-west-1.amazonaws.com/46b33023-6872-4096-bd4c-f1651fa91c45/NID%20Data%20Dictionary%20August%202024.pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIALJKNXPVPLAZKRFNA%2F20241010%2Fus-gov-west-1%2Fs3%2Faws4_request&X-Amz-Date=20241010T231203Z&X-Amz-Expires=60&X-Amz-Signature=be422d22d9e94dcc612d796b67a4f4782dc8aced5fc1c70ec66ca0b6d9582fa2&X-Amz-SignedHeaders=host).

Dam Condition	Definition	Typical Circumstances
Poor	<p>A dam safety deficiency is recognized to exist during normal operating conditions and may realistically occur. Remedial action is necessary.</p> <p>A dam's condition may also be rated as poor when uncertainties exist in relation to critical analysis parameters which are used to identify potential dam safety deficiencies; in this case, investigations and studies are necessary.</p>	<p>The dam has multiple deficiencies or a significant deficiency that requires remedial work.</p> <p>Lack of maintenance (erosion, sinkholes, settlement, cracking, unwanted vegetation, animal burrows, and/or inoperable outlet gates) has affected the integrity or the operation of the dam under normal operational conditions and requires remedial action to resolve.</p> <p>Critical design information for and an evaluation of the potential performance of the dam is needed. For example, a field observation or a review of the dam's performance history has identified a question that can only be answered by a review of the design and construction history for the dam. Uncertainty has arisen because there is no design and/or construction documentation available for review, and additional analysis is needed to better understand the risk associated with the dam's operation under normal conditions. Interim or permanent risk reduction measures may be under consideration.</p>

Dam Condition	Definition	Typical Circumstances
Unsatisfactory	A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.	<p>A critical component of the dam has deteriorated to an unacceptable condition or has failed.</p> <p>A safety inspection indicates major structural distress (excessive uncontrolled seepage, cracks, slides, sinkholes, severe deterioration, etc.), advanced deterioration, or operational deficiencies which could lead to failure of the dam or its appurtenant structures under normal operating conditions.</p> <p>Reservoir restrictions or other interim risk reduction measures are required.</p> <p>A partial or complete reservoir drawdown may be mandated by the dam's state or federal regulatory agency.</p>
Not Rated	The dam has not been inspected, is not under state or federal jurisdiction, or has been inspected but has not been rated.	
Not Available	Dams for which the condition assessment is not provided.	

When evaluating the risk posed by hazardous dams, it is important to know both the hazard classification and the condition of the dam.

#### REGULATORY REQUIREMENTS IN MASSACHUSETTS

The Massachusetts Office of Dam Safety requires the following from the owners of hazardous dams:

- Condition reporting:
  - Owners of dams are required to hire a qualified engineer to inspect the dams and report on the results of these inspections every two years for high hazard potential dams, every five years for significant hazard potential dams, and every ten years for low hazard potential dams.
  - High and significant hazard potential dams whose condition have been determined to be poor or unsafe by inspection must be inspected and reported at least every three months by a registered professional engineer employed by the owner until the needed dam safety repairs are completed and the dam is found to be in

satisfactory condition, unless otherwise ordered by the Commissioner of the ODS. Such inspections shall be termed follow-up inspections and shall be submitted to the Office of Dam Safety.

- Emergency Action Planning:
  - All dams classified as high hazard potential and significant hazard potential are required to have Emergency Action Plans (EAPs) submitted to the Commissioner of the ODS and the Massachusetts Emergency Management Agency. All EAPs are required to be updated annually, and their format should adhere to guidelines established by the Office of Dam Safety which are posted and updated on the ODS website.

The requirements included here are not comprehensive and only serve to provide context to the regulations surrounding hazardous dams in Massachusetts and how they pertain to the hazardous dams in Berlin.

## SECTION 2: PLANNING PROCESS

Section 2 helps meet the following FEMA local mitigation plan requirements:

- *HHPD1 -a: How the local government coordinated with local dam owners and/or the state dam safety agency, and;*
- *HHPD1 -b: Information shared by the state and/or local dam owners.*

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### HAZARDOUS DAMS THAT AFFECT BERLIN

According to the Massachusetts Office of Dam Safety, there are nine dams in Berlin, of which one is a high hazard potential dam, four are significant hazard potential dams, and one is a low hazard potential dam. The remaining three dams are rated Not Applicable (N/A). One of these three dams, the Fahey Dam, was noted by the HMP team in town and the Office of Dam Safety to no longer exist. Massachusetts Department of Conservation and Recreation engineers could not find this dam when they looked for it in the past decade; it was likely removed in the early 1900's. Further information on these dams can be found in the dam failure section of this plan (section 4.9). Dams in and/or of concern regarding Berlin exist under a variety of ownership structures ranging from private to public and in a variety of conditions from poor to good. A complete listing of the hazardous dams in Berlin is included below in table 3. This list also includes the high hazard potential Wachusett Reservoir South Dike, which is located in the neighboring towns of Clinton and Boylston but would impact Berlin if it were to fail.

**Table 3: High, Significant, and Low Hazard Class Dams in and/or of Concern Regarding Berlin**

ID	Dam Name	Dam Type	Owner	Regulatory Authority	Hazard Code	EAP Date	Inspected Condition
MA00458 and MA00459	Wheeler Pond Dam	Earth and Masonry; Size: Intermediate	Private – Robin Bonazzoli, Trustee of the Bonazzoli Family Estate	Office of Dam Safety	Significant Hazard	EAP: March 1 <sup>st</sup> , 2023	<p>This dam was rated as poor in the 2009 inspection / evaluation report for it. In 2023, this dam continued to show signs of failure. The Dam’s owner partnered with OARS (the Organization for the Assabet, Sudbury, and Concord Rivers) and Interfluve to develop grants to support the design and permitting of the Dam’s removal. In February 2025, the Town, OARS, and Interfluve reported that they have received funds through a MA EEA Dam and Seawall Repair or Removal Grant for currently underway permitting for the Dam’s removal. The project proponents will be seeking grant funding in 2025 and 2026 to complete the dam removal project. The Dam’s removal is anticipated in late 2026 or 2027, as funding allows.</p>
MA00958	Gates Pond Dam	Unknown	Public – Town of Hudson	Office of Dam Safety	Low Hazard	Unknown	Unknown

ID	Dam Name	Dam Type	Owner	Regulatory Authority	Hazard Code	EAP Date	Inspected Condition
MA01229	Lester G. Ross Dam	Earthen embankment; Size: Large	Public – MA Department of Conservation and Recreation	Office of Dam Safety	High Hazard	EAP: June 2022	Satisfactory Condition – Inspection / Evaluation Report: June 19 <sup>th</sup> , 2024
MA01230	Brewer Brook Dam	Earthen embankment; Size: Intermediate	Public – MA Department of Conservation and Recreation	Office of Dam Safety	Significant Hazard	EAP: June 2018	Satisfactory Condition – Inspection / Evaluation Report: July 2023
MA03377	Highland Commons Pond B Dam and Dike	Earth; Size: Intermediate (Dam), Small (Dike)	Private – Benderson Development	Office of Dam Safety	Significant Hazard	EAP: November 2024	Satisfactory Condition – Inspection / Evaluation Report: December 23 <sup>rd</sup> , 2021- in February 2025, a representative from Benderson Development stated that this dam will be inspected within the year.
MA03263	Wachusett Reservoir South Dike	Stone Masonry; Size: Large	Public – MA Water Resources Authority and MA Department of Conservation and Recreation	Office of Dam Safety	High Hazard	EAP: February 2018; updated May 2023	Good Condition – Inspection / Evaluation Report: October 11 <sup>th</sup> , 2024

These dams are listed in section 4.9 of this plan and were identified during local hazard mitigation team meetings for additional analysis in this appendix based on the risk they pose.

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## PLANNING PROCESS

The Town of Berlin sought feedback from the owners of dams in town as part of the hazard mitigation planning process, and this was met with success. The owners of publicly and privately owned dams in town or their representatives, namely the Town of Hudson, the Massachusetts Department of Conservation and Recreation, Benderson Development, OARS, and Interfluve, responded to requests for information and sent representatives to attend the High Hazard Potential Dams Appendix Meeting for this HMP plan update. Also, during the public comment period for this plan, the Office of Dam Safety and dam owners in town were sent a draft of the plan.

## SECTION 3: RISK ASSESSMENT

Section 3 helps meet the following FEMA local mitigation plan requirements:

- *HHPD2-a: Describe the risks and vulnerabilities to and from HHPDs, and;*
- *HHPD2-b: Document the limitations and describe the approach for addressing deficiencies.*

This risk assessment section reviews the risks and vulnerabilities Berlin faces relating to high hazard potential and significant hazard potential dams. It also reviews emergency management in Berlin' current approach to addressing deficiencies in preparedness and mitigation as it relates to high hazard potential dams as well as the limitations of this approach.

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EXPOSURE

Below is a table of exposures for each high hazard potential and significant hazard potential dam in Berlin as well as the high hazard potential Wachusett Reservoir South Dike in Clinton; this table draws information from the existing emergency action plans for these dams:

**Table 4: High Hazard Potential Dam Impacts and Exposures in Berlin<sup>3</sup>**

ID	Dam Name	Hazard Code	EAP Date	Inspected Condition	Dam Specs (Size, Normal Storage in Acre-Feet)	Modeling Scenario(s) for Inundation Zones in EAPs	Estimated Size of Population at Risk in Berlin <sup>4 5</sup>	Summary of Impacts <sup>6</sup>
MA00458 and MA00459	Wheeler Pond Dam	Significant Hazard	EAP: March 2023	Poor	Size: Intermediate; Normal Storage: 1.1 acre feet	1-year event / sunny day failure flooding event and 100-year event / Spillway Design Flood event	5 in Berlin	Immediate closure of three roadways, shallow flooding at two residences, and stormwater system surcharge and flow into the parking lots at four commercial and/or residential sites would occur in the event of a breach of this dam.

<sup>3</sup> Data was gathered from previous engineering inspections located in the dam EAPs

<sup>4</sup> The estimated numbers of people at risk from dam failure for all dams other than Lester G. Ross Dam and the Wachusett Reservoir South Dike were calculated by multiplying the number of residential units in dam inundation zones in Berlin by 2.28, the average Berlin household size according to the 2023 American Community Survey 5-year estimates and then rounding to the nearest whole number. After review of aerial imagery of these dams' inundation zones, it was determined that residences in these zones are predominantly single-family homes or are residences for which estimated populations were already calculated for in the analysis discussed in footnote 5; "S1101: Households and Families," Data.Census.gov, United States Census Bureau, accessed December 30, 2025, <https://data.census.gov/table/ACSST5Y2023.S1101?q=household+size&g=060XX00US2502705490>.

<sup>5</sup> The estimated numbers of people at risk from dam failure for Lester G. Ross Dam and the Wachusett Reservoir South Dike were calculated by georeferencing and digitizing dam failure inundation zone maps within Berlin for each dam, conducting a GIS analysis to find the number parcels with at least partially residential properties in each dam inundation zone, estimating the number of residential units for each of these parcels, assuming an average household size per unit of 2.28, the average Berlin household size according to the 2023 American Community Survey 5-year estimates, and rounding estimated population sizes to the nearest whole number. People living in buildings outside of inundation zones in developments partially within inundation zones were included in the population at risk estimates for these dams; "S1101: Households and Families," Data.Census.gov, United States Census Bureau, accessed December 30, 2025, <https://data.census.gov/table/ACSST5Y2023.S1101?q=household+size&g=060XX00US2502705490>.

ID	Dam Name	Hazard Code	EAP Date	Inspected Condition	Dam Specs (Size, Normal Storage in Acre-Feet)	Modeling Scenario(s) for Inundation Zones in EAPs	Estimated Size of Population at Risk in Berlin	Summary of Impacts
MA01229	Lester G. Ross Dam	High Hazard	EAP: June 2022	Satisfactory	Size: Large; Normal Storage: 28 acre feet	Sunny-day breach and half-PMF breach / inflow design flood (IDF) condition	547 in Berlin <sup>7</sup>	<p>A breach of this dam will inundate 112 occupied properties and 11 streets in the Town of Berlin.</p> <p>In Hudson, a breach will inundate 186 properties and affect a business in town. A breach will also inundate 14 roads in Hudson.</p> <p>In addition, a breach will inundate one property and one roadway in Marlborough.</p>

<sup>7</sup> Additional people are at risk in Hudson and Marlborough.

ID	Dam Name	Hazard Code	EAP Date	Inspected Condition	Dam Specs (Size, Normal Storage in Acre-Feet)	Modeling Scenario(s) for Inundation Zones in EAPs	Estimated Size of Population at Risk in Berlin	Summary of Impacts
MA01230	Brewer Brook Dam	Significant Hazard	EAP: June 2018	Satisfactory	Size: Intermediate; Normal Storage: 10 acre feet	Partial dam breach	467 in Berlin <sup>8 9</sup>	<p>Six roadways in Berlin as well as buildings along several of them, one roadway in Marlborough, and two roadways in Hudson are in the inundation zone of this dam.</p> <p>Two interstate highways are also located in the inundation zone of this dam; based on their roadway elevations, they are not likely to be overtopped in the event of a breach. However, the dam breach flood wave may still adversely affect these roadways (e.g., by scour / erosion) and travel along roadways above the flood wave is not recommended and should be closely monitored.</p>

<sup>8</sup> Additional people are at risk in Hudson.

<sup>9</sup> A group of residences in Berlin with an estimated population of 465 is on the edge of the inundation zone for this dam; this estimated population of 465 is included in the population total of 467 listed above.

ID	Dam Name	Hazard Code	EAP Date	Inspected Condition	Dam Specs (Size, Normal Storage in Acre-Feet)	Modeling Scenario(s) for Inundation Zones in EAPs	Estimated Size of Population at Risk in Berlin	Summary of Impacts
MA03377	Highland Commons Pond B Dam and Dike	Significant Hazard	EAP: November 2024	Satisfactory	Size: Intermediate (Dam), Small (Dike); Normal Storage: 6.7 acre-feet	Summertime flow condition inundation	0 in Berlin <sup>10</sup>	12 downstream properties would be impacted by a breach of this dam. Inundation would also occur at one roadway and one private driveway in the event of a breach.
MA03263	Wachusett Reservoir South Dike	High Hazard	EAP: May 2023	Good	Size: Large	Wet weather event and sunny day failure	625 in Berlin <sup>11</sup>	In Berlin, the failure of the South Dike would result in the inundation of many residences and 15 roadways as well as bridges along many of them.
							Total	Roadways, a driveway, and residential and commercial properties in Berlin, Hudson, and/or Marlborough are at risk of being affected by the failure of high and/or significant hazard dams in and/or of concern in relation to Berlin.

<sup>10</sup> Homes with an estimated population of 27 at impacted properties are above the flood elevation or are otherwise not anticipated to be themselves impacted by a dam breach.

<sup>11</sup> Additional people are at risk in Berlin, Northborough, Hudson, Marlborough, and other communities in Middlesex and Essex counties, Massachusetts.

Berlin is exposed to catastrophic risk in the event of the failure of high hazard potential dams. However, dam failure events are unlikely in town because the dams that may affect the town are in satisfactory or good condition or are in the process of being removed. Several of Berlin's critical infrastructure sites lie within the inundation zones of high and significant hazard potential dams; there are no institutions or facilities outside of the areas listed under the summary of impacts column in the table above which are in the inundation zones of the dams which may impact the Town if they were to fail.

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## PROBABILITY OF FUTURE EVENTS

The probability of future dam failure events in Berlin is difficult to quantify, as dam failures are rare occurrences. According to the 2023 ResilientMass Plan, the frequency of 1% or 0.25% annual chance river flow events at high or significant hazard potential dams is likely to increase in both the near and mid-term in Worcester County.<sup>12</sup> Presently, it is estimated that the likelihood of a dam failure event in Berlin in the next year is very low.

Additionally, one of the four high and significant hazard potential dams in Berlin, Wheeler Pond Dam, is in poor condition, indicating that there are significant structural, operational and maintenance deficiencies at this dam and that it has a greater likelihood of failure than other dams in town. As was previously described, this dam is planned to be removed.

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## IMPACTS

The Town faces the potential for a “catastrophic impact” from the failure of high hazard potential dams, with multiple deaths and injuries as well as significant property damage being possible in the event of a dam failure. While impacts of potential dam failure events in town vary by dam, broadly speaking a failure event at any one of the high or significant hazard potential dams in town would have serious consequences.

### Economic Impact:

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Residential properties, commercial properties, and road and rail infrastructure are all located within the inundation zones of high and significant hazard potential dams in town. A dam failure event would lead to significant costs for the cleanup and restoration of facilities in town, including the dam which has failed and any other dams affected by the event. A dam failure event in town which causes flooding along roads and railroads will also cause disruptions in commerce and supply chains.

### Environmental Impact:

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Dam failure events can cause significant environmental damage. The sudden release of water can alter landscapes, erode soil, destroy habitats, and lead to the loss of wildlife. Flooding caused by a dam failure event in town could also cause a secondary hazard by potentially contaminating waters.

### Societal Impact:

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Dam failure events can also have significant societal impacts, such as the displacement of people and the disruption of communities, particularly in areas within or near dam inundation zones.

### Cascading Impacts:

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Other natural hazards, such as riverine flooding, severe winter storms, severe thunderstorms, hurricanes, wildfires, landslides, and earthquakes, have the potential to contribute to the occurrence of dam failures. For example, a severe precipitation event upstream of a dam may lead it to overtop and a severe precipitation event downstream of a failing dam may lead to worsened downstream flooding impacts.<sup>13</sup> Flooding, severe winter storms, and severe thunderstorms are among the natural hazards that Berlin has been identified as being most vulnerable to in this plan.

In addition, a failure at one dam, depending on the hydrology downstream and the amount of

<sup>12</sup> 2023 ResilientMass Plan, Appendix 5.8, Pgs 39-40

<sup>13</sup> 2023 ResilientMass Plan, Appendix 5.8, page 54.

water it holds back, may have the potential of causing cascading failures at downstream dams. Dams which potentially could be impacted by failures of dams in and/or which may impact Berlin are listed under the “summary of impacts” column of Table 4 above.

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#### VULNERABILITY

Based on a mostly qualitative assessment, Berlin has a hazard index rating of “4 – low risk” from dam failure as identified in the dam failure section (section 4.9) of this plan as well as this high hazard potential dams appendix. The Wheeler Pond Dam is in disrepair, although it is planned to be removed. In addition, the Brewer Brook Dam lacks the foundational safety of an up-to-date Emergency Action Plan. A catastrophic impact on the Town’s infrastructure and potentially to the region as a whole may occur in the case that any high and/or significant hazard potential dams in Town fail. However, as was previously stated, dam failure events are unlikely in town because the dams that may affect the Town are in satisfactory or good condition or are in the process of being removed.

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#### APPROACHES AND LIMITATIONS

The Town of Berlin is currently in an ad hoc / emerging resilience maturity model as it pertains to high hazard potential dams;<sup>14</sup> The risks that high hazard potential dams pose to the Town are well understood, but the ability of the Town to mitigate these risks is hampered by multiple factors. There are two major limitations to the Town’s current approach to planning related to high and significant hazard potential dams which were identified during this planning process: a lack of coordination with dam owners and stakeholders and a lack of enforcement capability / regulatory authority in relation to dams.

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##### Limitation 1 – Lack of Coordination with Dam Owners and Stakeholders:

The first major limitation of the Town’s current approach to planning related to high and significant hazard potential dams is a lack of coordination between dam owners and local emergency management. Local emergency management does reach out to dam owners and stakeholders on a semi-regular basis to receive updates on emergency action plans, request compliance with codes and statutes, and coordinate dam response activities. However, a reorientation of the resources of local emergency management to focus on other hazards besides dam failure that are seen as more pressing and more able to be addressed has occurred. More must be done to encourage coordination between dam owners and stakeholders and local emergency management, and the Town is seeing limited improvements in this coordination as part of the hazard mitigation plan update process. The Town’s emergency management would like to have a better understanding of the current conditions of the dams in town and would like to learn more about what they can do to help prevent them from failing. Additionally, there is a renewed interest in dam safety in the Central Massachusetts region following the flooding event which occurred in September 2023 and devastated parts of Leominster and surrounding communities.

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##### Limitation 2 – Lack of Regulatory Authority:

The Town’s local efforts to increase compliance with dam-related regulations rely on the willingness of dam owners to comply with the Town’s requests. This approach has many shortcomings; more must be done in town to enforce compliance with dam-related regulations, to ensure that dams are being maintained, and to ensure that dam emergency action plans are in

<sup>14</sup> FEMA National Resilience Guidance (August 2024), page 34.

place and are kept up to date.

Should these limitations be addressed, Berlin would be able to take a more proactive approach to dam safety.

## SECTION 4: MITIGATION STRATEGIES

Section 4 helps meet the following FEMA local mitigation plan requirements:

- *HHPD3-a: Address a reduction in vulnerabilities to and from HHPDs as part of its own goals or with other long-term strategies. The plan does not need to include a goal specific to HHPDs alone,*
- *HHPD3-b: Link proposed actions to reducing long-term vulnerabilities consistent with the goals*
- *HHPD4-a: Describe a range of specific actions, such as:*
  - *Rehabilitating/removing dams.*
  - *Adopting and enforcing land use ordinances in inundation zones.*
  - *Elevating structures in inundation zones.*
  - *Adding flood protection, such as berms, floodwalls or floodproofing, in inundation zones,*
- *HHPD4-b: Describe the criteria used for prioritizing actions related to HHPDs, and;*
- *HHPD4-c: Identify the position, office, department or agency responsible for implementing and administering the action related to mitigating hazards to or from HHPDs.*

This section describes plans for reducing Berlin’s vulnerability to high and significant hazard potential dam failure events. It includes an overall mitigation goal relating to high and significant hazard potential dams, mitigation actions that the Town intends to pursue to reduce its vulnerability to potential failures of these dams, and an overview of how these mitigation actions will be prioritized by the Town.

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### OVERALL GOAL FOR MITIGATING HIGH AND SIGNIFICANT HAZARD POTENTIAL DAM IMPACTS

The overall goal for mitigating high and significant hazard potential dam impacts in Berlin is as follows: The Town of Berlin aims to reduce the potential impacts of high and significant hazard potential dams on the lives, property, and safety of the Town’s residents as well as people living upstream and downstream through planning and infrastructure-related actions.

The strategies that follow are in alignment with this goal and were crafted by Berlin emergency management and the rest of the HMP planning team in town.

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### MITIGATION STRATEGIES

These strategies, which are described in more detail as part of section 7.6 of this plan, specifically aim to mitigate high and significant hazard potential dam impacts in town. See section 7.1 of this plan for more information on the criteria used for prioritizing mitigation strategies in this plan, including actions relating to high hazard potential dams, and see section 7.6 of this plan to review the priority level as well as the responsible entities for implementing the following mitigation strategies:

- Complete work to remove the privately-owned Wheeler Pond Dam; this dam is in failure per the MA Office of Dam Safety. The Town, OARS, and Interfluve have received funds through a MA EEA Dam and Seawall Repair or Removal Grant for currently underway permitting for the Dam’s removal. The project proponents will be seeking grant funding in 2025 and 2026 to complete the dam removal project. The Dam’s removal is anticipated in late 2026 or 2027, as funding allows.— Medium impact, High cost
- Perform an assessment of all dams in Berlin, with special attention to the Lester G. Ross Dam and Gates Pond Dam. Evaluate dams and bridges to help the Town become more

prepared for the expected increases in flooding and heavy rain events – High impact, Moderate cost

- Coordinate with the State to evaluate and repair dams identified by the Office of Dam Safety – High impact, Low cost
- Enhance coordination with the state to confirm that the Lester G. Ross Dam is properly maintained – High impact, Low cost
- Enhance coordination with the Town of Hudson to ensure that the Gates Pond Dam is properly managed – High impact, Low cost

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#### MITIGATION PRIORITIZATION

The Town intends on prioritizing high and significant hazard potential dam mitigation strategies during the course of hazard mitigation plan monitoring and implementation described in sections 8.2 and 8.3 of this plan. During this process, the Town will form a committee for hazard mitigation monitoring and implementation who have similar to if not the same credentials as the local HMP planning team for this plan update. This committee will meet on an annual basis at a minimum and/or as is needed based on the occurrence of natural hazard events. These meetings will address all hazards described in this plan, including high and significant hazard potential dam failures. Specifically, in relation to high and significant hazard potential dams, the committee will establish consensus during their meetings regarding what the highest risks relating to dam failure are in town and will determine what mitigation actions can be taken to address these risks. High and significant hazard potential dam mitigation actions will be tracked and monitored by the committee in a similar way to how other natural hazard mitigation actions in this plan are tracked and monitored.

## SECTION 5: FUNDING OPPORTUNITIES

Town meeting apportionment and other local funding sources could be used to fund high and significant hazard potential dam mitigation actions in Berlin. A list of federal and state funding sources which could be used for these mitigation actions is also included below; the information below is taken from section 8.4 of this plan.

### 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 relating to high and significant hazard potential dams in Massachusetts:

**Table 5: Federal Funding Sources for High and Significant Hazard Potential Dam Mitigation Actions**

<i>Program</i>	<i>Type of Assistance</i>	<i>Availability</i>	<i>Managing Agency</i>	<i>Funding Source</i>
<i>National Dam Safety Program (State Assistance Grant Program) (NDSP)</i>	Funding to improve dam safety & state dam safety programs	Annual	FEMA	FEMA, Bipartisan Infrastructure Law
<i>Rehabilitation of High Hazard Potential Dam Program (State Dam Safety Divisions) (HHPD)</i>	Cost-share funding to plan and rehabilitate high hazard potential dams	Annual	FEMA	65% FEMA / 35% non-federal

The programs listed in the above table are described in more detail below.

#### 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 SAFETY 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](#).

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## STATE FUNDING SOURCES

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

**Table 6: State Funding Sources for High and Significant Hazard Potential Dam Mitigation Actions**

<i>Program</i>	<i>Type of Assistance</i>	<i>Availability</i>	<i>Managing Agency</i>	<i>Funding Source</i>
<b><i>Dam and Seawall Repair or Removal Program</i></b>	Competitive grants for dam and seawall repair and removal, as well as construction loans	Annual	EEA	State funding

The program listed in the above table is described in more detail below.

### 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](#).

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### FUNDING SOURCES FOR DAM PROJECTS AND OTHER PROJECTS

In addition to the grant programs described above which are directly related to dams, the following federal and state funding sources which fund a broader range of project types could also be applied to for funding relating to high and significant hazard potential dams.

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### 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>.

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### MASSACHUSETTS ENVIRONMENTAL TRUST (MET) GRANT

The Massachusetts Environmental Trust (MET/Trust) is a grantmaking organization housed within the Executive Office of Energy and Environmental Affairs (EEA). Through an annual competitive application process, MET awards grants to organizations whose programs support its mission to protect and conserve threatened marine animals and to preserve and restore river and estuarine ecosystems throughout the Commonwealth. For the 2025-2026 annual cycle, MET's soon-to-be-released RFR will invite proposals for projects that encompass Environmental Advocacy and Educational Activities Related to Aquatic Habitat Improvements and Threatened & Endangered Marine Life Protection & Conservation. For more information, please visit: [New Massachusetts](#)

#### NOAA FISHERIES RESTORATION CENTER GRANTS

NOAA's Restoration Center administers the Community-based Restoration Program, which has funding that supports restoration projects that use a habitat-based approach to rebuild productive and sustainable fisheries, contribute to the recovery and conservation of protected resources, promote healthy ecosystems, and yield community and economic benefits. For more information, please visit: [NOAA Fisheries Grants](#).

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#### DEPARTMENT OF ECOLOGICAL RESTORATION (DER) PRIORITY PROJECTS

DER chooses Priority Projects to advance its mission. It has recently funded projects located in Massachusetts that focus on cranberry bog wetland restoration, dam removal and river restoration, coastal wetland restoration projects, or a combination of these topics. For more information, please visit: [DER Priority Project](#).

**APPENDIX G:**  
**Glossary**

## APPENDIX G

### 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 H:**

**Certificate of**

**Adoption**



**Town of Berlin**  
Select Board  
23 Linden Street, Berlin, MA 01503  
978-310-5919  
[sboffice@townofberlin.com](mailto:sboffice@townofberlin.com)

**CERTIFICATE OF ADOPTION SELECT BOARD  
TOWN OF BERLIN, MASSACHUSETTS**

A RESOLUTION ADOPTING THE *BERLIN HAZARD MITIGATION PLAN*

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

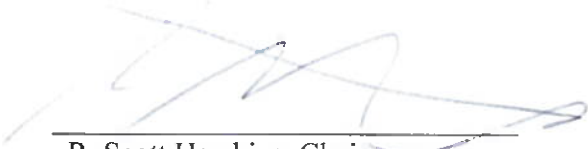
**WHEREAS**, the updated *Berlin Hazard Mitigation Plan* contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Berlin; and

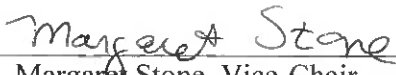
**WHEREAS**, duly noticed public meetings were held by the LOCAL HAZARD MITIGATION PLANNING TEAM on March 10, 2025 and March 16, 2026; and

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

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

**ADOPTED AND SIGNED** this 16th day of March, 2026.

  
\_\_\_\_\_  
R. Scott Hawkins, Chair

  
\_\_\_\_\_  
Margaret Stone, Vice-Chair

  
\_\_\_\_\_  
Lisa J. Wysocki, Clerk

*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)).