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Blackstone Hazard Mitigation Plan

The Town of Blackstone Municipal Complex, a flood control berm, and the Blackstone River (CMRPC photo)

Adopted by the Board of Selectmen DATE

Prepared by the **Central Massachusetts Regional Planning Commission**
One Mercantile Street, Suite 520
Worcester, MA 01608
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&

Local Hazard Mitigation Team
Town of Blackstone, Massachusetts

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This Certificate of Adoption helps meet:

- *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)).*

< INSERT TOWN LETTERHEAD>

CERTIFICATE OF ADOPTION
BOARD OF SELECTMEN
TOWN OF BLACKSTONE, MASSACHUSETTS

A RESOLUTION ADOPTING THE *BLACKSTONE HAZARD MITIGATION PLAN*

WHEREAS, the Town of Blackstone established a Committee to prepare the 2024 update of the *Blackstone Hazard Mitigation Plan*; and

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

WHEREAS, duly-noticed public meetings were held by the LOCAL HAZARD MITIGATION PLANNING TEAM on DATE and DATE; and

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

NOW, THEREFORE BE IT RESOLVED that the Town of Blackstone BOARD OF SELECTMEN adopts the 2024 update of the *Blackstone Hazard Mitigation Plan*, in accordance with M.G.L. 40 or the charter and bylaws of the Town of Blackstone.

ADOPTED AND SIGNED this DATE, 2024.

Name	Brian Scanlan	Daniel Keefe	Mike Sweeney
Title	Chairman	Vice-Chairman	Clerk
Name	Mary Bulso	Tanya Polak	
Title	Member	Member	
Signatures	_____	_____	_____
	_____	_____	

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ACKNOWLEDGEMENTS

This Acknowledgements section helps meet:

- *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 Blackstone by the Central Massachusetts Regional Planning Commission (CMRPC). The Blackstone Board of Selectmen extends its thanks to participants in the Local Hazard Mitigation Team for their time and hard work in participating in this timely project. Core Team members include:

Gregory Gilmore, Police Department, Chief

Jimmy Sullivan, Department of Public Works, Superintendent

Gary Bibbo, Department of Public Works, Assistant

Kevin Roy, Fire Department, Chief

Colleen Strapponi, Health Department, Health Agent

Kevin Ryan, Board of Health, Vice Chairman

Chad Lovett, Town Administrator's Office, Town Administrator

Lauren Taylor, Town Administrator's Office, Town Accountant / Assistant Town Administrator

Karen Testa, Council on Aging, Director (former)

Bill Kessler, Fire Department, Chief (former)

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

Will Talbot, Assistant Resiliency Planner

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Trish Settles, AICP, Deputy Executive Director, Regional Collaboration & Community Planning

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

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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, the bill was signed into law by President Clinton on October 30, 2000, creating Public Law 106-390. The law established a national program for pre- disaster mitigation and streamlined the federal administration of disaster relief. Specific rules on the implementation of DMA 2000 were published in the Federal Register in February 2002 and required that all communities must have a Hazard Mitigation Plan in place in order to qualify for future federal disaster mitigation grants following a Presidential disaster declaration. The Hazard Mitigation Plan emphasizes 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

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

New England weather is renowned for its mercurial and dramatic nature. Late summer hurricanes, major winter blizzards, and summer droughts are all part of the climatic atmosphere in Central Massachusetts. These occur frequently enough to be familiar scenes to residents of Blackstone. The intersection of these natural hazards with the built environment can transition these routine events into classified natural disasters. In addition, as climate change continues to progress, the severity and frequency of hazard risk will increase.

This planning effort has drawn on the knowledge of local municipal officials and residents. The recommendations presented in the following report are intended to be realistic and practical steps for mitigating natural hazards and preparing the community 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.

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1.3 Planning Process

Section 1.3 helps meet:

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

- *A2. "Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process?" (Requirement 44 CFR § 201.6(b)(2)); and*

- A3. "Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval?" (Requirement 44 CFR § 201.6(b)(1))

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

The planning process in Blackstone was composed of two distinct but related phases: 1.) data collection and technical review, and 2.) public input and planning. Identification of natural hazards impacting the Town of Blackstone was accomplished through review of available information from various sources. These 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, homes, businesses, etc.) at the highest risk for being damaged by hazards, particularly flooding. Local knowledge as imparted by Town officials, staff, emergency management volunteers and others was a critical element of this phase.

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

The Hazard Mitigation Planning team contained a group of local staff and volunteers including:

Gregory Gilmore, Police Department, Chief

Jimmy Sullivan, Department of Public Works, Superintendent

Gary Bibbo, Department of Public Works, Assistant

Kevin Roy, Fire Department, Chief

Colleen Strapponi, Health Department, Health Agent

Kevin Ryan, Board of Health, Vice Chairman

Chad Lovett, Town Administrator's Office, Town Administrator

Lauren Taylor, Town Administrator's Office, Town Accountant / Assistant Town Administrator

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Karen Testa, Council on Aging, Director (former)

Bill Kessler, Fire Department, Chief (former)

To discuss hazard areas, critical infrastructure and other assets, and plan priorities and strategies, the Hazard Mitigation Planning team met NUMBER times on October 10th, 2023, December 13th, 2023, February 14th, 2024, March 27th, 2024, April 10th, 2024, June 26th, 2024, ADDITIONAL MEETINGS. Between meetings and during development of the draft and final plans, information and comments were shared among the local team and CMRPC. On December 14th, 2023, the Hazard Mitigation Planning team launched a public survey to gauge resident, worker, visitor, and business owner concerns about and experiences with natural hazards in Town. The survey was distributed on the Town's website and social media pages, and flyers for and paper copies of the survey were distributed around Town. A total of 33 responses were collected. Survey responses were discussed by the local planning team at its March 2024 meeting and helped inform the development and prioritization of mitigation strategies. The local planning team and CMRPC tabled at public events on December 16th, 2023 and on April 18th, 2024 to discuss the overall planning effort and to highlight best practices in mitigation efforts and policies. Representatives from the surrounding communities of Millville, Mendon, Bellingham, Woonsocket, Rhode Island, and North Smithfield, Rhode Island were invited to comment on the draft plan during the public comment period in an effort gather input from surrounding communities who might have shared interests or concerns. As planning activities progressed, a public presentation was made by CMRPC and the local planning team on June 25th, 2024 at a Blackstone Board of Selectmen meeting to provide a summary of key aspects of the draft Plan report then being finalized. The presentation was televised on the local cable access channel 8 and the opportunity for public comment was emphasized. Materials and notes from the presentation and subsequent public discussion are included in the Appendix D. A full draft Plan was provided to the Town for distribution and made available online on the Town of Blackstone website for public comment for two weeks from June 26th, 2024 through July 12th, 2024. In addition, the full draft Plan was distributed to officials in all neighboring communities for their review and input regarding shared hazards and to community lifelines identified by the local planning team and CMRPC for their review and input during this public comment period. _____ feedback was provided during the public forum and the public comment period.

The final draft Plan was submitted to MEMA for review on DATE, and was then relayed to FEMA for federal review. After receipt of FEMA's revisions on DATE, the plan was formally adopted by vote of the Board at the DATE meeting of the Board of Selectmen.

The Blackstone 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 planning team. In addition, CMRPC, the State-designated regional planning authority for Blackstone, works with all agencies that regulate development in its region, including the municipal entities listed above and state agencies, such as Department of Conservation and Recreation and MassDOT. This regular involvement ensured that during the development of the Blackstone Hazard Mitigation Plan, the operational policies and any mitigation strategies or identified hazards from these entities were incorporated. Engaging a diverse array of representatives, stakeholders, community lifelines, and organizations promoted the creation of mitigation strategies for local recovery and resilience efforts in town. Blackstone's planning process exemplified engagement of stakeholders from a broad range of sectors whose inclusion in local government is critical for equitable, effective, and comprehensive risk reduction outcomes.

The following community lifelines were sent the full draft plan during the public comment period for

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their review and input. FEMA defines community lifelines as "the most fundamental services in the community that, when stabilized, enable all other aspects of society to function.[1]"

Safety and Security Lifelines:

- National Grid
- Liberty Gas
- Eversource
- American National Power
- Mass DCR
- Army Corps of Engineers
- Blackstone Watershed Collaborative

Food, Water, and Shelter Lifelines:

- Blackstone Valley Boys and Girls Club
- Blackstone-Millville Regional School District
- Blackstone Housing Authority
- Fox Brook Manor
- Early Village
- DuCharme Estates
- The Hamlet at Blackstone
- Divine Mercy Parish
- Christ Community Church
- Solid Rock Bible Baptist Church

Health and Medical Lifelines:

- Landmark Medical Center, Woonsocket, Rhode Island
- Milford Regional Medical Center, Milford, Massachusetts

Communications Lifelines:

- Blackstone Enlightener
- Comcast
- Verizon

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

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- T-Mobile

Transportation Lifelines:

- Providence & Worcester Railroad / Genessee & Wyoming
- Tellstone & Son Bus Company

Hazardous Materials Lifelines:

- Kimball Sand Company

Emergency Shelter Lifelines:

- Blackstone-Millville Regional School District

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2.0 Community Profile and Development Trends

2.1 Regional and Community Profile

The Central Massachusetts Regional Planning Commission (CMPRC) region occupies roughly 1,000 square miles in the southern two-thirds of Worcester County, Massachusetts. The area surrounds 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. Nearly 588,141 people live in the CMRPC Region, of whom 9,208 reside in Blackstone.[2]

The CMRPC area is framed on the west by the Central Massachusetts uplands, on the south by Rhode Island and Connecticut, on the east by the Boston metropolitan area, and on the north by the Montachusett region in northern Worcester County. The forty-community region has been divided for planning purposes into six sub-regions, determined by shared characteristics and roadway corridors. Blackstone is located in the southeast sub-region consisting of 11 towns located to the east and northeast of Worcester, including: Blackstone itself, Douglas, Grafton, Hopedale, Mendon, Millbury, Millville, Northbridge, Sutton, Upton, and Uxbridge.

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 2021, nearby Worcester saw monthly mean temperatures ranging from 20.7 degrees in January to 78.7 in July. Precipitation is relatively high at 49.38 inches annually, including 73.9 inches of snowfall. Approximately 30 miles from the Atlantic coast, Blackstone and its neighboring communities are subject to a variety of severe weather, including hurricanes, nor'easters, thunderstorms, and blizzards.

The Town of Blackstone, Massachusetts was incorporated in 1845 and for many decades was an industrial center. It is located some 20 miles south of the City of Worcester and 20 miles north of Providence, RI and is now largely a bedroom community. Highway access to both major cities is available via Route 146, which is accessible in nearby Millville. Blackstone lies within the historic Blackstone River Valley. Its employment base is healthy: as of March 2024, Blackstone employs 5,287 people[3]. Blackstone is bordered by Mendon to the north, Millville to the west, Woonsocket, Rhode Island and North Smithfield, Rhode Island to the south, and Bellingham to the east.

Blackstone has a total area of 11.2 square miles and a population of 9,208[4]. Blackstone's population is projected to continue growing; according to the Central Massachusetts Regional Planning Commission's (CMRPC) Long Range Transportation Plan the Town of Blackstone is expected to grow approximately 26% between 2020 and 2050, reaching 11,567 residents[5]. The number of residents in town grew by approximately 34% from 1980 to 2000 but grew by only 4.5% between 2000 and 2020.[6] According to the 2020 US Census, 90.7% of Blackstone's population

[2] "P1: Race," Data.Census.gov, United States Census Bureau, accessed June 10, 2024, https://data.census.gov/table/DECENNIALPL2020.P1?q=Blackstone%20Massachusetts.

[3] Massachusetts Department of Economic Research, "Municipal Employment Data: Blackstone - 2010," lmi.dua.eol.mass.gov, March 2024, https://lmi.dua.eol.mass.gov/lmi/MunicipalEmploymentData/LmiTown?A=000283.

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

[5] Central Massachusetts Metropolitan Planning Organization. "Mobility2040: The Update for 2020 – 2020 Long Range Transportation Plan," Cmrpc.org, Central Massachusetts Regional Planning Commission, 2020, page 1-13, https://cmrpc.org/wp-content/uploads/2024/05/Mobility2040-The-Update-for-2020-Endorsed-Document.pdf.

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

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identifies as white, 1.1% of the Town's population identifies as Asian, 1.0% of the Town's population identifies as Black or African American, 1.6% of the Town's population identifies as some other race, and 5.5% of the town's population identifies as belonging to two or more races.[7] According to the 2020 Census, about 4.0% of Blackstone residents identified as Latino or Hispanic. According to the 2020 US Census, 19.6% of the Town's population is under 18 years old, while 18.2% of the population is 65 years and over.[8]

The median age in town, according to the 2020 US Census, is 43.0 years old, which is comparatively higher than the State's median age at 39.9.[9] At $95,132, median household annual income in Blackstone (according to 2022 American Community Survey 5-year estimates) is similar to that of the State at $96,505 and Worcester County at $88,524.[10] The poverty rate in town (according to 2022 ACS 5-year estimates) is 4.9%, approximately half of the State's and Worcester County's rates of, respectively, 9.9% and 10.0%[11]. With a median value of owner-occupied housing units at $355,100 according to 2022 ACS 5-year estimates, housing costs in Town are relatively lower compared to the State and to Worcester County, whose comparable numbers are $483,900 and $363,200, respectively.[12] According to 2022 ACS 5-year estimates, 73.3% of occupied homes are single-family homes (detached or attached), and 26.7% are multi-unit structures.[13] With a 5.2% vacancy rate according to the 2020 Census, vacancies in Blackstone are relatively lower than the State and Worcester County with 8.3% and 5.7% vacancy rates respectively.[14] The majority of homes in town were built between 1940 and 1999, with 22.3% of them being built before 1940 and 12.3% of them being built since 2000 according to 2022 ACS 5-year estimates.[15]

2.2 Development Trends

Section 2.2 helps meet:

- *E1. "Was the plan revised to reflect changes in development?" (Requirement 44 CFR § 201.6(d)(3))*

[7] "DP1: Profile of General Population and Housing Characteristics," Data.Census.gov, United States Census Bureau, accessed June 10, 2024, https://data.census.gov/table?q=dp1%20blackstone%20ma.
[8] Ibid
[9] Ibid
[10] "S1903: Median Income in the Past 12 Months (in 2022 Inflation-Adjusted Dollars)," Data.Census.gov, United States Census Bureau, accessed June 10, 2024, https://data.census.gov/table/ACSST5Y2022.S1903?q=ACS%20Massachusetts&g=050XX00US25027_060XX00US2502706015.
[11] "S1701: Poverty Status in the Past 12 Months," Data.Census.gov, United States Census Bureau, accessed June 10, 2024, https://data.census.gov/table/ACSST5Y2022.S1701?q=ACS%20Massachusetts&g=050XX00US25027_060XX00US2502706015.
[12] "DP04: Selected Housing Characteristics," Data.Census.gov, United States Census Bureau, accessed June 10, 2024, https://data.census.gov/table/ACSDP5Y2022.DP04?q=ACS%20Massachusetts&t=Vacancy%20Characteristics&g=050XX00US25027_060XX00US2502706015.
[13] "S2504: Physical Housing Characteristics for Occupied Housing Units," Data.Census.gov, United States Census Bureau, accessed June 10, 2024, https://data.census.gov/table/ACSST5Y2022.S2504?q=ACS%20Massachusetts&g=050XX00US25027_060XX00US2502706015.
[14] "DP1: Profile of General Population and Housing Characteristics," Data.Census.gov.
[15] "S2504: Physical Housing Characteristics for Occupied Housing Units," Data.Census.gov.

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Town of Blackstone Development Projects between 2017 - 2024

Name	Status	Year	Housing Units	Commercial SQ Feet	Project Type
110 Milk Street	Complete	2020	N/A	N/A	Solar Project
83 Federal Street	Complete	2020	N/A	N/A	Solar Project
307 Blackstone Street	Complete – on Planning Board Agenda because of stormwater issues	2021	N/A	N/A	Solar Project
142 Blackstone Street	Complete – on Planning Board Agenda because of stormwater issues	2021	N/A	N/A	Solar Project
260 Main Street	Units 1-8 have been permitted and sold, units 9 and 10 are permitted and are up for sale (10 still has certificate of occupancy pending), 11-12 are waiting to be built and permitted for occupancy	2022	12	0	Residential - Duplexes

There are no substantial potential future development projects of note in Blackstone.

The Town of Blackstone is a former industrial center which is now largely a residential community. The intersection of these factors contributes to ongoing development and redevelopment throughout the Town. There are no industrial and commercial development projects that are currently underway in Town. There have been four solar projects that have been permitted in town since 2018, of which two have been completed and have caused few to no problems. Two others are completed but have been having stormwater issues which have caused the town to issue a cease and desist on the projects until these problems have been resolved. All subdivisions and new developments in town are rigorously reviewed by the Planning Board, Fire Department, Police Department and other departments to ensure that new construction complies with bylaws and ensures emergency vehicle access.

There are also several residential construction projects that have been recently completed or are under construction in town; there have been three new single-family home construction projects requested since August 2023. A new 12-unit duplex development at 260 Main Street has been constructed since 2022, with 8 of these units currently occupied, 2 units up for sale, and 2 units which are still waiting to be built. If formal approval of development is made by appropriate boards, due consideration should be given to the protection of newly constructed residences. The clearing of brush and trees lessens the chance of wildfire near new development. However, an increase in storm runoff in localized areas of town caused by new development is possible, and

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proper drainage infrastructure is necessary to mitigate disruption to surrounding properties caused by development-induced runoff. Development is generally less vulnerable to hazards than non-developed areas: during the construction process. stormwater drainage is improved, trees are trimmed back from structures and power lines, roads are built wide enough to allow emergency vehicles to enter, modern building codes are followed, and setbacks from wetlands are required.

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

New development in Blackstone needs to be in line with the state building code. In addition, on January 1st, 2014, Blackstone codified a Stretch Energy Code, based on the International Energy Conservation Code (IECC) 2009 building code created by the International Code Council.[16] The Stretch Energy Code provides a more energy efficient alternative to the base energy code for new construction and existing buildings in Blackstone, strengthening the town's climate resilience and hazard mitigation capabilities.

As the population of Blackstone continues to grow and additional development occurs, officials should seek to further integrate hazard mitigation practices into its planning and development processes. In 2018, the Town of Blackstone updated its Master Plan, and this was a process which 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 Blackstone.

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

3.0 Critical Facilities and Vulnerable Populations

A Critical Facility is defined as a building, structure, or location which:

- Is vital to the hazard response effort.
- Maintains an existing level of protection from hazards for the community.
- Would create a secondary disaster if a hazard were to impact it.

3.1 Critical Facilities Within Blackstone

The Critical Facilities List for the Town of Blackstone has been identified utilizing several sources, and the knowledge and expertise of the team:

- Blackstone's Comprehensive Emergency Management Plan
- MassGIS data
- 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.

Blackstone's Hazard Mitigation Team has broken up this list of facilities into four categories:

- Emergency Response Facilities needed in the event of a disaster
- Non-Emergency Response Facilities that have been identified by the Team as non-essential. These are not required in an emergency response event, but are considered essential for the everyday operation of Blackstone
- Dams
- Facilities/Populations that the Team wishes to protect in the event of a disaster

Critical infrastructure and facilities are mapped in Appendix A.

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3.2 Category 1 – Emergency Response Facilities

The Town has identified the Emergency Response Facilities and Services as the highest priority in regards to protection from natural and man-made hazards.

Type	Name	Address	Details	Has Emergency Generator?
Emergency Operations Center/Police Station	Blackstone Municipal Center / Public Safety Building / Senior Center / Emergency Operations Center	15 Saint Paul Street	This shared facility has a backup power generator located in rear of building. It is the location of the Police HQ as well as Fire Station #1. It is located adjacent to the FEMA 100 and 500-year flood zones on the Blackstone River. The basement is regularly flooded in long-duration rainstorms (causing damage to fire apparatus and Town archives) and historically the site has been flooded by the nearby Blackstone. The generator is also vulnerable to flooding, which has been a problem during past power failures. The flat roof has to be shoveled off in major snow events (such as 2015's blizzards) due to concerns about snow loads and risks from falling snow/ice to nearby pedestrians. This facility was noted as vulnerable to locally identified snow load and flooding hazards by CMRPC's GIS analysis	Yes
Fire Department	Blackstone Municipal Center / Public Safety Building / Senior Center / Emergency Operations Center	15 Saint Paul Street	See the description above. Station #1 is located in the Town Hall complex and is manned 24/7. This facility was noted as vulnerable to locally identified snow load and flooding hazards by CMRPC's GIS analysis	Yes

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	Fire Station #2 / Backup Emergency Operations Center	666 Rathbun Street	This station is located in a low-lying area with poor drainage, which can hinder access for vehicles. It experienced power outages from major storms prior to the generator being installed. It is manned as is needed. This facility was noted as vulnerable to locally identified flooding hazards by CMRPC's GIS analysis	Yes
	Fire Station #3	132 Elm Street	This station is only used for storage. It is unmanned and closed. It has experienced power outages from major storms, most recently in 2011, and it is thought to be vulnerable to roof damage from extreme winds.	Yes, a small, portable manual-start generator is currently in place at this facility to provide very limited backup power. The Town is looking into the possibility of improving the type of generator which is here.
	Dry hydrant system	Lake Shore Drive (Lake Hiawatha)	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
	Dry hydrant system	Mendon Street (Wojcik's farm pond)	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
Communications Facilities	Blackstone Municipal Center / Public Safety Building / Senior Center / Emergency Operations Center	15 Saint Paul Street	See the description above. This facility was noted as vulnerable to locally identified snow load and flooding hazards by CMRPC's GIS analysis.	Yes
	Fire Station #2 / Backup Emergency Operations Center	666 Rathbun Street	See the description above. This facility was noted as vulnerable to locally identified flooding hazards by CMRPC's GIS analysis.	Yes

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	Repeater	128 Blackstone Street (at water tank)	This facility was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team.	Yes, generator funded by FEMA's EMPG program was recently installed at the repeater site.
	AT&T Tower	near 286 Mendon Street	There are no noteworthy concerns regarding natural hazard impacts on this facility.	No
Department of Public Works	DPW offices/garage	51-53 Elm Street	This facility was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team.	Yes, the Town recently acquired a new generator for the site.
Emergency Shelters	Hartnett Regional Middle School	35 Federal Street	This school is a primary emergency shelter and was noted as vulnerable to a locally identified snow load hazard by CMRPC's GIS analysis.	Yes
	Kennedy Elementary School	200 Lincoln Street	This school is a back-up emergency shelter and was noted as vulnerable to a locally identified snow load hazard by CMRPC's GIS analysis.	Yes
Primary Evacuation Routes	Main Street (Route 122) to Millville	Main Street (Route 122) to Millville	This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified flooding, invasive species, and wildfire hazard areas, the 100-year and 500-year flood zones, as well as a high slope hazard area.	N/A
	Main Street (Route 122) to Rhode Island	Main Street (Route 122) to Rhode Island	This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified flooding, invasive species, and wildfire hazard areas, the 100-year and 500-	N/A

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			year flood zones, as well as a high slope hazard area.	
	Lincoln Street/Summer Street	Lincoln Street/Summer Street	This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified flooding hazard areas as well as the 100-year flood zone.	N/A
	Elm Street (southern end) to Bellingham	Elm Street (southern end) to Bellingham	This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified flooding hazard areas as well as the 100-year flood zone.	N/A
	Blackstone Street	Blackstone Street	This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified flooding hazard areas as well as the 100-year flood zone and high slope hazard areas.	N/A
	Federal Street	Federal Street	This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified flooding hazard areas as well as high slope hazard areas.	N/A
	Mendon Street to Mendon	Mendon Street to Mendon	This route has been noted as vulnerable by CMRPC's GIS analysis because it crosses locally identified flooding and invasive species hazard areas as well as the 100-year flood zone. Its northern stretch within town also runs between two high slope hazard areas.	N/A
	Rathburn Street to Woonsocket, Rhode Island	Rathburn Street to Woonsocket, Rhode Island	This route has been noted as vulnerable by CMRPC's GIS	N/A

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			analysis because a portion of it (between Carter Avenue and just north of Elmwood Street) lies along a locally identified flooding hazard area and it crosses multiple other locally identified flooding hazard areas.	

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 Blackstone.

Type	Name	Address	Details	Has Emergency Generator?
Water Supply	Well Pumps #2, 7	See maps in Appendix A	These wells were identified as the most likely water supply facility to be damaged in an extreme flooding event by the HMP Core Team. The wells are 4 to 5 feet above the flow of the river.	No
	Well Pump #4	See maps in Appendix A	This well was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team.	No
	Well Pump #5a	See maps in Appendix A	This well was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team.	Yes
	Well Pump #6	See maps in Appendix A	This well was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team.	Yes
	Well Pump #8	See maps in Appendix A	This well was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team.	Yes
	Well Pump #9	See maps in Appendix A	This well was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team.	Yes
	Water Supply Storage Tank	Near 315 Blackstone Street	This facility was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team.	Yes

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	Water Supply Storage Tank	Lincoln Street near Millville line	This facility was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team.	Yes
	Water Supply Storage Tank	45 Bellingham Road	This facility was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team.	Yes
	Water Supply Water Tank	128 Blackstone Street	This facility was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team.	Yes
	DPW Offices and Garage / Corrosion Facility	51-53 Elm Street	This facility was identified as potentially susceptible locally identified flooding hazards by the HMP Core Team. Roughly 80% of water users in town utilize the municipal water system.	Yes, the Town recently acquired a new generator for the site.
Sewer	Sewage Lift Station	51-53 Elm Street	Blackstone's sanitary sewage is treated at a regional facility operated by the City of Woonsocket, RI. The sewer system covers the more developed parts of town, primarily in the southern area near the Blackstone River. Roughly 35% of all households use the town system – the rest are on septic. This facility is near an 100-year flood zone and a locally-identified flood zone, but the HMP Core Team has noted that it has not seen substantial damage in past floods.	Yes, the Town recently acquired a new generator for the site.
	Sewage Lift Station	Mill Street	See the first row of this section for more information on the Town's sewer system. This facility is in a 500-year flood zone and was therefore noted as vulnerable to flooding by CMRPC's GIS analysis, but the HMP Core Team has noted that it has not seen substantial damage in past floods.	Yes
	Sewage Lift Station	Main Street	See the first row of this section for more information on the Town's sewer system. This facility is in a 100-year flood zone and was therefore noted as vulnerable to flooding by CMRPC's GIS analysis, but the HMP Core	Yes

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			Team has noted that it has not seen substantial damage in past floods.	
	Sewage Lift Station	Staples Lane	See the first row of this section for more information on the Town's sewer system. This facility is near an 100-year flood zone, but the HMP Core Team has noted that it has not seen substantial damage in past floods.	Yes
	Sewage Lift Station	760 Rathburn Street	See the first row of this section for more information on the Town's sewer system. This facility is near a swampy area that can flood, but the HMP Core Team has noted that it has not seen substantial damage in past floods.	Yes
	Sewage Lift Station	Montcalm Avenue	See the first row of this section for more information on the Town's sewer system. This facility is near several locally-identified flood zones, but the HMP Core Team has noted that it has not seen substantial damage in past floods.	Yes
	Sewage Lift Station	Elmwood Avenue	See the first row of this section for more information on the Town's sewer system. This facility is near a locally-identified flood zone, but the HMP Core Team has noted that it has not seen substantial damage in past floods.	Yes
	Sewage Lift Station	Edgewater Drive	See the first row of this section for more information on the Town's sewer system. This facility is near a an 100-year flood zone, but the HMP Core Team has noted that it has not seen substantial damage in past floods.	No, but this facility can be powered by a mobile generator if needed. This is less than ideal, though.
	Sewage Lift Station	Quickstream Street	See the first row of this section for more information on the Town's sewer system. This facility is near an 100-year flood zone, but the HMP Core Team has noted that it has not seen substantial damage in past floods. This facility has also been noted as vulnerable to high slope hazards by CMRPC's GIS analysis.	Yes

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	Sewage Lift Station	666 Rathburn Street	See the first row of this section for more information on the Town's sewer system. This facility is in a 100-year flood zone and was therefore noted as vulnerable to flooding by CMRPC's GIS analysis, but the HMP Core Team has noted that it has not seen substantial damage in past floods.	Yes
	Sewage Lift Station	Elm Street	See the first row of this section for more information on the Town's sewer system. This facility is in a 100-year flood zone and was therefore noted as vulnerable to flooding by CMRPC's GIS analysis, but the HMP Core Team has noted that it has not seen substantial damage in past floods.	Yes
	Sewage Lift Station	175 Lincoln Street	See the first row of this section for more information on the Town's sewer system. This facility is near a locally identified flood zone, but the HMP Core Team has noted that it has not seen substantial damage in past floods.	Yes
	Sewage Lift Station	Alice Avenue	See the first row of this section for more information on the Town's sewer system. This facility is near a locally identified flood zone, but the HMP Core Team has noted that it has not seen substantial damage in past floods.	Yes
Town Facilities	Public Library	86 Main Street	This library is located within the FEMA 500-year flood zone. It is located near Fox Brook, just upstream from the brook's confluence with the Blackstone River. It is immediately adjacent to the 500-year flood zone and is in two locally identified flood zones, and therefore it was noted as vulnerable to flooding by CMRPC's GIS analysis.	Yes
	Blackstone Municipal Center / Public Safety Building / Senior Center / Emergency Operations Center	15 Saint Paul Street	See the description above. This facility was noted as vulnerable to locally identified snow load and flooding hazards by CMRPC's GIS analysis.	Yes

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Utilities	Algonquin Natural Gas Pipeline	The northeast corner of town	There are no noteworthy concerns regarding natural hazard impacts on this pipeline.	N/A
	Providence and Worcester Railroad	Along the Blackstone River	Aging bridge structures over the Blackstone River along this freight railroad line may be at risk from very extreme riverine flooding or from earthquakes. This route has been noted as vulnerable by CMRPC's GIS analysis because there is a locally identified wildfire hazard along its length as well as because it crosses locally identified flooding hazards, the 100-year flood zone, and a high slope hazard area.	N/A
	ANP Blackstone Natural Gas Power Plant	204 Elm Street	This power plant is adjacent to the 100-year flood zone next to Fish Pond and Mill River; however, it is elevated well above the waterways and is not considered vulnerable by the HMP Core Team.	Yes
	Kimball Sand Company – sand / gravel mine	202 Elm Street	During very heavy rain events, runoff from this facility reportedly increases turbidity and sometimes causes minor siltation in the nearby Mill River; however, the HMP Core Team notes that there have not been noticeable impacts to the flood hazard level in that area.	Yes

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3.4 Category 3 – Dams[17]

The third category is a listing of dams in Blackstone.

National ID	Dam Name	Owner	Regulatory Authority	Hazard Code	Notes
MA00096	Stone Diversion Dam	Private	FERC Jurisdiction	Low Hazard	Aka Rolling Dam; Historic This dam is located in the 100-year flood zone and therefore was noted as vulnerable by CMRPC's GIS analysis.
MA00624	Hopedale Pond Dam	Private	Office of Dam Safety	Significant Hazard	This dam is also called the Mill River Dam. It is in Hopedale, MA, upstream from Blackstone.
MA01164	Blackstone River Dam at Canal Street	Public - Town of Blackstone – Board of Selectmen	Office of Dam Safety	Low Hazard	This dam was noted as being a flooding hazard by the HMP core team and is in the 100-year flood zone, so therefore it was noted as vulnerable by CMRPC's GIS analysis. The catwalk at the dam is in poor shape. It is also called the Saranac Dam.
MA01167	Lake Hiawatha Dam	Public - Town of Blackstone – Board of Selectmen	Office of Dam Safety	Significant Hazard	This dam was on the state's 2011 list of 100 dams needing substantial investments in maintenance and/or operations; these concerns were substantially addressed using funds from a state earmark, and the dam is no longer considered in poor condition. This dam was also noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.

[17] "MassGIS Data: Dams," Mass.gov, Massachusetts Bureau of Geographic Information, February 2012, https://www.mass.gov/info-details/massgis-data-dams; "2023 Annual Report to the Governor on the Activities of the Dam Safety Program: 2023 Dam Safety Annual Report Attachment," Dem.ri.gov, Rhode Island Department of Environmental Management, Office of Compliance and Inspection, May 13, 2024, https://dem.ri.gov/sites/g/files/xkgbur861/files/2024-05/damrpt23.pdf, pages 15, 22; "Slatersville Reservoir Upper Dam: Visual Inspection / Evaluation Report," Dem.ri.gov, Pare Corporation, May 23, 2019, https://dem.ri.gov/sites/g/files/xkgbur861/files/programs/maps/mapfile/damfiles/043.pdf; "Slatersville Reservoir Middle Dam: Visual Inspection / Evaluation Report," Dem.ri.gov, Pare Corporation, June 23, 2016, https://dem.ri.gov/sites/g/files/xkgbur861/files/programs/maps/mapfile/damfiles/046.pdf; "Dam Safety Inspection Harris Pond (Providence County, RI)," Data.statesman.com, Austin American Statesman, accessed June 28, 2024, https://data.statesman.com/dam/rhode-island/providence-county/harris-pond/ri03901/; "Dam Safety Inspection Slatersville Reservoir Lower (Providence County, RI)," Data.statesman.com, Austin American Statesman, accessed June 28, 2024, https://data.statesman.com/dam/rhode-island/providence/slatersville-reservoir-lower/ri02503/.

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MA02741	Canal Headgate Dam	Private	FERC Jurisdiction	Low Hazard	This dam is located in the 100-year flood zone and therefore was noted as vulnerable by CMRPC's GIS analysis.
MA02742	Mill Pond Dam	Private	Office of Dam Safety	Low Hazard	This dam was noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis. It is also in the 100-year flood zone.
MA02743	Crain's Pond Dam	Private	Non-Jurisdictional - Other	N/A	This dam was noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis. It is also in the 100-year flood zone.
MA02744	Fish Pond Dam	Private	Non-Jurisdictional – Other	N/A	This dam is located in the 100-year flood zone and therefore was noted as vulnerable by CMRPC's GIS analysis.
MA02745	Fox Brook Dam	Private	Non-Jurisdictional – Other	N/A	This dam is historic and was also noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.
MA02746	Old Ice Pond #1 Dam	Private	Non-Jurisdictional – Other	N/A	There are no noteworthy concerns regarding natural hazard impacts on this dam.
MA02748	Walsh's Pond Dam	Public - Town of Blackstone – Office of the Town Administrator	Non-Jurisdictional - Other	N/A	This dam is located in the 100-year flood zone and therefore was noted as vulnerable by CMRPC's GIS analysis.
RI00043	Slatersville Reservoir Upper Dam	Private	Rhode Island Department of Environmental Management Office of Compliance and Inspection	High Hazard	This dam is in neighboring North Smithfield, Rhode Island.
RI00046	Slatersville Reservoir Middle Dam	Private	Rhode Island Department of Environmental Management Office of Compliance and Inspection	High Hazard	This dam is in neighboring North Smithfield, Rhode Island.
RI00047	Slatersville Reservoir Lower Dam	Private	Rhode Island Department of Environmental Management Office of Compliance and Inspection	Significant Hazard	This dam is in neighboring North Smithfield, Rhode Island.

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RI00073	Harris Pond Dam	Public - Woonsocket Water Division	Rhode Island Department of Environmental Management Office of Compliance and Inspection	High Hazard	This dam is in neighboring Woonsocket, Rhode Island, lies immediately along the town/state boundary, and creates Harris Pond upstream. The pond itself is almost completely within Blackstone. Impacts from a failure of this dam would take place almost completely in Rhode Island. A former iteration of this dam failed due to embankment collapse during Tropical Storm Diane in 1955, according to the Association of State Dam Safety Officials' inventory of failures and near-failures.

For additional information on dams and dam failure hazards in Blackstone, also see Chapter 4.

3.5 Category 4 – Facilities/Populations to Protect

Type	Name	Address	Details
Special Needs Population/Apartment Complexes/Assisted Living/ Housing Authority	Fox Brook Manor (Blackstone Housing Authority)	15 Fox Brook Manor (also known as Austin Street)	This complex has experienced power failures during past storms.
	Early Village (Blackstone Housing Authority)	Alice Avenue, off Blackstone Street	This complex has experienced power failures during past storms. It was also noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.
	DuCharme Estates	25 Federal Street	There are no noteworthy concerns regarding natural hazard impacts on this complex.
	The Hamlet	Fox Run Road	There are no noteworthy concerns regarding natural hazard impacts on this complex.
Schools/Daycares[18]	Blackstone/Millville Regional High School	175 Lincoln Street	This school sustained roof damage during winter storms in 2013. More than $1 million in repairs were required, in total among the three schools affected, for school roof damages from these

[18] "Licensed Child Care Search," Childcare.Mass.gov, Massachusetts Department of Early Education and Care, accessed June 10, 2024, https://childcare.mass.gov/findchildcare.

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			storms. It has a backup generator. This school was also noted as vulnerable to a locally identified snow load hazard by CMRPC's GIS analysis.
	Hartnett Regional Middle School	35 Federal Street	This school is a primary emergency shelter. It has a backup generator and is intended to shelter residents of both Blackstone and Millville as part of the regional school district arrangement. This school was also noted as vulnerable to a locally identified snow load hazard by CMRPC's GIS analysis.
	Kennedy Elementary School	200 Lincoln Street	This school is a back-up emergency shelter. This school sustained roof damage during winter storms in 2013. More than $1 million in repairs were required, in total among the three schools affected, for school roof damages from these storms. It has a backup generator. This school was also noted as vulnerable to a locally identified snow load hazard by CMRPC's GIS analysis.
	Maloney Elementary School	200 Lincoln Street	This school sustained roof damage during winter storms in 2013. More than $1 million in repairs were required, in total among the three schools affected, for school roof damages from these storms. It has a backup generator. This school was also noted as vulnerable to a locally identified snow load hazard by CMRPC's GIS analysis.
	Bethany Christian Academy	15 Cape Road	This school is located in Mendon.
	Blackstone Valley Boys and Girls Club	115 Canal Street	The Boys and Girls Club offers afternoon daycare programs. It was also noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis and is near the 100 and 500-year flood zones as well as a locally identified wildfire hazard area.
	Bouchard Home Daycare	4 Susan Drive	There are no noteworthy concerns regarding natural hazard impacts on this daycare.

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	Growing Einsteins Home Daycare	5 Rivers Edge Drive	This daycare was noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis and is near the 100-year flood zone.
	Hart Home Daycare	21 Bellingham Road	There are no noteworthy concerns regarding natural hazard impacts on this daycare.
	Battaglia Home Daycare	138 Blackstone Street	There are no noteworthy concerns regarding natural hazard impacts on this daycare.
	Languirand Home Daycare	30 Carrington Street	There are no noteworthy concerns regarding natural hazard impacts on this daycare.
	Little People's Day Care Center, Inc.	27 Federal Street	There are no noteworthy concerns regarding natural hazard impacts on this daycare.
	Viveiros Home Daycare	32 Valley Street	This daycare was noted as vulnerable to a locally identified flooding hazard by CMRPC's GIS analysis.
	Wainwright Home Daycare	7 Rhode Island Ave	There are no noteworthy concerns regarding natural hazard impacts on this daycare.
	St. Amant Home Daycare	91 Elm Street	There are no noteworthy concerns regarding natural hazard impacts on this daycare.
Historic Buildings/Sites[19]	According to the Massachusetts Cultural Resources Information System (MACRIS) online database accessed in April 2024, there are 27 Areas, 425 Buildings, 15 Burial Grounds, 5 Objects, and 43 Structures listed for Blackstone. 19 of these historic areas, 165 of these buildings, 1 of these burial grounds, 1 of these objects, and 33 of these structures lie within regulated or locally identified flood areas within town. The following historic sites were identified by the Blackstone HMP Core Team as critical facilities or infrastructure: the Blackstone River Dam at Canal Street / the Saranac Dam and a series of five bridges along the Providence and Worcester Railroad.		

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[19] "Search Results," Mhc-macris.net, Massachusetts Historical Commission, accessed June 10, 2024, https://mhc-macris.net/queryresults.

Employment Centers

Based on data obtained from the Massachusetts Executive Office of Labor and Workforce Development (EOLWD)[20] and the knowledge of local HMP committee members, the following table shows the largest employers in Blackstone

Company name	Address	Number of Employees	NAICS Code
Kennedy Elementary School and Maloney Elementary School	Lincoln St # 1	50-99	6111
Blackstone/Millville Regional High School	Lincoln St	50-99	6111
Hartnett Regional Middle School	Federal St	50-99	6111
Blackstone Town Municipal Center	Saint Paul St	50-99	9211
Alternative Creative Energy	Union St	20-49	2382
Blackstone Fire Department	Saint Paul St	20-49	9221
Blackstone Police Department	Saint Paul St	20-49	9221
Blackstone Valley Boys & Girls Club	Canal St	20-49	6241
Blackstone Valley Dental Associates	Main St	20-49	6212
Blackstone-Millville Regional School District	Lincoln St	20-49	6111
Dunkin'	Main St # 4	20-49	7225
Goodstuff Smokehouse	Main St	20-49	4244
Henry's Auto Parts Inc	Rathbun St	20-49	4413
Kimball Sand Co Inc	Elm St	20-49	2381
Roast House	Farm St	20-49	7225
Blackstone Department of Public Works	Elm St	10-19	9261
Fawcett Energy	Montcalm Ave	10-19	2382
Ideal Pizza	Main St # 2	10-19	7225
New England Chimney & Roofing	Main St	10-19	2381
UPS Access Point Location	Main St	10-19	5418

Local HMP committee members also noted that Cumberland Farms on Main Street, A Plus Tire and Auto Care on Rathburn Street, Harpin's Tire Shop Inc on Rathburn Street, and Toni's State Line Power Products, LLC on Main Street are notable employers in town.

[20] "Largest 25 Employers in Blackstone," Lmi.dua.eol.mass.gov, Massachusetts Department of Economic Research, accessed June 10, 2024, https://lmi.dua.eol.mass.gov/LMI/LargestEmployersArea/LEAResult?A=05&GA=000283.

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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 office'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. They are defined as neighborhoods (U.S. Census Bureau census block groups) 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 neighborhood 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);.

In Blackstone, one block group (block group 3 of census tract 7471.01) in the Millerville neighborhood in the southeastern corner of town was identified as an EJ area due to its relatively low household income.[21] As of the 2022 American Community Survey 5-year estimates, median household income in this block group is estimated at $46,316, compared to Blackstone's town-wide median of $95,132 and Worcester County's median of $88,524.[22] Median income in this block group is well below regional and local norms and suggests that some residents may lack the economic wherewithal to fully prepare for or recover from a disaster; Therefore, it is recommended that hazard mitigation outreach and education efforts in Blackstone should include extra emphasis to reach residents of Millerville and that mitigation efforts in this block group should be prioritized when appropriate.

It is important for the Town to consider EJ populations and other vulnerable community members in the hazard mitigation planning process. In Blackstone, according to the 2020 US Census, 19.6% of the population is under the age of 18 and 18.2% of the population is 65 years and over.[23] According to 2022 ACS 5-year estimate data, approximately 13.1% of the population in town speaks a language other than English at home.[24] Approximately 13.2% of the population in

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

[22] "B19013: Physical Housing Characteristics for Occupied Housing Units," Data.Census.gov, United States Census Bureau, accessed June 10, 2024, https://data.census.gov/table/ACSDT5Y2022.B19013?q=b19013%20blackstone%20ma&g=050XX00US25027_1500000US250277471013.

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

[24] "S1601: Language Spoken at Home," Data.Census.gov, United States Census Bureau, accessed June 10, 2024, https://data.census.gov/table?q=s1601%20blackstone%20ma.

Blackstone has a disability according to this same data.[25] This 2022 ACS 5-year estimate data also shows that people without health insurance account for about 1.6% of Blackstone's population[26] and about 4.9% of the Town's population is living in poverty.[27]

Outreach to EJ populations and other vulnerable community members was a vital part of the public outreach strategy for the Blackstone Hazard Mitigation Plan. Paper HMP surveys were available at the municipal center, library, and senior center and CMRPC staff attended multiple public events 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 and provide their feedback on the planning process. The public presentation for the draft plan was televised on local cable access TV, and a flyer on the presentation was sent to the HMP Team's contacts at the Blackstone Housing Authority and local businesses frequented by residents in the EJ block group in Millerville.

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[25] "S1810: Disability Characteristics," Data.Census.gov, United States Census Bureau, accessed June 10, 2024, https://data.census.gov/table?q=s1810%20blackstone%20ma.
[26] "S2701: Selected Characteristics of Health Insurance Coverage in the United States," Data.Census.gov, United States Census Bureau, accessed June 10, 2024, https://data.census.gov/table?q=s2701%20blackstone%20ma.
[27] "S1701: Poverty Status in the Past 12 Months," Data.Census.gov.

4.0 HAZARD PROFILES, RISK ASSESSMENT & VULNERABILITIES

Sections 4.0-4.13 help meet:

- *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)); and*
- *E1. "Was the plan revised to reflect changes in development?" (Requirement 44 CFR § 201.6(d)(3))*

The following section includes a summary of natural hazards that have affected or could affect Blackstone in the future. Natural hazards are weather, climate, or environmental threats to lives, property, or other valuable assets to human society. By examining historical data on natural hazard occurrences, and future projections of how climate change will interact with natural hazards, it is possible to approximate the future risk of natural hazards. Historical research, discussions with local officials and emergency management personnel, available hazard mapping and other weather-related databases were used to develop this list.

The most significant identified hazards are the following:

- Flooding
- Severe Snowstorms / Ice storms/ Nor'easters
- Hurricanes
- Severe Thunderstorms / Wind / Tornadoes
- Wildfires / Brushfires
- Earthquakes
- Dam failure
- Drought
- Extreme Temperatures
- Invasive Species
- Other hazards

4.1 STATE-WIDE OVERVIEW OF HAZARDS

4.1.1 MASSACHUSETTS STATE HAZARD MITIGATION AND CLIMATE ADAPTATION

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The state of Massachusetts and 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, and mitigate natural hazards.[28] The plan is the first of its kind to incorporate climate change adaptations into the mitigation plan. The plan also makes Massachusetts eligible for federal disaster recovery and hazard mitigation. The plan is effective under FEMA from September 12, 2023, to September 13, 2028. The Massachusetts SHMCAP is a useful model for incorporating climate change interactions into the natural hazard mitigation planning process.

4.1.2 Climate Change Interactions

As part of the creation of the SHMCAP planning process the state of Massachusetts performed a statewide analysis that detailed the affects of climate change on the cities and towns of Massachusetts. This culminated with the release of the 2022 Climate Change Assessment, which details the impacts of climate change to the Central Region of Massachusetts (which includes 55 cities and towns spanning the middle of the State) among 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 high heat days becoming more prevalent, as well as extreme lows in temperature) as 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 the local planning team. This is based more on the local conditions rather than any contradictions with the State's Analysis, and the local hazard mitigation planning effort was informed by the state planning process.

- **Human Impacts**: The assessment identified a **Reduction in Food Safety and Security**, and **Health and Cognitive Effects** from extreme heat being the most urgent human sector impacts for the central region. The reduction in food safety and security is likely to be affected at all levels of production and distribution by both extremes in temperature causing spoilage, power outages as well as extremes in precipitation creating a more unpredictable environment for the growth of produce. According to the report Reduction in crop yields across the state and within the region plays a role in this impact with key commodity crop yields in the Central region could decline by 12 percent by 2030[29]. These impacts to the supply chain for food regionally are expected to be reflected in state and national crop yields and distribution, and while currently our food supply networks are anticipated to be able to withstand these shocks, the subsequent increases in food prices will correspondingly

[28] "2023 ResilientMass Plan," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs, accessed June 10, 2024, https://www.mass.gov/info-details/2023-resilientmass-plan.
[29] Estimates derived from application of data from the following two sources:
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.

see an increase in food insecurity within our region.

The impacts of Extreme Temperatures are also projected to have a significant impact on health and cognition within our region, particularly in our more urbanized areas. Currently, three annual premature deaths are attributable to extreme temperature in the region, but approximately 35 additional premature deaths per year are expected as a result of climate change by the end of the century[30], assuming that no mitigation measures are taken to reduce the threat of temperature extremes beyond what our regions current capabilities are. Even short of mortality, the impacts of heat on cognition could cause a further decline in learning outcomes, workplace productivity, and see an increase in usage and strain upon emergency rooms dealing with heat related illnesses and injuries.

Additional Human Sector impacts include: Increases in Mental Health Stressors; Increases in Vector Borne Diseases 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 as human impacts to the region.

- **Infrastructure Impacts**: The most urgent impacts to the infrastructure sector are the **Loss of Urban Tree Cover** and **Damage to Electric Transmission and Distribution Infrastructure**. Urban Trees face a broad range of climate impacts and stressors: from a projected increase in extreme event activity, increased threats from invasive pests and diseases, and reduced water and soil quality all correspond to an increased rate of tree mortality and associated costs of urban forest management for towns. Central Massachusetts features 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 this is the City of Worcester, which is the state's second most populous city. 75 percent of the city's area falls within state-designated environmental justice block groups, but it has relatively low canopy coverage and is at disproportionate risk for urban tree loss.[31]

  Regionwide Damage to Electric Transmission and Distribution is projected to have increasing costs by orders of magnitude in the coming decades, with additional annual costs growing to $6 million by 2030; $12 million by 2050; $19 million by 2070; and $28 million by 2090.[32] These costs are based on the need for repair activities in response to climate related damages and failures, and take into account a wide range of climate stressors beyond extremes in temperature and precipitation.

  Additional Infrastructure Sector Impacts include: Damage to Roads and Loss of Road

[30] 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.

[31] "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.

[32] 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.

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 State Plan identified **Freshwater Ecosystem Degradation** and **Forest Health Degradation** as the most urgent impacts on this sector in the Central region. Increased nutrient load and harmful algal bloom growth from increased precipitation runoff, and increased concentrations of contaminants when drought conditions occur are all exacerbated by climate extremes. Shifts in habitat caused by increased average air and water temperatures in particular threaten the coldwater habitats and fisheries of the Central region.

  The affect on the region's forests that climate change will have is harder to predict, however the potential for significant ecosystem loss from climatological changes cannot go understated. Statewide, a third of tree species are classified by the U.S. Forest Service as having low capacity for adapting to projected climate changes, and an increased frequency of extreme events poses an additional threat to forests in the Central region.[33]

  Additional impacts to the natural environment include: Shifting Distribution of Native and Invasive Species and Soil Erosion.

- **Governance Impacts**: The most urgent Impacts of climate change on the Governance Sector, as is true with the rest of the statewide impacts in this sector, is: an **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. Climate Migration, whether forced or voluntary, is already being felt by Massachusetts Communities, and has been identified in the state plan as having a major consequences in addition to having the largest adaptation gap for our 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 a relative assessment of climate hazards nationwide. This new influx of population 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 refugees represents a significant stressor to local government. Increased needs for MassHealth, food security support, and emergency services are expected, as are the effects on those systems due to climate change beyond rapid population growth.

  Many of these impacts are expected to be concentrated in low-income areas, as existing inequalities may become exacerbated by an influx of climate refugees that will require additional expenditure if steps are not taken to prepare for these Impacts.

  Disruptions to State and Municipal revenue generation through property tax losses as well

[33] 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.

as the loss of sales taxes from interruptions to business and the economy from natural hazards is expected to increase over time.

Additional impacts to the Governance Sector are: an Increased Need for State and Municipal Policy Review and Adaptation Coordination and Damage to Inland State and Municipal Buildings were identified in the state's assessment.

- **Economic Impacts**: The Impacts to this sector identified as having the most urgency are a **Reduced Ability to Work** and a **Decrease in Agricultural Productivity** caused by climate change. In both of these areas an increase in temperature extremes corresponds to an decrease in worker's ability to work in dangerous conditions in addition to other natural hazards affecting workers ability to get to the job safely and increases in illnesses 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 per worker each year by 2050 and 128 hours per worker each year by 2090, the highest in the Commonwealth by the end of the century.[34]

  While agriculture represents a smaller role in the Central region's economy, impacts to this sector of the economy through lower crop yields have the potential to severely disrupt the local economy and regional food systems. Key commodity crop yields in the Central region could decline by 12 percent by 2030, and by 14 percent by 2070 and carry potentially disproportionate impacts on the local economies that rely on agricultural production for both farm workers and employers.[35]

  Additionally, though not identified as the one of the most urgent impacts to the Central region in the state's assessment, the expected **Reduction in Availability of Affordably Priced Housing** has become more prevalent since the assessment was released. As affordable properties are typically situated in more hazard prone areas creating a decrease in supply over time and as increases in demand for housing continue, a disproportionate economic impact on working families is already decreasing the overall resiliency of the region to shocks.

  Additional impacts to this sector 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 Town noted that their chief concerns were also Extremes in Precipitation in the form of rain or snow, in concurrence with the state assessment.

4.2 Natural Hazard Identification and Analysis

This section examines the hazards in the Massachusetts SHMCAP which are identified as likely to affect Blackstone. The analysis is organized into the following sections: Hazard Description, Location, Extent, Previous Occurrences, Probability of Future Events, Impact, and Vulnerability. A description

[34] 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.

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

of each of these analysis categories is provided below.

4.2.1 Hazard Description

The natural hazards identified for Blackstone are: Flooding, Severe snowstorms / Ice storms / Nor'easters, Hurricanes, Severe thunderstorms / Wind / Tornadoes, Wildfire / Brushfire, Earthquakes, Dam Failure, Drought, Extreme Temperatures, and Invasive Species. Many of these hazards result in similar impacts to a community. For example, hurricanes, tornadoes and severe snowstorms 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, such as a floodplain or area that is susceptible to wildfires. Classifications are based on the area that would potentially be affected by the hazard, on the following scale:

Table 1: Percentage of Town Impacted by Natural Hazard

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

4.2.3 Extent

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

4.2.4 Previous Occurrences

Previous hazard events that have occurred are described. 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 a future event for each natural hazard was classified according to the following scale:

Table 2: 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

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4.2.6 Impact

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

Table 3: 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 on quality of life. Temporary shutdown of facilities.

4.2.7 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 probability of future events depending on the hazard. The section of the hazard risk assessment lists climate change interactions as described by the 2023 ResiliantMass Plan.

4.2.8 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

The ranking is qualitative and is based, in part, on local knowledge of past experiences with each type of 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 can be applied to the expected natural hazards, regardless of their unpredictability.

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Type of Hazard	Location of Occurrence	Probability of Future Events	Impact	Potential Climate Change Effects	Hazard Risk Index Rating
Flooding	Small	Moderate	Minor	Increase extent; increase probability	2
Severe Snowstorms / Ice Storms/ Nor'easter	Large	Very High	Limited	Increase extent	2
Hurricanes	Large	Low	Limited	Increase extent; increase probability	3
Severe Thunderstorms/Wind	Small	Moderate	Minor	Unclear	2
Tornadoes	Small	Very Low	Limited	Unclear	4
Wildfire / Brushfire	Small	Moderate	Minor	Increase extent; increase probability	4
Earthquakes	Large	Very Low	Minor	None	5
Dam Failure	Small	Very Low	Limited	Indirect effects related to flooding	4
Drought	Large	Very Low	Minor	Increase extent; increase probability	4
Extreme Temperatures	Large	Moderate	Limited	Increase in average temperature; increase in probability of extreme heat	4
Invasive Species	Medium	High	Limited	Increase in range and severity of invasive species	3

Source: based on Massachusetts Resilient Mass Plan 2023; modified to reflect conditions in Blackstone.

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4.3 FLOODING

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

FEMA Flood zones

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

FEMA FIRMs also identify areas with a "moderate" flood risk, defined as locations between the 1% annual chance flood and a .2% annual chance flood. These areas are also known as the 0.2% flood zone.

LOCATION

Flooding and flood-prone areas in Blackstone are closely associated Blackstone river and associated tributaries canals and impoundments; specifically the areas around the town hall, Main street, St. Paul street, Canal street, and others in the southern part of town. According to a GIS analysis performed by CMRPC, there are 45 parcels in Blackstone that are susceptible to 100-year floods, with 40 of them containing structures. Building footprints that overlap with these flood zones may be impacted by flooding of that magnitude, especially if homeowners have not taken action to mitigate their personal flood risk. Despite Blackstone having numerous flooding problems, geographically much of Blackstone is a slightly elevated rolling plateau, away from rivers and ponds – as a result, the location of this hazard is relatively "small" (10% or less of the Town). Map 2 in Appendix A illustrates the FEMA FIRM 1% flood zones in town, as well as locally identified flooding areas.

As of September 2023, the Town of Blackstone has 0 repetitive loss structures as defined by FEMA's NFIP. As defined by the National Flood Insurance Program (NFIP), a repetitive loss property is any property which the NFIP has paid two or more flood claims of $1,000 or more in any given 10-year period since 1978. For more information on repetitive losses see https://www.fema.gov/repetitive-flood-claims-grant-program-fact-sheet.

EXTENT

The average annual precipitation for the closest weather station to Blackstone has been 57.67 inches for the period from 2017 to 2024[36]. Over the past five years, Blackstone has received an

[36] Temperature and precipitation data were obtained from the Applied Climate Information System (ACIS) provided by the NOAA Regional Climate Centers.
"Climate," Weather.gov, National Oceanic and Atmospheric Administration National Weather Service, accessed June 10, 2024, https://www.weather.gov/wrh/Climate?wfo=box.

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average of 15 days annually with precipitation over 1 inch[37]. Water levels in Blackstone's rivers, streams, and wetlands rise and fall seasonally and during high rainfall events. High water levels 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 are highly variable but for the period between 2017 and 2024 Blackstone received the most precipitation in the months of April, September, October, and December. At any time, heavy rainfall may create conditions that raise water levels in rivers and streams above bank full stage, which then overflow adjacent lands. Blackstone in particular is especially vulnerable to riverine flooding due to its location near the bottom of the Blackstone River Watershed, and while the location of the flooding is geographically situated in a relatively small area of town, that area primarily consists of Blackstone's Downtown neighborhood and municipal facilities. Heavy rainfall may also cause excessive runoff that causes the sides of roads to give way, creating a public safety concern and maintenance problem for the town's Department of Public Works.

Previous Occurrences

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

- Downtown Blackstone
  - Saint Paul St
  - Rivers Edge Rd
  - Farnum St
  - Canal St
- Elm St & Mill Brook
- Farm St & Hop Brook
- Blackstone St & Hop Brook
- Lakeshore Dr & Quick Stream
- Mendon St & Fox Brook
- Rathbun St
- Main St
- Lincoln St & Fox Brook
- Carter Ave & Shore Dr

Most of the flood hazard areas listed here were identified due to known past occurrences in the respective area. While some of the areas noted as potentially prone to flooding were included in the previous plan, new development of solar farms near Milk Street and Blackstone Street was identified in both survey results and in the planning meetings as causing flooding to their surrounds due to inadequate water retention at those facilities.

As noted in the Town's MVP, it was reported that major floods occurred in 1927, 1938, and 1955. The 1955 flood prompted major reconstruction of the Mill St. dam. In the past 10 years, there have been a number of flooding events that have occurred in and around the Blackstone community. The

[37] Ibid.

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National Oceanic and Atmospheric Administration (NOAA)'s National Centers for Environmental Information (NCEI) database notes the following flood events having occurred in Blackstone since the previous planning process:

- 5/15/18 – Flooding Caused by Heavy Rain: A cold front over the Great Lakes moved through Southern New England during the late afternoon and early night of May 15th. The air mass over Massachusetts was very warm and humid, and as the cold front moved into this air it generated numerous thunderstorms. Some thunderstorms produced damaging wind gusts, large hail, and heavy downpours. It was reported by an amateur radio operator that at 5:23 PM EST, Main Street in Blackstone was flooded and impassable. A car was trapped in the floodwaters and towed out.
- 7/17/2018 – Flash Flooding: 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. At 4:22 pm EST heavy rain in Blackstone made Rathbun Street at Champlain Avenue flooded and impassable.
- 11/03/2018 – Flood: Low pressure over New York City early in the morning on November 3rd rapidly intensified as it moved northeastward across New England. Heavy rain occurred in the early morning hours, with generally 1.50 to 2.50 inches in eastern sections of southern New England and up to 3.66 inches in the slopes of the Berkshires. A few severe thunderstorms moved from Rhode Island into eastern Massachusetts around daybreak. As the strong low passed to our north, strong to damaging westerly winds developed during the afternoon. In Blackstone, Main Street was closed due to flooding. A car was stuck in flood waters on Main Street near the CVS Pharmacy.
- 08/07/2019 – Flood: A warm front moving across southern New England triggered severe thunderstorms with wind damage across western portions of southern New England from the mid afternoon hours and through the evening. Another band of thunderstorms moved in from the southwest overnight, progressing to the coast before daybreak, causing some additional wind damage and some flooding. In Blackstone, a car was stuck in flood waters on Rathbun Street.
- 06/28/2020 – Flash Flood: A mid-level short wave trough combined with an approaching cold front and a warm, humid environment to produce severe thunderstorms and flash flooding across MA and northern RI during the afternoon and evening hours. A Flash Flood Emergency occurred in the Norwood, MA area. In Blackstone, two cars were stuck in flood waters on Rathbun Street. Roadway was impassable.
- 7/9/21 – Flood: Tropical Storm Elsa made landfall in Rhode Island on Friday morning before moving into the Gulf of Maine. It interacted with a stalled frontal boundary and brought widespread heavy rainfall of 2 to 3.5 inches as noted by the Local Planning Team.
- 11/12/21 – Flood: Strong southerly wind flow out ahead of an advancing cold front

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produced strong to damaging wind gusts and some heavy rain that caused some street and basement flooding, as noted by the Local Planning Team.

Probability of Future Events

Based upon previous data, there is a "moderate" probability of localized flooding occurring in Blackstone in a given year. This represents a slight increase over the last plan due to new development in Blackstone and increased precipitation from climate change.

Impact

The Town faces a minor impact, with less than 10% of the total Town area likely to be affected by a 1% annual chance flooding event. Based on the HAZUS analysis described below, a flood in Blackstone is unlikely to completely destroy any buildings, but a .2% annual chance flood event could displace residents and come with 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 damages to the community from a .2% annual chance flood event, assuming a 1 square mile data resolution.

	.2% annual chance flood event
Building Characteristics	
Estimated total number of buildings in Blackstone	2,421
Estimated total building replacement value (2024 $)	$1,146,000,000.00
Building Damages	
# of buildings sustaining minor damage (1-10%)	6
# of buildings sustaining moderate damage (11-40%)	14
# of buildings sustaining severe damage (41-50%)	1
# of buildings destroyed	0
Population Needs	
# of households displaced	169
# of people seeking public shelter	57
Value of Damages	
Total property damage (buildings and content)	$ 52,730,000.00
Total losses due to business interruption	$ 120,650,000.00
Total Economic loss	**$173,380,000.00**

Though there are no recorded instances of a flood event of this size in Blackstone, this model was included in order to present 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 we enter into a period of more intense and frequent storms. For more information on the HAZUS-

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MH software, go to http://www.fema.gov/hazus-software.

EXPOSURE

Certain features within Blackstone's community infrastructure, society, and environment may face more exposure to flooding, 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:

- 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 residence 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 meant 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.
- Sides of roadways, which may be erode due to excessive rainfall. Lack of funding to make road repairs may compound this issue.

POTENTIAL CLIMATE CHANGE EFFECTS

According to the 2023 State Hazard Mitigation and Climate Adaptation Plan, climate change effects coupled with changes in development and population density increase the risk of flooding from precipitation. As noted earlier in the plan, the Central region in particular 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 within a year, including the potential for extreme precipitation events. Instances of inland flooding, river overflows, and pressure on dams may result.
- Projected changes in precipitation patterns in all seasons, as well as higher frequency of extreme weather (including hurricanes and nor'easters), will change patterns of river flow and increase the frequency and severity of inland riverine flooding.

In summary, climate change is likely to increase the extent and probability of future flood events in Blackstone which will make it more likely for multiple storms in a short duration to cause cumulative damage. This can impact land use and development, such as no longer being able to develop on parts of town that flood frequently and the need to zone for increased stormwater resilience

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measures across town (such as increased storm drains, rain gardens, etc.).

VULNERABILITY

Based on this analysis and the assessment of the Blackstone Core Team, Blackstone faces a hazard index rating of "2 - High risk" from flooding. Conditions in Blackstone demonstrate somewhat greater vulnerability to flooding than in most other Central Massachusetts communities. Previous NFIP claims are slightly higher than in most nearby towns with similar populations and levels of development, a relatively large number of parcels with structures are located within the 100 year flood zone, and HAZUS simulations show that roughly 30% of Blackstone households would be displaced in a very rare flooding event along the lines of 1955's Tropical Storm Diane, despite the installation of limited flood control berms since that time. The local planning team notes the following concerns:

- The Town Hall/Public Safety/Senior Center complex sees recurrent basement and access road flooding when the Blackstone River is high and during long-duration rain events. This has been mitigated with some flood control measures, but fundamentally the building's location within the flood plain makes it naturally more susceptible to flooding hazards
- The Public Library abuts Fox Brook and the site is partly within a FEMA flood zone. Flooding on the street behind this facility has been noted by the local Planning team.
- Evacuation routes Main Street, Blackstone Street and Elm Street have seen regular flooding in some places. Mendon Street (a secondary route) is also subject to flooding.
- Pump stations for drinking water wells 2 and 7 are adjacent to flooding areas, and remain vulnerable to flooding events.
- Extreme rainfall associated with Tropical Storm Diane in 1955 placed most of the town and village centers along the Blackstone River underwater.

These concerns largely reflect the same concerns noted in the Last Hazard Mitigation Plan.

MITIGATION STRATEGIES

The Town of Blackstone is currently able to effectively respond to flooding through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, the Town's existing capabilities to mitigate and respond to flooding could be expanded upon through numerous avenues. The local planning team identified the following strategies that could be used to reduce the threat of Flooding in Blackstone:

1. Conduct a townwide stormwater drainage improvement study. Include an inventory and visual assessment as well as hydrological modeling in this study.
2. Continued drainage and structural resiliency improvements at Saint Paul Street/Rivers Edge Road/Farnum Street/Canal Street near Town Hall/Public Safety/Senior Center building; area is just above Blackstone River 100-year flood zone and sees recurrent basement flooding in heavy/long rain events
3. Complete flood-proofing work on well pumps 2 and 7.
4. Investigate Community Rating System (CRS) benefits and requirements and decide whether to participate.
5. Complete a study on how development in town, such as solar farms, affects flooding in town, looking at problems and enforcement mechanisms. Create and enforce a solar development / land use bylaw, and work with homeowners to mitigate localized flooding caused by development.
6. Assess green infrastructure opportunities for stormwater management and develop a list

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of specific priorities. Review Town regulations and update as necessary to support green infrastructure and low-impact development. Consider projects in areas that are prone to flooding, such as the Harris Pond Village neighborhood, including Shore Drive and the Precious Blood Cemetery.

7. Develop a comprehensive plan for beaver management to mitigate against unpredictable flooding / impoundment impacts. Investigate options for expanded beaver control.

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. Winter storms can result in flooding, storm surge, closed highways, blocked roads, downed power lines and hypothermia. A northeast coastal storm, known as a nor'easter, is typically a large counterclockwise wind circulation around a low-pressure center often resulting in heavy snow, high winds, and rain.

Location

The entire town of Blackstone is susceptible to severe snowstorms, which means the location of occurrence is "large." Because these storms occur regionally, they would impact the entire town is equally vulnerable.

Extent

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

NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. 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 converted into one of the five NESIS categories. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers.

Table 4: Northeast Snowfall Impact Scale Categories[38]

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

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

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Previous Occurrences

Based on data available from the National Oceanic and Atmospheric Administration, there are 66 high-impact snowstorms since 1958 that have affected the Northeast Corridor. Of these, approximately 38 storms resulted in snow falls in Blackstone of at least 10 inches. These storms are listed in the table below:

Start Date	NESIS Value	NESIS Category	NESIS Classification
12/13/2022	8.52	4	Crippling
01/28/2022	1.73	1	Notable
01/04/2022	1.60	1	Notable
01/30/2021	4.93	3	Major
12/14/2020	3.21	2	Significant
3/11/2018	3.16	2	Significant
1/3/2018	2.27	1	Notable
3/12/2017	5.03	3	Major
2/8/2015	1.32	1	Notable
1/29/2015	5.42	3	Major
1/25/2015	2.62	2	Significant
3/4/2013	3.05	2	Significant
2/7/2013	4.35	3	Major
1/26/2011	2.17	1	Notable
1/9/2011	5.31	3	Major
12/24/2010	4.92	3	Major
2/23/2010	5.46	3	Major
12/18/2009	3.99	2	Significant
3/15/2007	2.54	2	Significant
2/12/2006	4.10	3	Major
1/21/2005	6.80	4	Crippling
2/15/2003	7.50	4	Crippling
3/31/1997	2.29	1	Notable
2/8/1994	5.39	3	Major
3/12/1993	13.2	5	Extreme
2/10/1983	6.25	4	Crippling
4/6/1982	3.35	2	Significant
2/5/1978	5.78	3	Major
1/19/1978	6.53	4	Crippling
2/18/1972	4.77	3	Major
2/22/1969	4.29	3	Major
2/8/1969	3.51	2	Significant
2/5/1967	3.50	2	Significant
2/2/1961	7.06	4	Crippling

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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
2/14/1958	6.25	4	Crippling

Additionally, the NCEI database notes at least one instance of heavy snowfall in the Southern Worcester County region, of which The Town of Blackstone is a part:

- 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.

Probability of Future Events

Based upon the availability of records for Worcester County, the likelihood that a severe snowstorm will affect Blackstone is "very high" (greater than 70 percent in any given year).

In the 2023 ResiliantMass Plan notes that on average, Massachusetts experiences one to two nor'easters per year. In the past 10 years (2013– 2022), there have been 63 heavy snow days, 12 blizzard days, and two ice storm days in Massachusetts.

Impact

Blackstone faces a "limited" impact or less than 10 percent of total property damaged, from snowstorms. The weight from multiple snowfall events can test the load ratings of building roofs and potentially cause significant damage. Multiple freeze-thaw cycles can also create large amounts of ice and make for even heavier roof loads.

Other impacts from snowstorms and ice storms 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 are also at risk from severe winter storms and the associated flooding that can occur following heavy snow melt.
- Damage to telecommunications structures
- Reduced ability of emergency officials to respond promptly to medical emergencies or fires

The local planning team noted icing concerns along

EXPOSURE

Certain features within Blackstone's community infrastructure, society, and environment may face more exposure to winter storms, 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

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vulnerable populations in *Section 3*. These features include:

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

Potential Climate Change Effects

According to the 2023 ResilientMass Plan, Sea level rise, warming ocean temperatures, and changing atmospheric circulation patterns are likely to increase the frequency and severity of winter storms. Warmer temperatures indicate that more precipitation will fall as rain rather than snow throughout the 21st century. This essentially will create fewer overall snowstorms, but the snowstorms that do occur will likely be worse. This also creates a greater risk for Wintery Mix, Sleet and Ice Storms and hazardous roadway conditions as temperature drops over night will cause transportation infrastructure to ice over without mitigations in place.
In summary, climate change is likely to increase the extent and probability of future snowstorm events in Blackstone. This may have societal impacts as more frequent severe winter storms may change lang use and development protocols; more homes and community buildings may need to account for greater sheltering infrastructure to prepare for heavy snowfall. The Local Planning Team noted that extreme snowfall events were high on their list of concerns.

Vulnerability

Based on the above assessment, Blackstone has a hazard index rating of "2 — high risk" from snowstorms and ice storms. Snowstorms, ice storms, Nor'Easters, and other forms of winter precipitation are a common occurrence in Massachusetts, and expected to only become more common over time. Additionally, the expected increase in "wintery-mix" precipitation may lead to increased roadway hazards as standing water may freeze in overnight temperatures creating hazardous road conditions for travelers and responders. The local team also notes that the Town Hall/Public Safety/Senior Center building has a flat roof and has needed shoveling off during snowy winters, to prevent collapse and protect pedestrians.

Mitigation Strategies

The Town of Blackstone 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. However, the Town's existing capabilities to mitigate and respond to severe snowstorms, ice storms, and Nor'easters could be expanded upon through numerous avenues. The local planning team identified the following strategies that could be used to reduce the threat of Snowstorms in Blackstone:

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1. Evaluate structural conditions and implement long-term solutions for buildings that have previously seen roof damage from winter storms, including Town Hall/Public Safety/Senior Center building, regional High School, and elementary schools
2. Road information coordination and planning for snow removal
3. Install/improve generators at critical public facilities where needed, including the DPW garage and the Fire Station #3; also evaluate feasibility of obtaining a mobile generator to serve multiple public facilities.

4.5 HURRICANES

Hurricanes begin as tropical storms that form over warm ocean waters in the Atlantic Ocean, Pacific Ocean, or off the west coast of Africa. The heated, moist air is drawn up into the atmosphere and begins circulating clockwise or counterclockwise depending on which hemisphere they are in. Tropical storms become hurricanes when their sustained winds exceed 74 miles per hour, or greater. The primary damaging forces associated with these storms are high-level sustained winds and heavy precipitation. Hurricanes winds can reach speeds of up to 200 miles per hour and can grow to 500 miles in diameter. While the official hurricane season starts on June 1st, in New England, hurricanes generally occur between 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, and can result in flooding and wind damage to structures and above-ground utilities.[39]

LOCATION

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

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, 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 5: Saffir-Simpson Scale[40]

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

[39] 2023 ResilientMass Plan

[40] 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 that have affected the region in which Blackstone is located are shown in the following table:

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	"Super Storm"
Andrea	2013	Minor Storm
Elsa	2021	Tropical Storm
Fred	2021	Extratropical Storm
Henri	2021	Tropical Storm/Depression

Blackstone, and the whole Blackstone area, have been hit hard by hurricanes and tropical storms in the past, resulting in widespread flooding. In 1955, Hurricane Connie and Tropical Storm Diane resulted in major flooding. This was noted by the local Planning team as well. USGS Circular #377 reports that 18,800 cfs flowed through the Blackstone River in Blackstone during that storm, which followed only days after heavy rains from Tropical Storm Connie. Historic photos below show the aftermath:

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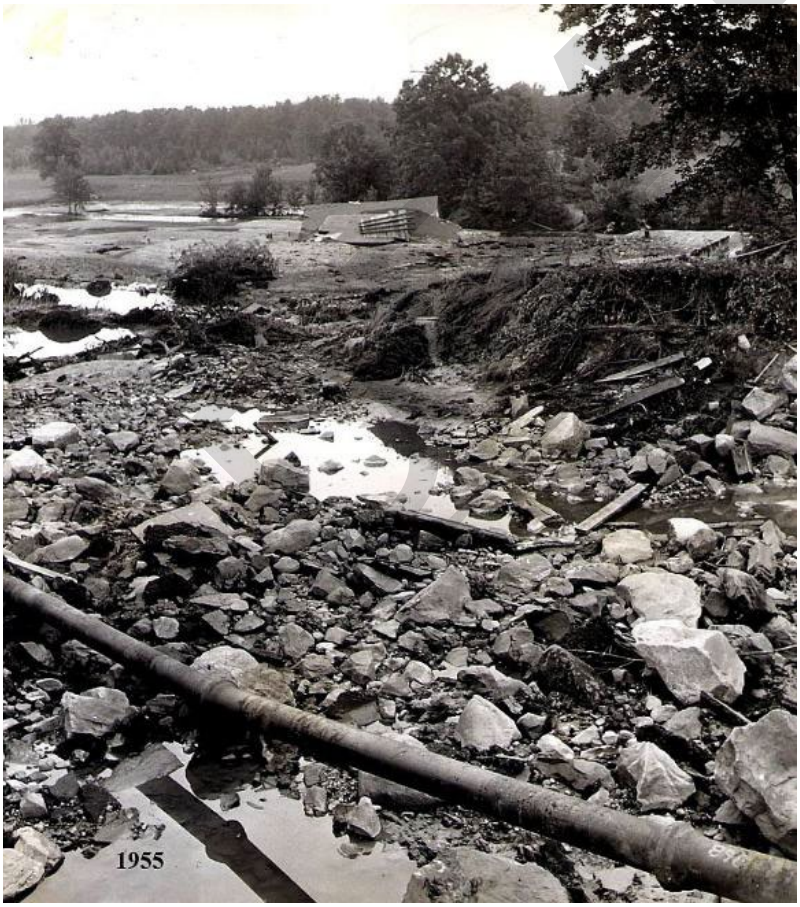
1955


1955

Probability of Future Events

Blackstone's location in central Massachusetts approximately 25 miles inland reduces the risk of extremely high winds that are associated with hurricanes, although it can still experience some high wind events. Based upon past occurrences, it is reasonable to say that there is a "low" probability (1 percent to 10 percent in any given year) of hurricanes in Blackstone. 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 increase in the future.

Impact

A description of the damages that could occur due to a hurricane is described by the Saffir-Simpson scale, as shown below:

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

HAZUS- MH (multiple-hazards) is a computer program developed by FEMA to estimate losses due to a variety of natural hazards. The HAZUS software was used to model potential damages to the community from a 1% and 0.2% hurricane event; storms that are 1% and .0.2% likely to happen in a given year, and roughly equivalent to a Category 1 and Category 2 hurricane. The damages caused by these hypothetical storms were modeled as if the storm track passed directly through the Town, bringing the strongest winds and greatest damage potential.

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	1% storm (89 mph winds)	0.2% storm (102-105 mph winds)
Building Characteristics		
Estimated total number of buildings	2,421.00	
Estimated total building replacement value (2024 $)	$1,146,642,000.00	
Building Damages		
# of buildings sustaining minor damage	189	634
# of buildings sustaining moderate damage	20	176
# of buildings sustaining severe damage	1	24
# of buildings destroyed	1	38
Population Needs		
# of households displaced	5	82
# of people seeking public shelter	2	37
Debris		
Building debris generated (tons)	2,625	10,641
Tree debris generated (tons)	5,687	17,188
# of truckloads to clear building debris	32	208
Value of Damages (thousands of dollars)		
Total property damage (buildings and content)	$ 10,109.82	$66,749.40
Total losses due to business interruption	$ 874.33	$7,642.06

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

The Town faces a "limited" impact from hurricanes, with 10 percent or less of Blackstone affected.

EXPOSURE

Certain features within Blackstone's community 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. Vulnerable community features include:

- The electrical grid is vulnerable to outages from trees falling across power lines. National Grid proactively trims trees in their right of way, but outages are still common. Though concerns regarding street trees are a Town-wide issue, the local planning team identified Adin Street, Dutcher Street, Mill Street, and Freedom Street as particularly vulnerable. During Hurricane Irene in 2011, some neighborhoods in Blackstone were without power for 3 to 4 days.
- Municipal buildings have been impacted by high winds in the past. Damage to these buildings could impact critical town functions and be a distraction from other essential emergency response and recovery activities.
- Public safety, utility, and highway department workers, who are tasked with responding to emergency calls and keeping the streets clear during hurricanes.

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

Potential Climate Change Effects

According to the 2023 ResilientMass Plan, climate change may have the following impacts on hurricane activity within the region:

- 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.
- 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 Blackstone. Having been hit previously by a named tropical storm which devastated their community through flooding and precipitation, the chief concern of the local planning team is greater expanded upon in that section of the plan.

Vulnerability

Based on the above analysis, Blackstone has a hazard index rating of "3 – medium risk" from hurricanes. The local team notes that the site of the current Town Hall/Public Safety/Senior Center building (built in the late 1960s) was underwater during Tropical Storm Diane, suggesting that critical items located in the basement (including the generator, archives and fire apparatus parking) are vulnerable to extreme storms. Other critical facilities such as Fire Station #2/EOC (in an area susceptible to minor flooding), evacuation routes such as Main Street, Blackstone Street and Elm Street and low-lying water pump stations (esp. #2 and #7) would also be vulnerable to tropical storms.

Mitigation Strategies

The Town of Blackstone 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, the Town's existing capabilities to mitigate and respond to hurricanes could be expanded upon through numerous avenues. The local planning team identified the following strategies that could be used to reduce the threat of hurricanes in Blackstone:

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- Continued drainage and structural resiliency improvements at Saint Paul Street/Rivers Edge Road/Farnum Street/Canal Street near Town Hall/Public Safety/Senior Center building; area is just above Blackstone River 100-year flood zone and sees recurrent basement flooding in heavy/long rain events
- Conduct field inventory of bridges to rank and prioritize projects for increased flooding resiliency and storm-hardening. Design and implement priority resizing or replacement projects. Known problem areas should be areas of focus, and they include: Elm Street Bridge, Lincoln Street Bridge, culverts on Lincoln Street, Blackstone Street, and Shore Drive.
- Complete a Town-wide dam assessment of all public, private, and beaver dams, focusing on reducing the risk of flooding from dam failures during intense storm events and protection of ecosystems that provide flood storage and other resilience benefits.
- Investigate/join the Central Massachusetts Stormwater Coalition to aid in public outreach and funding of drainage improvements.
- Assess green infrastructure opportunities for stormwater management and develop a list of specific priorities. Review Town regulations and update as necessary to support green infrastructure and low-impact development. Consider projects in areas that are prone to flooding, such as the Harris Pond Village neighborhood, including Shore Drive and the Precious Blood Cemetery.

4.6 Severe Thunderstorms / Wind / Tornado

A thunderstorm is a storm with lightning and thunder produced by a cumulonimbus cloud, usually producing gusty winds, heavy rain, and sometimes generating hail. Effective January 5, 2010, the 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 recorded was a downburst in North Carolina of 175 mph. Winds exceeding 100 mph have been measured from downbursts in Massachusetts.[41]

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

[41] 2023 ResilientMass Plan

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 a path that ranges from a few dozen yards to over a mile in width. The path of a tornado may be hard to predict because they can stall or change direction abruptly. Within Massachusetts, tornadoes have occurred most frequently in the Connecticut River Valley and in western Worcester County. 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.

Location

As per the 2023 ResilientMass Plan, the entire town is at risk of high winds, severe thunderstorms, and tornadoes. The plan identifies Blackstone and its surrounding communities as having a moderate frequency of tornado occurrence within the Massachusetts context. However, the actual area affected by thunderstorms, wind, or tornadoes is "small," with less than 10 percent of the Town generally affected.

Extent

An average thunderstorm is 15 miles across and lasts 30 minutes; severe thunderstorms can be 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 can be linked to a number of different hazards, including hurricanes and winter storms, in addition to thunderstorms and tornadoes. High winds can cause damage to structures, trees, as well as increase the risk of wildfire.

Tornadoes are measured using the enhanced F-Scale, shown with the following categories and corresponding descriptions of damage:

Table 6: Enhanced Fujita Scale Levels and Descriptions of Damage[42]

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; damages to sign boards.
EF1	Moderate	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	Significant	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	Severe	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	Devastating	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.

[42] 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.

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Table 7: Extent Scale for Hail[43]

HAIL SIZE (in.)	OBJECT ANALOG REPORTED
.50	Marble, moth ball
.75	Penny
.88	Nickel
1.00	Quarter
1.25	Half Dollar
1.50	Walnut, ping pong
1.75	Golf ball
2.0	Hen egg
2.5	Tennis ball
2.75	Baseball
3.00	Tea cup
4.00	Grapefruit
4.50	Softball

Previous Occurrences

Because thunderstorms and wind affect the town regularly on an annual basis, there are not significant records available for these events. As per the Massachusetts Hazard Mitigation 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. However, a data search for tornadoes rating 3 or above, or resulting in death/injury, or significant property damage, identifies the following events:

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

Within the last 5 years, there has only been one small tornado that has affected communities near Blackstone:

- 2018 Tornado (East Douglas, Uxbridge, Upton)

Thunderstorm occurrences are more frequent in Massachusetts than tornados, as Thunderstorms have the potential to produce tornadoes. However, the type of storm that most commonly produces tornadoes is supercells: severe, long-lived thunderstorms. Approximately 20 percent of supercells

[43] Storm Prediction Center, "Converting Traditional Hail Size Descriptions," Spc.noaa.gov, National Oceanic and Atmospheric Administration, accessed June 10, 2024, https://www.spc.noaa.gov/misc/tables/hailsize.htm.

produce tornadoes. In Blackstone there have been several severe thunderstorm/wind occurrences:

- 10/01/2010 – Strong Wind: Several waves of low pressure moved across Southern New England bringing unseasonably warm air into the area. This allowed for good mixing which brought strong winds from a strong low level jet to the surface. The Automated Surface Observing Station at Worcester Regional Airport (KORH) recorded sustained winds of 31 mph and a wind gust of 47 mph. Several trees were downed throughout southern Worcester County, including one in Oxford that landed on a garage and another downed on wires on Elm Street in Blackstone.
- 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. In Blackstone, power lines were downed onto the intersection of Reilly Avenue and Austin Street. Trees were downed onto wires on Williams Street in Hopedale. In Grafton, a tree was downed onto a house on Pleasant Street. A tree was downed onto a house on Snow Street in Webster. In Uxbridge, a tree was downed onto a house on West Street. A two foot diameter tree was downed on Fowler Road in Northbridge.
- 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. At 9:33 AM EST a tree and wires were down on Flint Road at Old Town Road. At 10:05 AM EST a tree and wires were down on Fitzgerald Street in Charlton. At 11:57 AM EST a tree and wires were down on Grove Street in Worcester. At 2:22 PM EST the Automated Surface Observing System platform at Worcester Regional Airport measured a wind gust to 64 mph. At 2:29 PM EST a tree was down at the intersection of U.S> Route 20 and State Route 50 in Oxford. At 2:43 PM EST an amateur radio operator in Mendon reported a gust to 67 mph. At 4:47 PM EST a large tree blocked U.S. Route 20 in Auburn. At 5 PM EST a tree was down on Union Street in Blackstone. At 7:05 PM EST a tree fell through the roof of a house on Columbine Street in Worcester; also, a tree was down on Richmond Street in Worcester.
- 06/23/2015 – Thunderstorm Wind: A strong cold front combined with a remnant of an elevated mixed layer (EML) and a significant amount of deep layer shear and instability to produce showers and thunderstorms across southern New England. Many of these thunderstorms became severe, producing strong to damaging winds, large hail, and even two EF0 tornadoes. A tree was downed onto wires at the intersection of Milk and Chestnut Streets in Blackstone.
- 01/01/2019 – High Wind: Low pressure center passing through New York State on January 1 brought strong west winds to Massachusetts on January 1. At 11:10 AM EST a tree fell on Arnold Road in Sturbridge. At 11:15 AM EST a tree fell on wires on Beaver Street in Worcester. At 11:15 AM EST a large tree fell on Blackstone Street in Blackstone. At 11:35 AM EST a tree fell on Leland Hill Road in Grafton. At 12:30 PM EST a tree fell

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on a car on Canal Street in Sutton. At 2:33 PM EST a tree fell on Morrison Drive in Mendon. At 10:53 AM EST an amateur radio operator estimated a wind gust of 53 mph.

- 07/17/2019 – Thunderstorm Wind: An approaching cold front, coupled with moisture associated with the remnants of Barry brought showers and thunderstorms to the region. A few of these storms were severe, with damaging wind gusts. There was also isolated flooding from heavy rainfall. In Blackstone, trees were down on Lincoln Street at Tee Jay Lane. Also, a tree was down at the intersection of Goddard and Washington Streets.
- 08/19/2019 – Thunderstorm Wind: An upper level short wave combined with a surface trough and unstable conditions to provide an environment favorable for severe thunderstorms, with both large hail and damaging wind gusts. In Blackstone, a tree was down on Federal Street near the Hartnett Middle School. Trees and wires were down on Farm Street.
- 02/28/2024 – High Wind: A strong cold front crossed southern New England on Wednesday night the 28th bringing soaking rains and strong wind gusts to southern New England followed by sharply falling temperatures. This cold frontal passage included a fine line stronger storms. Winds generally gusted 45 to 55 mph. The strongest gusts were 59 mph at the Worcester Airport ASOS (KORH) at 2:18 AM EST on the 29th and a gust to 55 mph at the Fitchburg Airport ASOS (KFIT) at 1:57 AM EST on the 29th.

Also, the Local HMP Committee noted that two lightning strikes damaged multiple homes each within town during the summer of 2023. One of these strikes damaged two homes off of King Street, and another damaged three homes on Ingrid Drive.

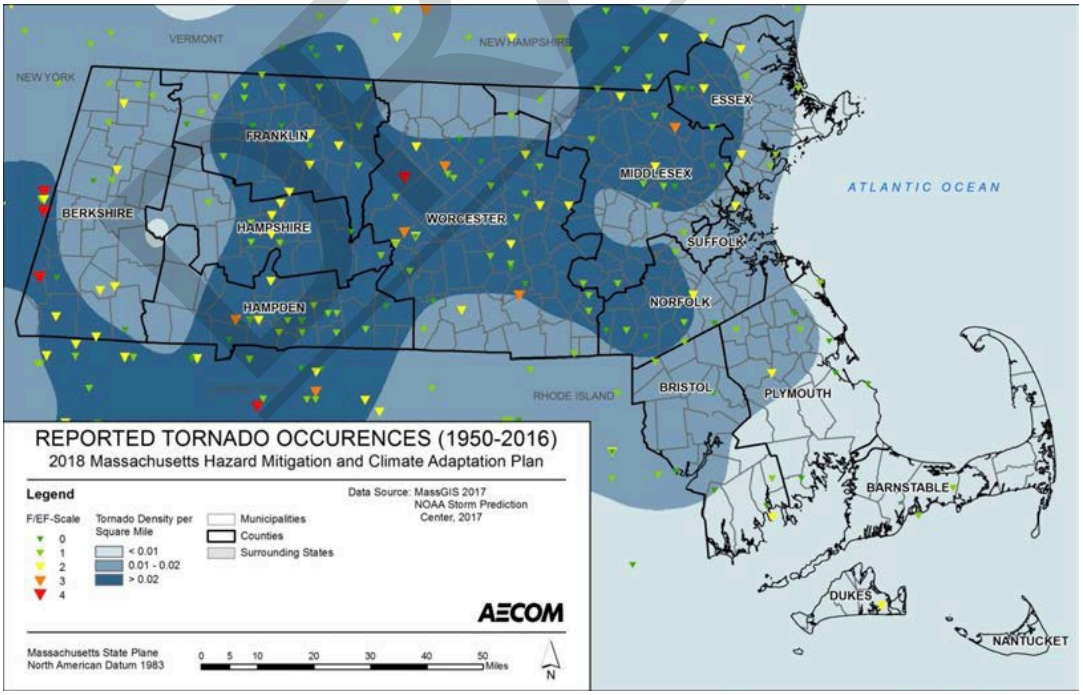

Image 1: Density of Reported Tornados per Square Mile (1950-2016). Source: Massachusetts State Hazard Mitigation and Climate Adaptation Plan, 2018.

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Image 2: 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 Landsat 5 satellite.

Probability of Future Events

According to the 2023 ResilientMass Plan, Massachusetts averages two to five tornadoes per year. Only two tornadoes (1953 and 2011) received disaster declarations. Massachusetts has experienced 12 tornadoes since 2018 (EF0 to EF1). Massachusetts experienced six tornadoes in 2021 (EF0), causing under $50,000 in property damage. Because tornadoes are relatively rare in the Commonwealth, residents are less likely to be prepared. Populations in manufactured housing such as mobile homes are more at risk. Tornadoes can affect all sectors and populations, and their primary effect is damage from 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 it is difficult to predict the likelihood of future events in Blackstone.

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

Impact

Overall, Blackstone faces a "minor" impact from severe thunderstorms, and a "limited" impact from severe winds, or tornados, with 10 percent or less of the Town likely to be affected.

The Enhanced Fujita Scale Levels for tornados describes the likely impacts of tornados on the physical environment:

As indicated as part of the Enhanced Fujita Scale Levels for tornados, the following impacts can result from a tornado:

- EF0 - Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.

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- EF1 - 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 - Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
- EF3 - Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest 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 Blackstone, a tornado that hit residential areas would leave much more damage than a tornado with a travel path that ran along the town's uplands, where less settlement has occurred. Most buildings in the 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 60.87% percent of the town's 4,030 total housing units were constructed in 1979 or earlier (American Communities Survey, 2022 5-year estimate). Beyond private homes, some important Town facilities are vulnerable to strong winds and tornados.

Utilizing the Town's median home value of $355,100 (American Communities Survey, 2022 5-year estimate), combined with the total value of all property, $1,385,688,347 (Massachusetts Dept. of Revenue, 2024), and an estimated 10 percent of damage to 5 percent of all structures, the estimated amount of damage from a tornado is $6,928,441.735. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

EXPOSURE

Certain features within Blackstone's community 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 features vulnerable to hurricanes and flooding.

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 unclear if tornado frequency will increase with climate change. Some studies suggest there will be a decrease in the number of tornado days, but an increase in the number of tornadoes per day. (pg. 5.1-56).

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

VULNERABILITY

Based on the above assessment, Blackstone has a hazard index rating of "2- high risk" from severe thunderstorms and winds, and a "4 – low risk" from tornadoes.

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MITIGATION STRATEGIES

The Town of Blackstone 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, the Town's existing capabilities to mitigate and respond to severe thunderstorms, wind, and tornadoes could be expanded upon through numerous avenues. The local planning team identified the following strategies that could be used to reduce the threat of severe thunderstorms and tornados in Blackstone:

- Establish a town program to buy lightning rods on an as-needed basis.
- Tree trimming needed throughout town to protect utility wires; coordinate with utility to implement systematic approach

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4.7 Wildfires / Bush Fires

Wildfires are typically larger fires, involving full-sized trees as well as meadows and scrublands. Brushfires are uncontrolled fires that occur in meadows and scrublands, but do not involve full-sized trees. Typical causes of brushfires and wildfires are lightning strikes, human carelessness, and arson. Relative humidity and wind and two weather-related factors that influence fire danger. Relative humidity refers to "the ratio of the amount of moisture in the air to the amount of moisture necessary to saturate the air at the same temperature and pressure."[44] When relative moisture drops, light fuels like grasses become drier and burn more easily.[45]

FEMA has classifications for 3 different classes 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 lightening
- Crown fires move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions.

Potential vulnerabilities to wildfires include damage to structures and other improvements and impacts on natural resources. Smoke and air pollution from wildfires can be a health hazard, especially for sensitive populations including children, the elderly, and those with respiratory and cardiovascular diseases.

Location

Approximately 62% of total land area in Southern Worcester County is forested land.[46] Much of this region of Massachusetts, including the Blackstone area, have a high risk of wildfire. In Blackstone, an estimated 63.99% of the land is forested.[47] Blackstone is developed in a moderate to high-density suburban pattern, with few uninterrupted tracts of forest present. Although the substantial tree cover does present some risk for wildfires and brushfires, the total amount of town that could be affected by a wildfire is categorized as "small," or less than 10 percent of the total area.

The public water supply in Blackstone covers roughly 90% of the Town. The majority of water is supplied by a tubular well field on Mill Street located within the Blackstone golf course. There are also five separate wells located on the water treatment plant property that provide additional water. The Blackstone Fire Department manages a cistern off Francis Road and has the ability to pull water from Spindleville Pond for firefighting purposes.

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[44] "Understanding Fire Danger," Nps.gov, United States National Park Service, August 17, 2023, https://www.nps.gov/articles/understanding-fire-danger.htm.
[45] Ibid.
[46] 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.
[47] Ibid.

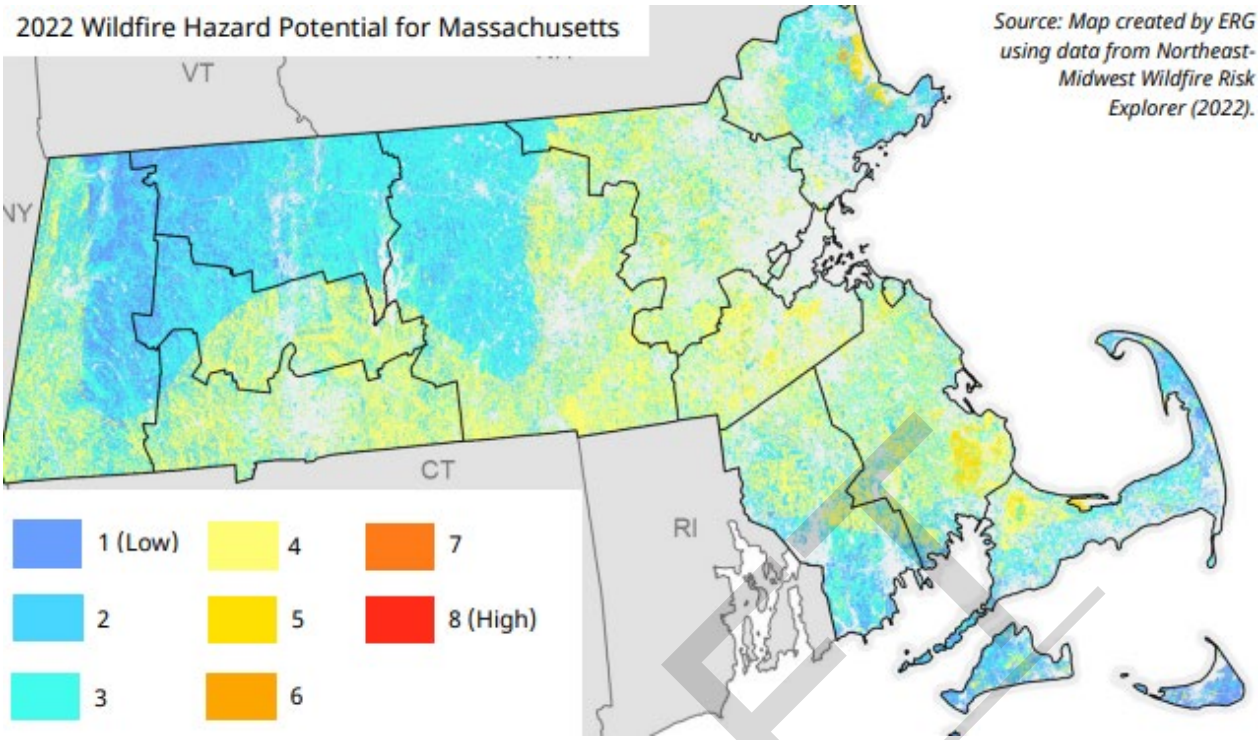

Figure 1: Wildfire Risk Areas for the Commonwealth of Massachusetts. Sourced from the 2023 ResilientMass Plan.

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. Fires can last for several hours up to several days.

In Blackstone, approximately 63.99 percent of the town's total land area is deciduous forest, evergreen forest, or forested wetland, and an additional 16.17% of the town consists of grassland or shrub. These areas are at risk of fire and are spread evenly throughout the community, with developed areas, rivers, and major transportation corridors (Route 140 and the Grafton-Upton Railroad) breaking up the forest. In drought conditions, a brushfire or wildfire would be a matter of concern.

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

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.

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

Beyond the direct hazards that wildfires pose, wildfires pose an additional indirect hazard of reducing air quality through smoke particulates. This is measured, along with other particulates that effect air quality, by the EPA's Air Quality Index[48]. 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 protection of public health. AQI values at or below 100 are generally thought of as satisfactory. When AQI values are 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: 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.

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

AQI Basics for Ozone and Particle Pollution

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

Previous Occurrences

Blackstone has a full-time Fire Department providing 24/7 coverage. In addition, Blackstone is part of the South Middlesex County Fire Department (Mutual Aid District 14), with 23 other Towns. Blackstone has experienced four brushfires between 2001-2020, however, each of these fires were quite small; the largest was only two acres in size, and altogether they consumed only three acres of brush/wildland (Massachusetts Fire Incident Reporting System). In 1995, one brushfire off of Greene Street consumed 50 acres of brush/wildland. This fire was of particular significance not only because of its size, but also because of the residential development contained in that area. Thankfully, no residential property was affected by this fire. The local planning team identified concerns regarding brush fires that are caused by sparking of the Grafton-Upton Railway, however, this railway was not the cause of the sizable fire in 1995, a permit fire was. In addition, the local planning team identified the Parklands as vulnerable to wildfires because of its large tracts of uninterrupted forested land.

Probability of Future Events

The Blackstone Hazard Mitigation Team found it difficult to predict the likelihood of wildfires in a

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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 brush fires, the planning team determined the probability of future damaging wildfire events to be "moderate" (10 percent to 40 percent probability in the next year).

The 2023 ResilientMass Plan notes that changes in precipitation, prolonged drought conditions, rising temperatures, and increased frequency of thunderstorms are expected to increase the frequency and severity of wildfires. Particularly in drought conditions, forest types that are not typically prone to fire hazard will become more likely to burn. Globally, wildfires are projected to increase worldwide by 14% by 2030, 30% by 2050, and 50% 2100.

Climate scenarios project that by mid-century, the mean summer temperatures in the Blackstone River basin will increase by 3.6° F to 8.1° F.[49] Combined with increasingly variable precipitation, rising temperatures could exacerbate summer drought and further promote high-elevation wildfires, releasing stores of carbon and further contributing to the buildup of greenhouse gases.

Climate change is also predicted to bring increased wind damage from major storms, as well as new types of pests 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.

IMPACT

While a large wildfire could in theory damage much of the landmass of Blackstone, most forested areas are sparsely developed, meaning that wildfire affected areas are not likely to cause damage to property. For this reason, the town faces a "minor" impact from wildfires, with little damage likely to occur.

Both wildfires and brush fires can consume homes, other buildings and/or agricultural resources. The impact of wildfires and brush fires are as follows:

- Impact to benefits that people receive from the environment, such as food/water and the regulation of floods and drought
- Impact on local heritage, through the destruction of natural features
- Impact to the economy, due to damage to property and income from land following a wildfire
- Impact through the destruction of people and property

Utilizing the total value of all property, $1,385,688,347 and an estimated 5 percent of damage to 1 percent of all structures, the estimated amount of damage from a wildfire is $692,844.17. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

EXPOSURE

In Southern Worcester County[50], the Wildland Urban Interface (WUI) defined as is the area where

[49] ResilientMass Maps and Data Center, "Climate Change Projections Dashboard," Resilientma-mapcenter-mass-eoeea.hub.arcgis.com, ResilientMass, accessed July 1, 2024, https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/#ClimateDashboard.

[50] Volker C. Radeloff et al., "The 1990-2020 wildland-urban interface of the conterminous United States -

houses meet or intermingle with undeveloped wildland vegetation, represents a large percentage of the land use within Worcester county as a whole.

Certain features within Blackstone's community infrastructure, society, and environment may face more exposure to wildfires/brushfires, 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 community features include:

- People who are sensitive to smoke, including children, the elderly, and individuals with other health conditions. Wildfires outside of Blackstone may also impact the town residents. Air pollution from wildfires can be a severe public health concern. Smoke can exacerbate respiratory conditions like asthma and carry toxic chemicals and particulate matter. In 2021, wildfire smoke from western states and Canada extended across the continental US forced the Massachusetts Department of Environmental Protection to issue an air quality alert.[51]
- First responders, especially the town's firefighters.

Additionally, 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, Air quality was reduced throughout the months of May and June, with the AQI for Worcester County peaking at 148: Unhealthy for Sensitive Groups for fine particulate matter (PM2.5) on June 6th 2023[52].

Potential Climate Change Effects

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. 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% 2100.

Seasonal drought 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 Blackstone. The increase in wildfires may result in changes in land use, such as the Town no longer being able to develop nearby dense forest. Additionally, if brush fires 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 Blackstone from wildfires are hard to predict with any certainty, and represent a threat to the broader region more than a single town, but air purifying equipment may need to be included within shelter planning within the foreseeable future.

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.

[51] 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/.

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

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VULNERABILITY

Based on the above assessment, Blackstone has a hazard risk index of "4 – low risk" from wildfires. However, this risk assessment is highly dependent on short term weather patterns like wind, lightning, and rainfall, which are impossible for the town to predict with certainty.

MITIGATION STRATEGIES

The Town of Blackstone is currently able to effectively respond to wildfires and brushfires through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, the Town's existing capabilities to mitigate and respond to wildfires and brushfires could be expanded upon through numerous avenues. The local planning team identified the following strategies that could be used to reduce the threat of wildfires / brush fires in Blackstone:

- Improve vegetation and debris management along P&W Railroad rights-of-way; recurrent brush fires reported near tracks.
- Investigate rural firefighting capabilities for the town. Investigate options for having more rural firefighting assets such as dry hydrants and cisterns.
- In tandem with water conservation outreach listed above, conduct enhanced enforcement of water usage restrictions (in part to conserve water for firefighting).

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4.8 EARTHQUAKES

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

LOCATION

Because of the regional nature of the hazard, the entire Town of Blackstone is susceptible to earthquakes. This makes the location of occurrence "large," or over 50 percent of the total area.

EXTENT

The magnitude of an earthquake is sometimes measured using the Richter Scale, which measures the energy of an earthquake by determining the size of the greatest vibrations recorded on the seismogram. On this scale, one step up in magnitude (from 5.0 to 6.0, for example) increases the energy 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.[53]

Table 8: Richter Scale Magnitudes and Effects

Magnitude	Effects
< 3.5	Generally not felt, but recorded.
3.5 - 5.4	Often felt, but rarely causes damage.
5.4 - 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 - 6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0 - 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or >	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

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[53] "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, with I denoting a weak earthquake and XII denoting an earthquake that causes almost complete destruction.

Table 9: Modified Mercalli Intensity Scale for and Effects[54]

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

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

Previous Occurrences

The last earthquake to cause major damage in New England occurred in 1755,[55] though seismologists state that another serious earthquake occurrence is possible. There are five seismological faults in Massachusetts, but there is no discernible pattern of previous earthquakes along these fault lines. Additionally, earthquakes that are based in more seismologically active regions like parts of Canada may also impact Massachusetts.[56] Earthquakes occur without warning and may be followed by aftershocks. Image 4 below shows the locations of earthquakes that have occurred across the New England region and beyond over the last 45 years.

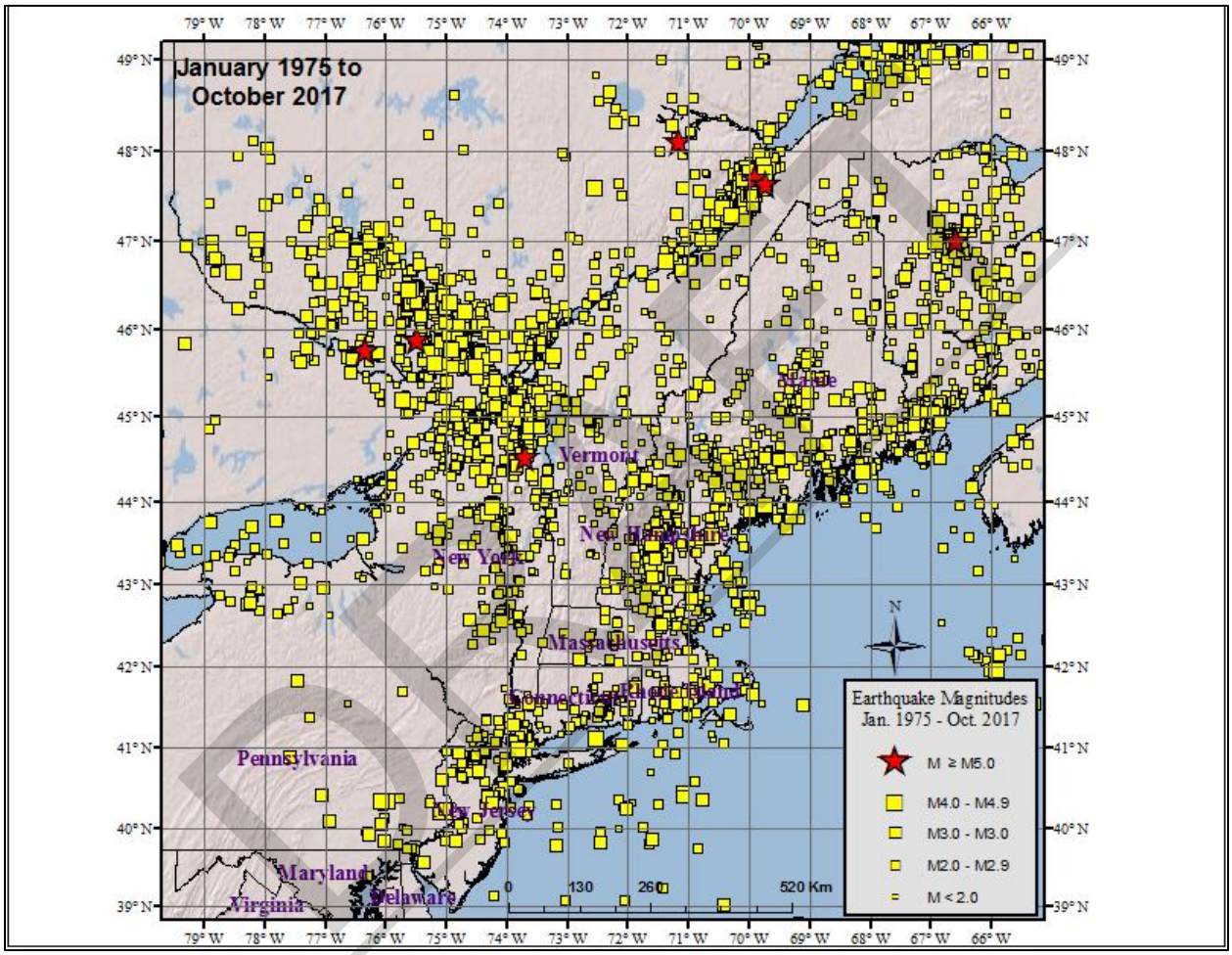

Image 3: Map of Earthquakes of the Northeastern US and Southeastern Canada 1975 to 2017. Source: The Northeast States Emergency Consortium website.

The local Hazard Mitigation Team reports that no earthquakes have been felt in Blackstone. To determine whether earthquakes have occurred recently near Blackstone, events listed by Weston Observatory in Boston College were reviewed for all towns in Massachusetts for a five-year lookback.

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

[56] 2023 ResilientMass Plan.

Listed earthquakes above magnitude 2.0 include:

- 07/25/2021 – 5.0km W OF PEABODY 1.4/2.5 [Mn*/Mc**]
- 01/01/2022 – 13.0km N OF ROCKPORT 2.3/3.0
- 03/04/2022 - 5.0km WSW OF ORANGE 2.2/2.7
- 11/10/2022 – 12.0km NW OF NANTUCKET 2.6/3.0
- 11/13/2023 – 208.0km E OF CHATHAM 2.8/3.3
- 12/26/2023 – 52.0km ENE OF ROCKPORT 2.2/2.8
- 03/11/2024 – 6.0KM E OF LAWRENCE 1.1/2.1

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

Each of these earthquakes are minor. Additionally, earthquakes with a magnitude of about 2.0 or less are usually called "microearthquakes" and are generally only recorded locally[57].

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

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%[58]" Additionally, the plan notes that while Massachusetts is not near any tectonic plate boundaries, it is still susceptible to earthquakes on the North American Plate. Earthquakes elsewhere could also have secondary effects to the state and the region, potentially disrupting supply chains or causing other secondary effects.

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

Impact

Massachusetts introduced earthquake design requirements into their building code in 1975 and improved building code for seismic reasons in the 1980s. However, these specifications apply only to new buildings or to extensively modified existing buildings. Buildings, bridges, water supply lines, electrical power lines and facilities built before the 1980s may not have been 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 60.9% of the town's 4,030 housing units, according to 2022 American Community Survey 5-year estimates, were constructed in 1979 or earlier.[59] The seismic standards were upgraded with the 1997 revision of the State Building Code. Despite its fairly old average housing stock, Blackstone faces a "minor" impact from earthquakes, with little

[57] 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.
[58] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," page 5.1-42.
[59] "DP04: Selected Housing Characteristics," Data.Census.gov, United States Census Bureau, accessed June 10, 2024, https://data.census.gov/table/ACSDP5Y2022.DP04?q=dp04%20blackstone%20massachusets.

damage likely to occur due to the extreme rarity of damaging events.

HAZUS-MH (multiple-hazards) is a computer program developed by FEMA to estimate 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 had been 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 event occurred in 1963.

	Magnitude 5.0
Building Characteristics	
Estimated total number of buildings	2,421.00
Estimated total building replacement value (2010 $)	$1,146,642,000.00
Building Damages	
# of buildings sustaining slight damage	729
# of buildings sustaining moderate damage	359
# of buildings sustaining extensive damage	79
# of buildings completely damaged	17
Population Needs	
# of households displaced	60
# of people seeking public shelter	27
Debris	
Building debris generated (tons)	18,000
# of truckloads to clear debris (@ 25 tons/truck)	720
Value of Damages (dollars)	
Total property damage	$150,320,000.00
Total losses due to business interruption	$18,708,200.00

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

EXPOSURE

Certain features within Blackstone's community 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* ***Error! Reference source not found.***. Vulnerable community features include:

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- Older buildings constructed prior to the first edition of the Massachusetts State Building Code.

Potential Climate Change Effects

According to the 2023 ResilientMass Plan, no climate change effects have been identified that pertain to earthquake hazards.

Vulnerability

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

Mitigation Strategies

The Town of Blackstone 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, the Town's existing capabilities to mitigate and respond to eartquakes could be expanded upon through numerous avenues. The local planning team identified the following strategies that could be used to reduce the threat of Earthquakes in Blackstone:

- During next municipal facilities or capital improvement planning process; review options for relocating departments (esp. public safety departments) away from current Town Hall/Public Safety/Senior Center building.
- Evacuation Plan updates; where possible, ensure that routes are outside of hazard areas

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4.9 Dam Failure

Dams and their associated impoundments provide many benefits to a community, such as water supply, recreation, hydroelectric power generation, and flood control. However, they also pose a potential risk to lives and property. 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 above overtop and erode the material components of the dam. Other failures are caused by foundation defects, inadequate maintenance, internal erosion caused by seepage, and many other specific causes.[60] Dam failure may be influenced by storm floodwaters but most are caused by structural, mechanical, or hydraulic failures.[61] Dam breeches can lead to catastrophic consequences as the water 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 will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

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

Location

According to the Massachusetts Office of Dam Safety, there are 10 reported dams in Blackstone, of which 0 are High Hazard and 1 is a Significant Hazard. Of some note is the Lake Hiawatha Dam, Town-owned, which was on the state's 2011 list of 100 dams needing substantial investments in maintenance and/or operations; these concerns were substantially addressed using funds from a state earmark, and the dam is no longer considered in poor condition. In addition to the dams in town, the Harris Pond Dam (High Hazard, RI00073) in neighboring Woonsocket, RI lies immediately along the town/state boundary, creating Harris Pond upstream from the dam. The pond itself is almost completely within Blackstone. Fortunately for Blackstone, impacts from a failure event would take place almost completely in Rhode Island. A former iteration of this dam failed due to embankment collapse during Tropical Storm Diane in 1955, according to the Association of State Dam Safety Officials' inventory of failures and near-failures. Blackstone dams are listed below and are mapped in Appendix A.

[60] "Dam Failures and Incidents," Damsafety.org, Association of State Dam Safety Officials, accessed June 10, 2024, https://damsafety.org/dam-failures.

[61] "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.

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National ID	Dam Name	Owner	Regulatory Authority	Hazard Code	Notes
MA00096	Stone Diversion Dam	Private	Office of Dam Safety	Low Hazard	AKA Rolling Dam, Historic
MA01164	Blackstone River Dam at Canal Street	Town of Blackstone	Office of Dam Safety	Low Hazard	
MA01167	Lake Hiawatha Dam	Town of Blackstone	Office of Dam Safety	Significant Hazard	Assessed every 5 Years, Last Assessment deemed "Satisfactory"
MA02741	Canal Headgate Dam	Private	Office of Dam Safety	N/A	
MA02742	Mill Pond Dam	Private	Office of Dam Safety	Low Hazard	
MA02743	Crain's Pond Dam	Private	Office of Dam Safety	Low Hazard	
MA02744	Fish Pond Dam	Private	Office of Dam Safety	N/A	
MA02745	Fox Brook Dam	Private	Office of Dam Safety	N/A	Historic
MA02746	Old Ice Pond #1 Dam	Private	Office of Dam Safety	N/A	
MA02748	Walsh's Pond Dam	Town of Blackstone	Office of Dam Safety	N/A	

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EXTENT

Often dam or levee breaches lead to catastrophic consequences as the water 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 will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

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

- High Hazard: Dams located where failure or improper operation will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.
- Significant Hazard: Dams located where failure or improper operation may cause loss of

life and damage to homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.

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

Some dams do not have a hazard rating.

Previous Occurrences

To date, there has been one dam failure in Blackstone, as noted by the local team. In the 1960s, a historic low stone dam on the Mill River just upstream from Summer Street failed due to damage from severe winter icing, draining its mill pond and causing minor downstream damage. In addition, the Harris Pond Dam on the Mill River on the border with Woonsocket, RI failed during Tropical Storm Diane in 1955. Harris Pond is located almost entirely in Blackstone, though the dam is in Rhode Island.

Probability of Future Events

Probability for future failure events is "very low" with less than 1 percent chance of a dam bursting in any given year.

Impact

The Town faces a "limited impact" from failure of dams with, with 10 to 25 percent of the Town likely to see damage.

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 be geographically limited to portions of the dam's inundation zone. This may change with future improvements to dam breach modeling software being developed and that are currently in early trial stages, such as the DSS-WISE™ (Decision Support System for Water Infrastructural Security) program[62].

Potential Climate Change Effects

Dam failure through overtopping can be caused by floodwaters flowing into a dammed body of water, exceeding the spillway capacity of the dam, and causing water to flow over dam the top of the dam (overtopping). If the water flowing over the dam erodes the dam itself, then a dam failure can occur. Therefore, the risk of dam failure may be indirectly impacted by climate change through its impacts on flooding.

Vulnerability

Based on a mostly qualitative assessment, Blackstone has a hazard index rating of "3 – medium" from dam failure. While the historic Harris Pond Dam collapse on the Blackstone River in next door Woonsocket, RI during Tropical Storm Diane and the 1960s Summer Street mill pond dam collapse from ice damage are quite unlikely to be repeated, they do indicate that there is local exposure to very extreme events that can result in failures. In addition, while the state's primary concerns with conditions at the Lake Hiawatha Dam have been addressed, it remains a Significant Hazard dam, presenting some continued risk to residences and to the replaced Harris Pond Dam downstream. A

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

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failure at the Lake Hiawatha Dam would also impact Elm Street, a designated evacuation route.

Mitigation Strategies

The Town of Blackstone 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, the Town's existing capabilities to mitigate and respond to dam failure could be expanded upon through numerous avenues. The local planning team identified the following strategies that could be used to reduce the threat of Dam Failure in Blackstone:

- Continue to monitor conditions at the Town- owned Lake Hiawatha Dam (High Hazard) to ensure compliance with state mandate on structural conditions.
- Review communications regarding downstream management of Blackstone River, especially in coordination with neighboring Woonsocket. Ensure that both towns are anticipating the impacts of development on water wells and flood storage area.
- Complete a Town-wide dam assessment of all public, private, and beaver dams, focusing on reducing the risk of flooding from dam failures during intense storm events and protection of ecosystems that provide flood storage and other resilience benefits.

4.10 Drought

Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. In the most general sense, drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector. Reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat are a few examples of the direct impacts of drought. Of course, these impacts can have far-reaching effects throughout the region and even the country.

Location

Because of this hazard's regional nature, a drought would likely impact the entire community, meaning the location of occurrence is "large" or over 50 percent of the town.

Extent

The severity of a drought would determine the scale of the event. The National Drought Mitigation Center also records information on historical drought occurrence. Unfortunately, data are only available at the state level. The National Drought Mitigation Center categorizes drought on a D0-D4 scale as shown below.

Table 10: U.S. Drought Monitor[63]

Classification	Category	Description
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures.

[63] "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.

		Coming out of drought: some lingering water deficits; pastures or crops not fully recovered
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

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Previous Occurrences

In Massachusetts, nine extreme droughts have occurred statewide since 1930, though the Blackstone area has been spared the most severe impacts in each case according to USGS Water Supply Paper for Massachusetts #2375. These historic major droughts range in severity and in length, lasting from three to eight years. In many of these droughts, water-supply systems around the state were found to be inadequate. Water was piped into urban areas, and water-supply systems were modified to permit withdrawals at lower water levels. The following table displays peak drought severity since 2000, from the National Drought Mitigation Center:

Table 11: Annual Drought Status[64]

Year	Maximum Severity
2000	No drought
2001	D2 conditions in 21% of the state
2002	D2 conditions in 100% of the state
2003	No drought
2004	D0 conditions in 48% of the state
2005	D1 conditions in 7% of the state
2006	D0 conditions in 98% of the state
2007	D1 conditions in 71% of the state
2008	D0 conditions in 69% of the state
2009	D0 conditions in 45% of the state
2010	D1 conditions in 27% of the state
2011	D0 conditions in 0.01% of the state
2012	D2 conditions in 51% of the state
2013	D1 conditions in 60% of the state
2014	D1 conditions in 54% of the state
2015	D1 conditions in 58% of the state
2016	D3 conditions in 52% of the state
2017	D3 conditions in 9% of the state
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 0.38% of the state

[64] "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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2024 (through May)	D2 conditions in 0.39% of the state

In Blackstone, there has not been a drought event with substantial impacts for many decades. Blackstone has a Drought Management Plan to issue water bans on odd/even days, meaning that Town water users with odd-numbered addresses are restricted to watering on odd-numbered days, and vice versa. Over the past few years, the local planning team noted that the Town has issued water bans every summer. More recently, the Town has been issuing water bans even when there is a substantial amount of rainfall. And in spring of 2022, the Town enacted a strict water ban, prohibiting outside watering during indicated periods. This stricter policy was to mitigate the inactivation of one of the Town's water wells due to high concentrations of polyfluoroalkyl substances (PFAS).

Probability of Future Events

In Blackstone, as in the rest of the state, extreme and exceptional droughts occur at a "very low" probability (1 to 10 percent in the next year). Based on past events and current criteria outlined in the Massachusetts Drought Management Plan, it appears that Central Massachusetts may be slightly more vulnerable than parts of eastern Massachusetts to severe drought conditions. However, many factors, such as water supply sources, population, economic factors (i.e., agriculture-based economy), and infrastructure, may affect the severity and length of a drought event.

In the long-term, the risk of drought may increase in Blackstone due to climate change influences, which will result in annual increases of consecutive dry days.

Impact

The specific impacts of drought in Massachusetts are categorized by the National Drought Mitigation Center in Table 23 below:

Table 12: Historic Impacts of Drought in Massachusetts[65]

Category	Historically observed impacts
D0	Crop growth is stunted; planting is delayed
	Fire danger is elevated; spring fire season starts early
	Lawns brown early; gardens begin to wilt
	Surface water levels decline
D1	Irrigation use increases; hay and grain yields are lower than normal
	Honey production declines
	Wildfires and ground fires increase
	Trees and landscaping are stressed; fish are stressed
	Voluntary water conservation is requested; reservoir and lake levels are below normal capacity
D2	Specialty crops are impacted in both yield and fruit size
	Producers begin feeding cattle; hay prices are high
	Warnings are issued on outdoor burns; air quality is poor

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

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	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. The volume and rate of groundwater withdrawn from underground aquifers can impact the amount of water that flows through surface water bodies, negatively impacting aquatic ecosystems. Additionally, more impervious surface coverage, and some forms of stormwater infrastructure, can prevent natural infiltration of precipitation into groundwater.[66]

Specific impacts in Blackstone may vary among customers of the water system and private well users. So, while the impact of a drought can be assessed as "minor" overall, with very little damage to people or property likely to occur, impacts may be higher in the parts of Town that are not located within the Town's water service area.

EXPOSURE

Certain features within Blackstone's community infrastructure, society, and environment may face more exposure to drought, 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 community features include:

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

Higher water bills or the cost of re-drilling private wells due to drought impacts, could also negatively affect local residents. Other factors like PFAS contamination of water sources could compound drought-related water supply challenges. Blackstone has already experienced this, having to inactive one of its wells due to PFAS contamination.

POTENTIAL CLIMATE CHANGE EFFECTS

According to the 2023 ResilientMass Plan, there are two major ways that drought can be influenced by climate change:

- 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 constant and more extreme.

[66] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

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- Rising temperatures and changes in precipitation will reduce the snowpack and hasten snowmelt. This could result in less snowmelt recharge of groundwater, less snowmelt feeding stream flows, and less snowmelt as a water source for agriculture.

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 social implications in Blackstone. Considering the impacts of drought on crop yield, land use designated for farming could be altered or reduced. The town may also have to plan for changes in drinking water systems to account for drought conditions, as the current town water system is noted to be "at capacity" by the local planning team, and is primarily fed through town own wells, with some 20% of the town on private well water as the alternative. Resident surveys ranked concerns of water quality/quantity degradation highly in the community survey. In addition, drought is predicted to worsen significantly in other parts of the country, particularly in the southwestern United States, it is possible that this could result in communities from other parts of the country to move to the Northeast including the town of Blackstone.

Vulnerability

Based on the above assessment, Blackstone has a hazard index rating of "4 – low risk" from drought. Minimal or no loss of property, or damage to people or property is expected due to this hazard.

Mitigation Strategies

The Town of Blackstone is currently able to effectively respond to drought through the emergency response facilities and services identified in the critical infrastructure and facilities and existing protection sections of this plan. However, the Town's existing capabilities to mitigate and respond to drought could be expanded upon through numerous avenues. The local planning team identified the following strategies that could be used to reduce the threat of Drought in Blackstone:

- Evaluate feasibility and possibly implement a permanent water system connection between Blackstone and neighboring Bellingham to provide resilience in drought (currently hydrants can be connected to share limited water)
- Plan and site new wells to supply the town water system.
- Continue to provide information to residents and businesses on water conservation through reduction in use, low-impact landscaping and other low-cost measures (in part to conserve water for firefighting)

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4.11 Extreme Temperatures

As per the 2023 ResilientMass Plan, there is no universal definition 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. Extreme heat in Massachusetts is typically defined as a period of 3 or more consecutive days with temperatures above 90 °F.[67] Extreme heat may also refer to any prolonged period of especially hot weather (a heat wave), which may also be accompanied by high humidity. Extreme cold is a dangerous situation that can result in health emergencies for susceptible people, such as those without shelter or who are stranded or who live in homes that are poorly insulated or without heat.

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 Blackstone area are[68]:

	July (Hottest Month)	January (Coldest Month)
Average High (°F)	84.0°	37.8°
Average Low (°F)	63.3°	18.8°

Specific criteria used by the National Weather Service for issuing extreme heat and extreme cold watches, warnings, and advisories, are described in Extent, below.

Location

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

Extent

2023 ResilientMass Plan notes that the extent (severity or magnitude) of extreme cold temperatures are generally measured through the Wind Chill Temperature Index. Wind Chill Temperature is the temperature that people and animals feel when outside and it is based on the rate of heat loss from exposed skin by the effects of wind and cold[69]. In Massachusetts, a wind chill warning is issued by the National Weather Service (NWS) Norton Forecast Office when the Wind Chill Temperature Index, based on sustained wind, is –25°F or lower for at least three hours. NWS Windchill Chart (shows three shaded areas of frostbite danger. Each shaded area shows how long a person can be exposed before frostbite develops.

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[67] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-1-5.2-2.
[68] "Climate," Weather.gov.
[69] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-1-5.2-3.

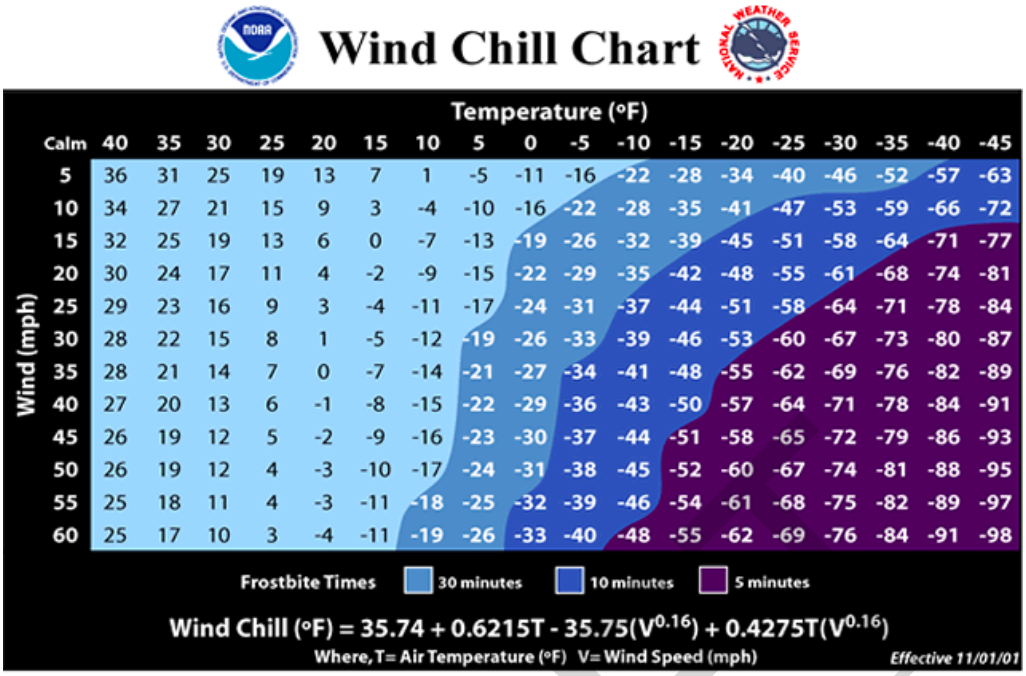

Figure 2: NWS Wind Chill Temperature (WCT) index. Source: https://www.weather.gov/safety/cold-wind-chill-chart

For extremely hot temperatures, the heat index scale is used, which combines relative humidity with actual air temperature to determine the risk to humans. The NWS issues an Excessive Heat Warning when the daytime heat index is forecasted to reach 105 degrees F for 2 or more hours. 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 defines a heat wave as 3 or more days of ≥ 90°F temperatures. The following chart indicates the relationship between heat index and relative humidity:

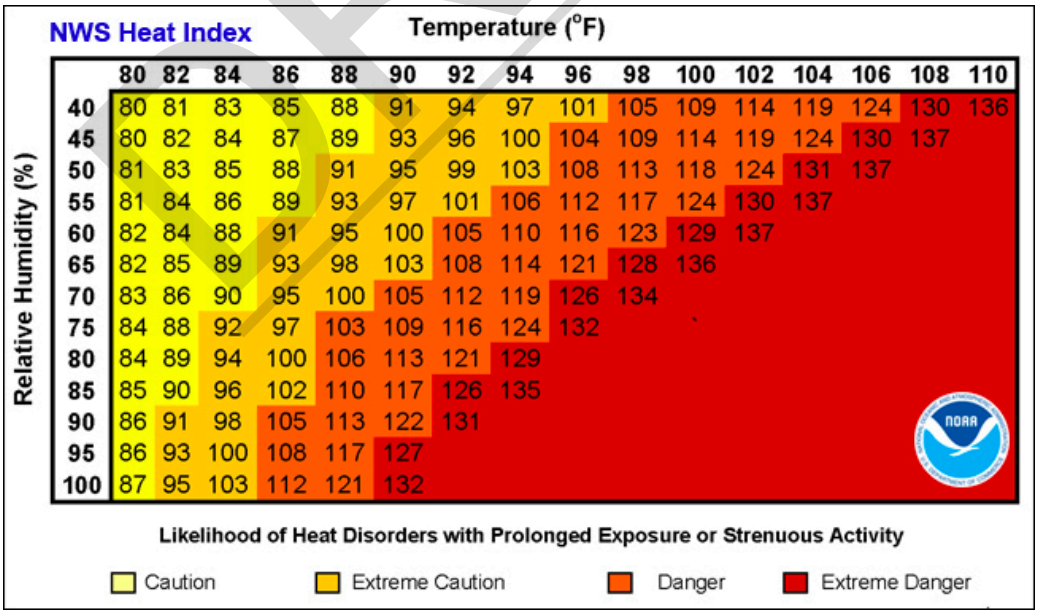

Figure 3: Heat Index. Source: https://www.weather.gov/safety/cold-wind-chill-chart

Extreme heat causes more fatalities in the United States that all other weather-related natural hazards combined.[70] Extreme heat can be the underlying cause of death or can worsen other medical conditions like heart disease, hypertension, alcohol poisoning and drug overdoses.[71] The heat-related mortality rate is higher among males and people aged 65 years and older.[72]

Table 13: Heat Effects on Body lists the effects of 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 to dangerous levels.

Table 13: Heat Effects on Body[73]

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.

Other impacts of high temperatures include drought, wildfire, and the formation of ground-level ozone.[74] Prolonged heat can cause power use to spike and overload the electrical grid, causing outages.[75] Cold temperatures are often combined with winter storms. Individuals may have to deal with the loss of heat and power due to storm damage, which could further subject them to the cold.[76] Carbon monoxide poisoning is another risk during cold weather, especially when households lack adequate power or heat.[77] Extreme heat and cold can both negatively impact transportation infrastructure. Railroad tracks are a particular concern because the metal rails can kink in high temperatures.[78]

Previous Occurrences

There is not a comprehensive data source listing instances when the National Weather Service has issued extreme heat or cold warnings or advisories in Worcester County. Across Massachusetts as a whole, there were 33 cold weather events between 1994 and 2018. The NOAA storm Events database lists the following Extreme Cold/ Wind Chill Events as having occurred in Southern Worcester County since the last Blackstone HMP was developed in 2017:

- 01/06/2018: Strong west winds trailed the January 4 winter storm. These winds drew

[70] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,"
[71] 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.
[72] Ibid.
[73] 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.
[74] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan,"
[75] Ibid.
[76] Ibid.
[77] Ibid.
[78] Ibid.

bitterly cold arctic air over Massachusetts. The combination of strong wind and low temperatures created a dangerous wind chill, with readings reaching 25 degrees below zero or colder in a couple of locations during the early mornings of January 6 and 7.

- 01/21/2019: Strong west to northwest winds trailing the January 20th storm drew cold air across Southern New England on January 21st and caused wind chill values of 25 below zero or colder in Central and Western Massachusetts. The wind diminished during the afternoon and evening of of January 21st allowing wind chill values to become less extreme, in the teens below zero.

According to the 2023 Resilient Mass Plan, there have been 118 warm weather events (heat and excessive heat events) between 1995 and 2022[79]. In Massachusetts, 2010–2022 had seven of the 10 warmest summers on record. The hottest two summers on record for the Commonwealth were 2020 and 2022[80]. August 2022 was the hottest August recorded in the Commonwealth, with temperatures more than 6°F greater than the 20th century average. In 2022, Boston experienced at least 17 days above 90 degrees and two six-day heat waves.

In 2012, Massachusetts temperatures broke 27 heat record[81]s. Most of these records were broken between June 20 and June 22, 2012, during the first major heat wave of the summer to hit Massachusetts and the East Coast[82]. In July 2013, a long period of hot and humid weather occurred throughout New England. One fatality occurred on July 6, when a postal worker collapsed as the heat index reached 100°F[83]

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

Probability of Future Events

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

Impact

The impact of extreme heat or cold in Blackstone is considered to be "limited," with no property damage and a limited effect on humans.

EXPOSURE

Certain features within Blackstone's community 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*. Vulnerable community features include:

- Children and elderly residents, who may find it difficult to regulate their body temperatures in extremely hot or cold conditions.
- Low-income residents unable to afford adequate cooling or heating.

[79] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.2-7-5.2-8.
[80] Ibid.
[81] Ibid.
[82] Ibid.
[83] Ibid.

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- Renters who may have few options for mitigating extreme heat and cold through home improvements.
- People who work outdoors such as construction or farm workers.
- The utility grid, which could be vulnerable to outages due to surges in power during extreme temperatures. Power outages during extremely hot or cold days could cause further problems to those who rely on air conditioners or electric heaters.
- Certain forms of agriculture may be negatively affected by extreme temperatures, especially extreme heat.

Potential Climate Change Effects

According to the 2023 ResilientMass Plan, climate change is already having an effect on temperatures within Massachusetts and beyond, with more high heat days and fewer extreme cold events. This will also shift the average temperature in Massachusetts higher, leading to longer warm seasons. The changes in temperature will also cause 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 health and an increased demand for energy and government services. Secondary climate risks include increased severity of wildfires, droughts, flooding and encroachment by invasive species as temperatures rise. According to the 2023 ResilientMass Plan,

- By 2050 average annual temperatures are expected to increase by 5.9 to 7.9°F. This is a drastically shortened timeline from the previous plan where increases of this magnitude were not expected until the end of the century.[84]
- By 2100, annual average temperatures are expected to increase by 10.0 to 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 historical period (1950-2013), worsening stress on electric transmission and utility distribution infrastructure[85].

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 Blackstone. Seasonal temperatures will shift, with spring and summer temperatures extending through more of the year.[86] Winters may also be more mild than historical norms.[87] 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.[88] In response, Blackstone 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 for

[84] Central Massachusetts Regional Planning Commission and the Local Hazard Mitigation Team, the Town of Blackstone, Massachusetts, "Blackstone Hazard Mitigation Plan," Cmrpc.org, Central Massachusetts Regional Planning Commission and the Town of Blackstone, Massachusetts, January 24, 2017, https://cmrpc.org/wp-content/uploads/2024/02/Blackstone-MA-Hazard-Mitigation-Plan-Narrative-FINAL.pdf.
[85] "2022 Massachusetts Climate Change Assessment," page RS30.
[86] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"
[87] Ibid.
[88] Ibid.

more cooling stations to offer residents, particularly vulnerable populations, such as the elderly and low-income residents. Similarly to drought conditions, Blackstone may have to account for an increase in population of people seeking refuge from extreme heat in other parts of the country.[89]

Vulnerability

Blackstone's vulnerability from extreme heat and cold is considered to be, "4 - Low Risk." The town has operated heating and cooling shelters and continues to do so at their municipal building and other town facilities. Its local ecology with forested areas covering approximately 60% of the town and its location along the Blackstone river also provides natural evaporative and transpirative cooling effects to the town.

Mitigation Strategies

The Town of Blackstone 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's existing capabilities to mitigate and respond to extreme temperatures could be expanded upon through numerous avenues. The local planning team identified the following strategies that could be used to reduce the threat of extreme temperatures in Blackstone:

- Plan and site new wells to supply the town water system.
- Install central air conditioning in the Town's schools to protect children from the impacts of increasing heat.

4.12 Invasive Species

Invasive species, as defined by the Invasive Species Advisory Committee (ISAC) on the U.S. Department of the Interior as "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."[90] This definition distinguishes invasives from other native pest species, such as beavers and deer, which will be discussed in greater detail in subsequent sections. 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 invasives. Invasive species can damage and disrupt existing ecosystems by outcompeting the native flora and fauna and can have negative impacts to water quality for aquatic species and can increase wildfire risks for land born invasives. These effects are all species dependent, making invasives a challenge to address for municipalities affected by some invasives but not others.

Location

Because of this hazard's regional nature, broad swaths of the state are affected by one invasive species or another. In the central region, Emerald Ash Borer (*Agrilus planipennis*) has been detected

[90] 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.

in every city and town within the region.[91] However, since invasives and their effects are very species dependent, and their affects are localized in many instances, this hazard bears a resemblance to other more localized hazards. Blackstone, with its forested uplands and location along the Blackstone River, is vulnerable to intrusion from both land based and aquatic invasive flora and fauna, making the more than 50% of the town affected.

EXTENT

The mercurial nature of and lack of verified data clearinghouses about invasive species, in addition to a lack of resources and capacity for local conservation officials to track invasives creates a dearth of knowledge about the extent of invasives. Very often, it is not until the damage caused by invasives is apparent that the true extent of the hazard is known. Still, there is some resources available to the local hazard mitigation planning team; the chief sources being utilized for this plan being the Massachusetts Department of Agriculture's Invasive Pest Dashboard[92]; the Center for Invasive Species and Ecosystem Health's Early Detection and Distribution Mapping System (EDDMapS) hosted by the University of Georgia[93]; and the Forest Ecosystem Monitoring Cooperative's Northeastern Forest Health Atlas[94]. In Worcester County, according to EDDMapS analysis of verified invasive species reporting from 2017 to 2024 there have been 378 records of locations with invasive species with 353 distinct sightings of invasive species ranging from plants to insects that have been left unchecked, with 2 invasive species being treated, and a total of 47 acres considered to be infested[95].

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[91] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," page 5.1-48.
[92] "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.
[93] "My EDDMapS," EDDMapS.org, Center for Invasive Species and Ecosystem Health, accessed June 10, 2024, https://www.eddmaps.org/tools/query/index.cfm?observationDateStart=06/03/2017&observationDateEnd=06/03/2024&eradicationstatus=1,2&country=926&state=92625000&fipscode=92625027.
[94] "Northeastern Forest Health Atlas," UVM.edu, Forest Ecosystem Monitoring Cooperative, accessed June 10, 2024, https://www.uvm.edu/femc/forest-health-atlas.
[95]"My EDDMapS," EDDMapS.org.

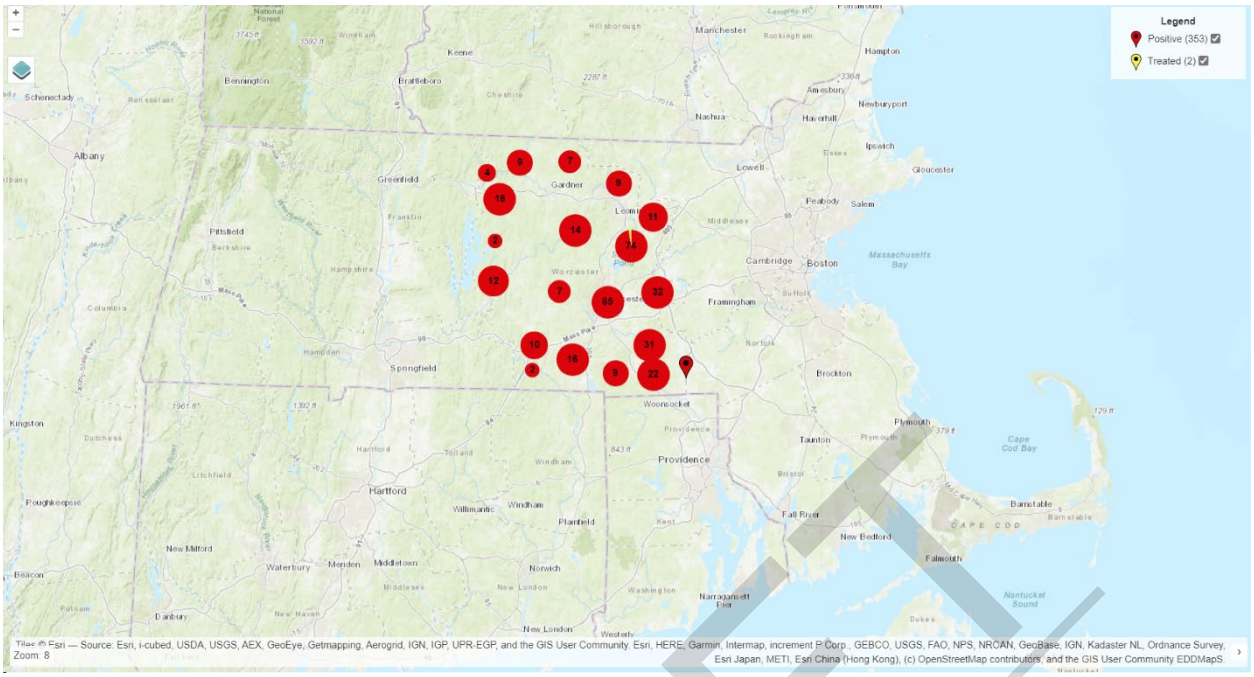

Figure 4: EDDMapS Analysis of Worcester County Invasives 2017-2024

In Blackstone the Massachusetts Department of Agriculture's Invasive Pests dashboard notes that Emerald Ash Borer has been detected in town in 2022, and that nearby towns suffer infestations of Mile-A-Minute Vine and Beech Leaf Disease [96]. However, a lack of reporting on invasives may yet prove that the extent is far greater than previously surmised from these databases.

Previous Occurrences

In Massachusetts, 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 from a variety of invasive pests, alarmingly with the greatest proportion of that damage occurring in the past 3 years[97].

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

[97] "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.

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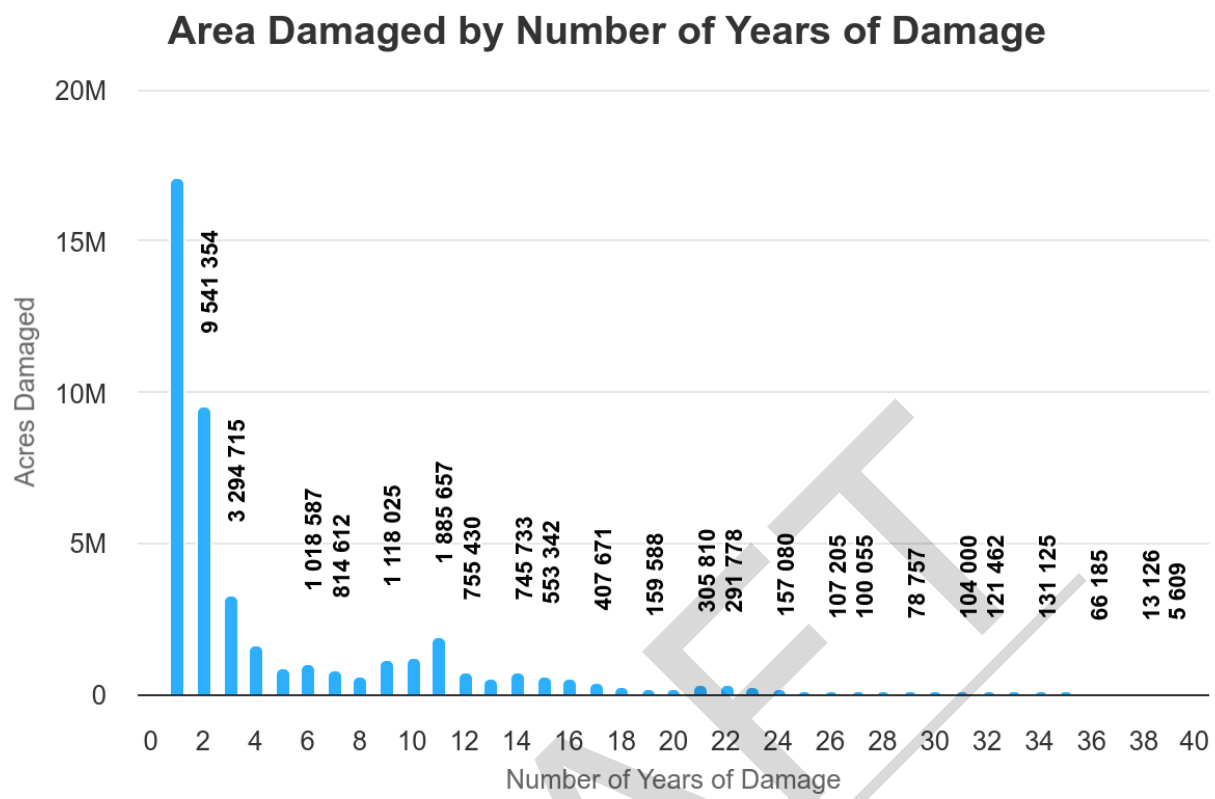

Table 14: Area Damaged by Spongy Moth, Forest Tent Caterpillar, and Winter Moth from 1979 to 2019

In Worcester County the vast majority of these damage events occurred in Southern Worcester County, in particular the south-east of Worcester County where Blackstone is located, as well as significant damages to the west and southwest of the county near the border with Hampshire and Hamden Counties, as well as localized defoliation events around the towns of Barre, the Tatnuck neighborhood of Worcester, and other towns. Tree mortality was concentrated in the southern half of Worcester County[98]. In 2008, an outbreak of Asian long-horned beetles in Worcester destroyed nearly 30,000 trees[99].

Blackstone experienced defoliation events from 1998 up to 2020, with significant mortality events occurring in 2018, 2019, and 2020. While the Atlas's reporting years only run to 2019, based on trends identified in the atlas there is no reason to assume that the hazard has lessened in the subsequent years.

Probability of Future Events

The 2023 ResiliantMass Plan notes that increased globalization of trade has created new paths for invasives to spread. Climate change is also an aggravating factor, as natural ecosystems become strained by increased temperatures and shifting precipitation patterns, there will only be more opportunities for invasives to disrupt and already fragile ecology. Based on the previously identified occurrences and trends, the probability of an invasive species event in Blackstone is Very High, with a 70-100% probability in the next year.

[98] Ibid.

[99] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

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IMPACT

Specific impacts in Blackstone may vary, depending on the type of invasive, its 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 bring with them new diseases to a region (such as the 2005 Chikungunya Epidemic, spread in part by a viral mutation that allowed for the virus to be more readily in the *Aedes albopictus* mosquito, an invasive subspecies)[100]. Invasives are also one of the costliest natural hazards in terms of control efforts, costing the United States and estimated $21 billion per year[101]. Lacking reliable information about the extent invasive species within Blackstone, we can only estimate a "Limited" Impact on the town.

EXPOSURE

Certain features within Blackstone's community infrastructure, society, and environment may face more exposure to Invasives;

- People with compromised immune systems or preexisting health conditions, children under five, and people over 65 might be particularly vulnerable to new diseases or aggravated health problems caused by invasives.
- Japanese Knotweed, an invasive known to cause streambank destabilization, can contribute to flood damages as well as affect sightlignts along roadways, potentially causing roadway hazards.
- Invasive species may pose a management cost burden that exceeds the local capacity to fund, especially in departments tasked with their management, and to the departments tasked with the maintenance of facilities that are impacted by invasives.
- 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, increasing the vulnerability to wildfires.

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. Already fragile ecosystems if left unmanaged will suffer the worst effects, being supplanted invasive species that outperform or outright damage our native flora and fauna. The vast majority of invasive species introductions are caused by human activity and introduction, either accidentally or intentionally.

Both changes in temperature and precipitation may increase chances of successful invasion of ecosystems by non-native species. As warmer temperatures place stress on native cold-weather species in the region, the shift allows invasive species accustomed to higher temperatures to expand their habitat ranges northward.

1. Precipitation

[100] 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.
[101] 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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a. Additionally, elevated atmospheric CO2 concentrations could reduce the ability of ecosystems to recover from climate shocks creating an opportunity for invasive species, which can often establish more rapidly 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.

Secondary hazards from invasive species include increased temperatures, damage to agriculture crops, and increased wildfire risk which as described in previous sections all have associated potential societal implications through population shifts and changes in land use and development.

Vulnerability

Based on the above assessment, Blackstone has a hazard index rating of "3" from Invasive Species.

Mitigation Strategies

The Town of Blackstone 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, the Town's existing capabilities to mitigate and respond to invasive species could be expanded upon through numerous avenues. The local planning team identified the following strategies that could be used to reduce the threat of Invasives in Blackstone:

- Increase education and outreach (on social media and through schools, the senior center, and community-based organizations) on all hazards in town, especially thunderstorms, snowstorms, and invasive species.

4.13 Other Hazards

In addition to the hazards identified in previous sections, the Hazard Mitigation Team reviewed the other hazards listed in the Massachusetts Hazard Mitigation Plan: coastal hazards, atmospheric hazards, ice jams, coastal erosion, sea level rise, and tsunamis. It was determined that these hazards are irrelevant to Blackstone due to the town's location.

Landslides

One other hazard that can affect Blackstone is landslides. Landslides occur in all U.S. states and territories. In 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 or thawing
- steepening of slopes by natural erosion or by human modification

Debris and mud flows are rivers of rock, earth, and other debris saturated with water. They develop

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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.

There are no documented previous occurrences of significant landslides in Blackstone. There are no documented previous occurrences of significant landslides in Blackstone. The town is relatively flat and most of its rivers are slow moving, frequently dammed and/or lined with riprap, which can minimize landslide risk. Roadways are not generally built close to river channels, reducing undercutting risk from stormwater-induced bank erosion. High slope terrain (defined as 15 to 25% grade) covers 196 acres, or only 2.7% of the town; very high slopes (higher than 25% grade) cover only 9 acres, far below 1% of the town's area. Little development is present in these areas. Should a landslide occur in the future, the type and degree of impacts would be highly localized. Vulnerabilities could include damage to structures, damage to transportation and other infrastructure, and localized road closures, though our data review and the local planning team noted no specific concerns. Injuries and casualties, while possible, would be unlikely given the low extent and impact of landslides in Blackstone.

Blackstone, like nearly all communities in the CMRPC region, has few areas with susceptibility for landscapes according to figure 4-16 in the 2018 State Hazard Mitigation and Climate Adaptation. Landslides are therefore considered low frequency events that may occur once in 50 to 100 years (a 1% to 2% chance of occurring per year).

Changes in Groundwater

Another Hazard of concern that affects Blackstone is changes in groundwater. This hazard was identified primarily through the community survey with residents noting basement flooding from water intrusion as being a common concern among respondents, as well as concerns of wells drying up in the future. While the 2023 ResilientMass Plan notes Changes in Groundwater as a specific hazard, our plan identifies it as being secondary effects to drought/ flooding[102]. Blackstone is particularly vulnerable to changes in groundwater due to its municipal water system being charged primarily by wellfields, with 80% of residents on municipal water and the residents who are not relying on their own private wells. The local planning team identified wells drying up as a concern as they are currently at capacity for water, with currently no means by which additional water could easily be obtained in the event of an emergency. The details of the specific vulnerabilities are included in both the drought and flooding sections of the plan.

According to the 2023 ResilientMass Plan, Climate change is predicted to have an effect on groundwater availability: Sea level rise, extreme temperature events, changes in precipitation patterns and the increased frequency and duration of drought conditions will all negatively impact the amount of available groundwater to the town[103].

[102] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan," pages 5.1-34-5.1-35.
[103] Ibid.

5.0 EXISTING PROTECTION

Sections 5.0 and 5.1 help meet:

- *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 Blackstone 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 any federal programs such as StormReady certification or Firewise community certification, but it does utilize CodeRed and Reverse 911 for emergency notifications. The Town plans to research the utility of public awareness and education programs as a result of this planning process.

Blackstone has most no-cost or low-cost hazard mitigation capabilities in place. These include land use, zoning, and subdivision regulations as well as an array of specific policies and regulations that include hazard mitigation best practices, such as limitations on development in floodplains, tree maintenance, and other practices. Blackstone 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 professionally run Department of Public Works, a Building Commissioner, and a Tree Warden. Blackstone has several relevant plans in place, including a Comprehensive Emergency Management Plan, an Open Space and Recreation Plan (2024), and a Master Plan (2018), and an NPDES MS4 Permit Action Plan. Not only does Blackstone have these capabilities in place, but they are also deployed for hazard mitigation, as appropriate. The Town also has very committed and dedicated volunteers who serve on Boards, Commissions and Committees and in other volunteer positions. The Town has opted into a fire protection mutual aid agreement through MEMA and the Town's DPW will provide assistance to neighboring towns. Blackstone is also an active member community of the Central Massachusetts Regional Planning Commission (CMRPC) and can take advantage of no cost local technical assistance provided by the professional planning staff at CMRPC as needed.

The table below describes existing mitigation protections in Blackstone. It includes a brief description of each activity as well as a subjective evaluation of its effectiveness and of any need for modifications.

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5.1 Existing Protection Matrix

Existing Measure	Description	Action	Effectiveness & Recommendations
Participation in National Flood Insurance Program (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.	Blackstone monitors building activity within the flood plain to ensure compliance with provisions of state building code.	Effective Blackstone has participated in the National Flood Insurance program since September 30th, 1977. As of 2024, there are 14 homeowners in town with flood insurance policies. There are no repetitive loss properties in Blackstone. The Town should seek to further limit development in the 100-year flood zones and should work to score in the Community Rating System (CRS) under NFIP to enable its residents to obtain lower flood insurance rates. Blackstone should also educate its residents about NFIP. Blackstone has adopted the Flood Insurance Rate Map (FIRM)[104] dated from July 4th, 2011, and this is noted in Article IV of Blackstone's Zoning Bylaw.[105] The Town's Flood Hazard District, described in this same Zoning Bylaw, includes all special flood hazard areas (SFHAs) designated as Zone A and AE in town and regulates and permits development within these areas. Blackstone's Building Commissioner / Zoning Enforcement Officer has been designated as the Town's FEMA Floodplain Administrator who implements the addressed commitments and requirements of the NFIP in town.

[104] "BLACKSTONE, TOWN OF," Msc.fema.gov, Federal Emergency Management Agency, June 7, 2024, https://map1.msc.fema.gov/firm?id=25027C1030E, https://map1.msc.fema.gov/firm?id=25027C1033E, https://map1.msc.fema.gov/firm?id=25027C1034E, https://map1.msc.fema.gov/firm?id=25027C1037E, https://map1.msc.fema.gov/firm?id=25027C1039E, https://map1.msc.fema.gov/firm?id=25027C1041E, https://map1.msc.fema.gov/firm?id=25027C1042E, https://map1.msc.fema.gov/firm?id=25027C1043E, https://map1.msc.fema.gov/firm?id=25027C1044E, https://map1.msc.fema.gov/firm?id=25027C1055E.

[105] "Chapter 123: Zoning," Townofblackstone.org, the Town of Blackstone, accessed June 10, 2024, https://www.townofblackstone.org/DocumentCenter/View/1373/Zoning-Bylaws.

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Existing Measure	Description	Action	Effectiveness & Recommendations
Floodplain Zoning District bylaw	Requires all development to be in compliance with state building code requirements for construction in floodplains	Blackstone regulates development in FEMA mapped floodplains as part of its zoning bylaw, as Chapter 123, Section 19.	Effective
Stormwater Management policy and regulations	Planning Board or Conservation Commission reviews projects for consistency with MA DEP standards. This helps ensure adequate on site retention and recharge and reduces the burden on the NPDES MS4 permitted stormwater system.	Blackstone enacted a Stormwater Management and Land Disturbance Bylaw in 2011, which is included as Chapter 110 in the Town's General Bylaws.	Very effective No changes recommended; however, Blackstone should evaluate participation in the Central Mass Stormwater Coalition.

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Existing Measure	Description	Action	Effectiveness & Recommendations
Local Open Space and Recreation Plan	Local plan identifying significant natural resources and identifying mechanisms to ensure their protection. Following Mass. Department of Conservation and Recreation guidance for development of OSRPs, this document does not focus on specific hazards.	Blackstone's Open Space and Recreation Plan received final approval by the Division of Conservation in 2024 and will expire November of 2029.	Somewhat effective The plan recommends establishing a Sustainability Committee whose tasks would include identifying parcels useful in improving resiliency to climate change as well as well as identifying opportunities for adding solar panels to Town sites. It also identifies the need to cleanup brownfield sites, notes the development impacts on erosion and stormwater management, and describes the potential of green infrastructure to address these issues.

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Existing Measure	Description	Action	Effectiveness & Recommendations
NPDES MS4 Compliance Program	Upgrade of municipal sewer systems and system inputs to reduce or eliminate CSOs and illicit connections to comply with NPDES requirements	Blackstone has implemented a stormwater program to ensure compliance with NPDES requirements, and the town sends out a newsletter for this program. Recent actions include installation of LID infrastructure at the Town Hall (bioretention area, pervious pavement, plantings), stormwater bylaw updates, public outreach, GPS mapping, capital improvements, and inspections for illicit connections. Appx. 1/3rd of the town is on municipal sanitary sewer.	Very effective No changes recommended
Local wetlands protection bylaw and regulations	Local bylaws building upon the State's Wetlands Protection Act and Regulations. These add regulatory oversight provisions for development within the jurisdictional buffer zone, adding increased attention to alteration of wetlands and the opportunity to preserve capacity and quality.	Blackstone adopted a wetlands protection bylaw (general bylaws, Chapter 119) in 1986 to protect wetlands and related waterways throughout town in accordance with Mass. regulations.	Very effective No changes recommended

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Existing Measure	Description	Action	Effectiveness & Recommendations
Drainage system cleaning and preventive maintenance	Plan to keep municipal drainage facilities (storm drains, culverts, etc.) in good order	Blackstone performs street sweeping and catch basin cleaning from April to November.	Effective Blackstone should continue its public education program for residents on storm drain clearance and other best practices
Tree Trimming	Maintain vegetation to reduce likelihood of damaging debris from storm events	Blackstone conducts roadside mowing from April-November to remove juvenile trees. Tree trimming (take-downs and clearing dead branches) takes place as needed.	Very Effective Blackstone should continue to coordinate with its electrical utility to foster a more systematic tree trimming program
Drainage maintenance, replacement and upgrade	Maintain existing culverts and drains through regular maintenance and (in some cases) beaver controls; replace/expand culverts where needed to allow for adequate stormwater flow.	The Town generally maintains and replaces problem culverts and other infrastructure when needed and as funding allows. Historically, the Town also installed flood protection berms, walls and riprap in vulnerable parts of the village centers.	Somewhat effective Current efforts are piecemeal and are limited by lack of resources and systematic approach. Blackstone should develop a prioritized inventory of problem culverts/drains for use in seeking external financial support. Planning must comply with 2014 Mass. Wetlands Protection Act update and any future updates to this Act; culverts may not simply be replaced in-kind.

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Existing Measure	Description	Action	Effectiveness & Recommendations
CodeRED system	Emergency warning system that sends voicemail/text/email alerts to residents (text/email alerts are optional).	Town Emergency Management officials are able to alert residents when information is received that a natural or man-made disaster is impending.	Effective Blackstone should consider NWS StormReady certification and adoption of StormReady emergency notification practices to supplement CodeRED.
Generator program	Install emergency backup power generators at key Town facilities to enable continued operations during and after natural and man-made disasters.	In 2016, generators were obtained through FEMA's EMPG program for the Blackstone Street emergency communications repeater site and for fire station #2. These supplement generators already in place at the Town Hall/Public Safety building and at the public schools, which serve as shelters. Generators were installed at Fox Brook Manor and Early Village within the past 2 years.	Effective Continue to pursue resources to install generators at key facilities to include fire station #3 and the DPW garage.
Master Plan	The Master Plan inventories town resources and can help in future town decision-making efforts over a 10-to-20-year period. It includes both short-term, incremental and long-term, more aspirational goals and objectives for the community.	The Blackstone Master Plan was completed in 2018.	Effective

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Existing Measure	Description	Action	Effectiveness & Recommendations
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 Blackstone MVP Plan was completed in May 2018.	Effective
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 state building code will be updated in 2025.	Very Effective

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6.0 Status of Mitigation Measures From 2017 Plan

Section 6.0 helps meet:

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

Town staff provided updates on the status of mitigation measures from Blackstone's 2017 Hazard Mitigation Plan. Certain measures were incomplete as of 2024 and deemed "still relevant". These actions were reviewed by the Core Team. Some actions were re-incorporated in the 2024 Hazard Mitigation Plan action strategy based on whether they could be completed in the next 5 years, and their perceived effectiveness.

2017 Task	2024 Status	2024 Notes	Include in 2024 Plan?
Structure & Infrastructure Strategies			
Continued drainage improvements at Saint Paul Street/Rivers Edge Road/Farnum Street/Canal Street near Town Hall/Public Safety/Senior Center building; area is just above Blackstone River 100 year flood zone and sees recurrent basement flooding in heavy/long rain events	In Progress	A new culvert has been added on Lincoln Street near the school. Besides this, there has not been much progress on this item due to a lack of funding and a complicated group of stakeholders in the area. Structural resiliency improvements are also needed in this area.	YES
Drainage improvements at Main Street on mostly south side from appx. 1st Avenue to Blackstone Street; area is partly within 100 and 500 year flood zones and sees recurrent flooding in heavy/long rain events; includes Public Library on Fox Brook	No movement on this action yet	Only road resurfacing has been done since 2017 Sectent here.	YES
Evaluate structural conditions and implement long-term solutions for buildings that have previously seen roof damage from winter storms, including Town Hall/Public Safety/Senior Center building, regional High School, and elementary schools	In Progress	The roof has been re-done at the Town Hall/Public Safety/Senior Center building, but the roof still leaks. All schools in town but the middle school have received new roofs (The Town owns the elementary school but the middle and high schools are operated by the regional district).	YES
Culvert/bridge upgrade on Elm Street at Mill River; within 100 year flood zone and area floods during storms when river exceeds capacity under roadway; evacuation route impacted	No movement on this action yet	There has been no progress relating to this action due to a lack of municipal resources.	YES

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Culvert/bridge upgrade on Farm Street at Hop Brook; within 100 year flood zone and area floods during storms when river exceeds capacity under roadway	No movement on this action yet	There has been no progress relating to this action due to a lack of municipal resources, except for the road being re-done near this area.	YES
Culvert/bridge upgrade on Blackstone Street at Hop Brook; within 100 year flood zone and area floods during storms when river exceeds capacity under roadway; evacuation route impacted	No movement on this action yet	There has been no progress relating to this action due to a lack of municipal resources.	YES
Culvert/raceway upgrade on Lakeshore Drive at Quick Stream at the outlet of the Lake Hiawatha Dam; near 100 year flood zone and wetland and area floods when dam is at maximum release	In Progress	The rebuilding of the headwalls on Elm Street is ongoing. The Town of Bellingham controls the load of Lake Hiawatha.	YES
Culvert upgrade on Mendon Street at Fox Brook below Crain's Pond Dam; within 100 year flood zone and area floods during storms when river exceeds capacity under roadway; secondary evacuation route impacted	No movement on this action yet	There has been no progress relating to this action due to competing priorities / a lack of municipal resources.	YES
Identify and address drainage problem in 600s area of Rathbun Street in area of Fire Station #2/EOC; low area sees mostly roadway flooding; adjacent area of Bellingham is in 500 year flood zone; within EJ area	Completed	Work was completed to re-do the roadway in this area in 2019, this flooding issue has been resolved.	NO
Identify and address roadway flooding problem on Main Street between Federal Street and Castle Hill Way; low area may also be impacted by runoff from upgradient subdivision; adjacent to 100 year flood zone	No movement on this action yet	This issue is caused by dirt and leaves covering catch basins. MassDOT has responsibility to help address this issue, it has not been addressed. Runoff from new subdivisions is an issue in this area.	YES
Tree trimming needed throughout town to protect utility wires; coordinate with utility to implement systematic approach	In Progress	Over the past two years the Town has done a better job with tree trimming, and as a result power outages are less frequent in town.	YES
Evaluate feasibility and possibly implement a permanent water system connection between Blackstone and neighboring Bellingham to provide resilience in drought (currently hydrants can be connected to share limited water)	No movement on this action yet	There has been no progress relating to this action, although the informal water system connection between the two towns is still in place.	YES

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Install/improve generators at critical public facilities where needed, including the DPW garage, Fire Station #3 and the Housing Authority's Fox Brook Manor complex; also evaluate feasibility of obtaining a mobile generator to serve multiple public facilities	In Progress	A generator has been installed at Fox Brook Manor, but there is still a need to install generators at the DPW garage and Fire Station #3. The Town would still like to evaluate the feasibility of obtaining a mobile generator.	YES
Continue to monitor conditions at the Town-owned Lake Hiawatha Dam (Significant Hazard) to ensure compliance with state mandate on structural conditions.	In Progress	The Town has been monitoring conditions at the dam and has been reporting to Mass DCR. The dam is now listed as a High Hazard Dam.	YES
Preparedness, Coordination & Response Action Strategies			
Continue to participate in National Flood Insurance Program (NFIP) (or other) training offered by the State and/or FEMA that addresses flood hazard planning and management	In Progress	The Town continues to participate in the NFIP. It does not currently have a floodplain manager and should hire one.	YES
Investigate Community Rating System (CRS) benefits and requirements and decide whether to participate	No movement on this action yet	The Town has not investigated the CRS.	YES
Road information coordination and planning for snow removal	In Progress		YES
Evacuation Plan updates; where possible, ensure that routes are outside of hazard areas	No movement on this action yet	There has been no progress relating to this action.	YES
Improve vegetation and debris management along P&W Railroad rights-of-way; recurrent brush fires reported near tracks in neighboring towns	No movement on this action yet	There are issues with trains causing brush fires in nearby Northbridge. In Blackstone, there have been issues with trees falling on train tracks, brush fires being exacerbated by drought, and issues with herbicides leading to trees along the train tracks being more vulnerable.	YES
Investigate/join the Central Massachusetts Stormwater Coalition to aid in public outreach and funding of drainage improvements	No movement on this action yet	The Town has not reached out to the Central MA Stormwater Coalition. There are some MS4 areas in town.	YES

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Education & Awareness Strategies			
Provide information to residents and businesses on water conservation through reduction in use, low-impact landscaping and other low-cost measures (in part to conserve water for firefighting)	In Progress	The Town has continued water prohibition outreach which has been ongoing for decades, but besides this, there has not been much progress relating to this action.	YES
Provide information to residents and businesses on generator safety and sump pump usage; Blackstone has seen generator safety problems during past floods when power was lost and homeowners switched to generator power for pumps	In Progress	The Town circulates info on generator safety once or twice a year. There have been instances of town residents using generators unsafely within the past year.	YES
Continue/restart education program begun under NPDES MS4 permit to supplement pollution prevention effort with storm drain safety/clearance and related topics	In Progress	The Town includes educational information on stormwater management in the water bills that are sent out four times per year to town residents who use the municipal water system.	YES
Local Plan & Regulation Strategies			
During next municipal facilities or capital improvement planning process; review options for relocating departments (esp. public safety departments) away from current Town Hall/Public Safety/Senior Center building, which floods regularly and is adjacent to 100-year flood zone	In Progress	This is an important action, as this building really needs improvements and its facilities do not currently accommodate town needs. The Town attempted to move the senior center out of this building, but this proposal failed at Town Meeting. The Town has applied for a grant to begin studying options for this building and is currently considering starting the process of completing a feasibility study relating to this building using local funding. The building has not flooded regularly in recent years, but the potential for flooding exists.	YES
In tandem with water conservation outreach listed above, conduct enhanced enforcement of water usage restrictions (in part to conserve water for firefighting)	In Progress	On an ongoing basis, the Town tells people to shut their water off if they are not following local water usage regulations.	YES

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Update Open Space and Recreation Plan (expired) to include mitigation goals	Completed	The Town's updated Open Space and Recreation Plan includes hazard mitigation goals and received final approval by the Division of Conservation in 2024. Also, two new playgrounds are going to be built in town, as the proposals for them passed at the 2023 Town Meeting.	YES
Review and update local plans and development review processes (planning, zoning, stormwater management, conservation, etc.) to ensure new construction will not be affected by hazards	In Progress	There is a process in place in town to include hazard mitigation concerns in local planning and development review processes. The Town would like natural hazards to be more explicitly addressed in development review meeting agendas and in the Town's Zoning Bylaw, which currently does not have a any passages dedicated to natural hazard concerns.	YES
Monitor implementation of Hazard Mitigation Plan	In Progress	The HMP team that met to draft the last HMP update for the Town has not met regularly to monitor the progress of the plan. This action is in progress due to the current HMP planning process in town. The HMP team for this plan update should meet once a year to discuss the progress of mitigation strategies.	YES

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7.0 MITIGATION STRATEGY

The Blackstone 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:

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

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

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

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

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

Political and public support - Strategies are given higher priority if they have political and/or public support which is shown through public feedback, prioritization in previous regional and local plans, initiatives that were locally initiated or adopted, and/or prioritization in the 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

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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 includes hard costs (construction and materials), soft costs (engineering design, permitting, etc.), and where appropriate Town staff time (valued at appx. $25/hour for grant applications, administration, etc.). Projects that already have secured funding are noted. Detailed and current estimates were generally not available, so costs are summarized within the following ranges:

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

7.3 Timeline

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 date is provided for when completion is expected. However, most projects 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 are subdivided into the following four broad categories so that they can facilitate local implementation discussions, especially regarding budget considerations and 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.

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They integrate disaster prevention/mitigation and preparedness into every relevant aspect of town operations, including the operations of the Police, Fire Department, EMD, EMS, DPW, Planning Board, Conservation Commission and Board of Selectmen; 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. Awareness and education 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. They can also review the effectiveness of past mitigation projects, programs, procedures, and policies so that strategies for making them more effective in the future can be formed. An example of a project which fits under this category is incorporating mitigation planning into master plans, open space plans, capital improvement plans, facility plans, and other town plans.

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

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

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7.5 Town of Blackstone 2024 Hazard Mitigation Strategies

Section 7.6 helps meet:

- *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)); and*
- *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))*

OVERALL GOAL: Facilitate activity within the Town of Blackstone that reduces the loss, and risk of loss, to persons, property, and the environment. Please view section 8.4, Potential Federal and State Funding sources, for more information on the funding sources listed below.

Actions	Hazards Addressed	Agencies Involved	Potential Funding Sources	Priority	Impact	Estimated Cost	Timeline
Structure & Infrastructure Strategies							
Continued drainage and structural resiliency improvements at Saint Paul Street/Rivers Edge Road/Farnum Street/Canal Street near Town Hall/Public Safety/Senior Center building; area is just above Blackstone River 100-year flood zone and sees recurrent basement flooding in heavy/long rain events	FL, SS, ST, HU	DPW, Building Commissioner	Local (capital trust, current operating budget, town meeting), Federal Grants (HMGP/BRIC, FMA), State Grants (MVP Action Grant)	High	High	High	3-5 years

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Drainage improvements at Main Street on mostly south side from appx. 1st Avenue to Blackstone Street; area is partly within 100- and 500-year flood zones and sees recurrent flooding in heavy/long rain events; includes Public Library on Fox Brook	FL, SS, ST, HU	DPW, MassDOT	Federal Grants (HMGP/BRIC, FMA), State Grants (MVP Action Grant)	Medium	High	High	3-5 years
Evaluate structural conditions and implement long-term solutions for buildings that have previously seen roof damage from winter storms, including Town Hall/Public Safety/Senior Center building, regional High School, and elementary schools	SS	Building Commissioner, Schools, MSBA	Local (capital trust, current operating budget, town meeting), Federal Grants (HMGP/BRIC), State Grants (MVP Action Grant), State/Federal (CDBG)	Medium	Medium	High	3-5 years
Study and address flooding issue on Valley Street, which affects a cemetery and a neighborhood in Rhode Island as well.	FL	DPW, Building Commissioner	State (MA (MVP Action Grant) and RI), Federal (FMA/BRIC)	Low	Low	High	5+ years
Study and address flooding / drainage issues along Champlain Avenue.	FL	DPW	Local (capital trust, current operating budget, town meeting), Federal (BRIC/FMA)	Medium / High	High	High	3-5 years

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Complete side wall repairs at the canal side of the Saranac / Blackstone River Dam. Study possible modifications to the canal side structures near the dam, such as removing the top part of the headworks.	FL	DPW	State (Dam & Seawall), Federal (BRIC, FMA, Army Corps of Engineers)	High	Medium	High	0-1 years
Culvert/bridge upgrade on Elm Street at Mill River; within 100-year flood zone and area floods during storms when river exceeds capacity under roadway; evacuation route impacted	FL, SS, ST, HU	DPW	Local (capital trust, current operating budget, town meeting), Federal Grants (HMGP/BRIC, FMA, TIP), State Grants (MVP Action Grant, Culvert Replacement Municipal Assistance Grant Program)	Medium	High	High	1-2 years
Culvert/bridge upgrade on Farm Street at Hop Brook; within 100-year flood zone and area floods during storms when river exceeds capacity under roadway	FL, SS, ST, HU	DPW	Local (capital trust, current operating budget, town meeting), Federal Grants (HMGP/BRIC, FMA, TIP), State Grants (MVP Action Grant, Culvert Replacement Municipal Assistance Grant Program)	Medium	Medium	High	1-2 years

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Culvert/bridge upgrade on Blackstone Street at Hop Brook; within 100-year flood zone and area floods during storms when river exceeds capacity under roadway; evacuation route impacted	FL, SS, ST, HU	DPW, BOH	Local (capital trust, current operating budget, town meeting), Federal Grants (HMGP/BRIC, FMA, TIP), State Grants (MVP Action Grant, Culvert Replacement Municipal Assistance Grant Program)	Medium	High	High	1-2 years
Culvert/raceway upgrade on Lakeshore Drive at Quick Stream at the outlet of the Lake Hiawatha Dam; near 100-year flood zone and wetland and area floods when dam is at maximum release	FL, SS, ST, HU	DPW	Local (capital trust, current operating budget, town meeting), Federal Grants (HMGP/BRIC, TIP), State Grants (MVP Action Grant, Culvert Replacement Municipal Assistance Grant Program)	Medium	Medium	High	0-1 years
Culvert upgrade on Mendon Street at Fox Brook below Crain's Pond Dam; within 100-year flood zone and area floods during storms when river exceeds capacity under roadway; secondary evacuation route impacted	FL, SS, ST, HU	DPW	Local (capital trust, current operating budget, town meeting), Federal Grants (HMGP/BRIC, FMA, TIP), State Grants (MVP Action Grant, Culvert Replacement Municipal Assistance Grant Program)	Medium	Medium	High	1-2 years

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Address roadway flooding problem (caused by dirt and leaves covering catch basins) on Main Street between Federal Street and Castle Hill Way; low area may also be impacted by runoff from upgradient subdivision; adjacent to 100-year flood zone	FL, SS, ST, HU	DPW, MassDOT	Federal Grants (HMGP/BRIC), State Grants (MVP Action Grant)	Low	Low	Low / Medium	1-2 years
Tree trimming needed throughout town to protect utility wires; coordinate with utility to implement systematic approach	SS, ST HU	National Grid, Tree Warden, Private property owners	Utility (National Grid), Local (capital trust, current operating budget, town meeting), Private (property owners)	Low	High	Low / Medium	Ongoing
Establish a town program to buy lightning rods on an as-needed basis.	LG, ST	Town Administrator, Building Department	Local (capital trust, current operating budget, town meeting)	Low	Medium	Low	1-2 years, then ongoing
Evaluate feasibility and possibly implement a permanent water system connection between Blackstone and neighboring Bellingham to provide resilience in drought (currently hydrants can be connected to share limited water)	DR	DPW, Town of Bellingham	Local (capital trust, current operating budget, town meeting), State Grants (Drinking Water Supply Grant, Statewide Water Management Act Grant)	Medium	Low	Medium / High	3-5 years

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Install/improve generators at critical public facilities where needed, including the DPW garage and the Fire Station #3; also evaluate feasibility of obtaining a mobile generator to serve multiple public facilities.	All	Building Commissioner, DPW, Housing Authority	Local (capital trust, current operating budget, town meeting), Federal Grants (HMGP/BRIC), State Grants (MVP Action Grant), State/Federal (CDBG)	High	Medium	High	5+ years
Continue to monitor conditions at the Town-owned Lake Hiawatha Dam (High Hazard) to ensure compliance with state mandate on structural conditions.	DF	DPW	Local (capital trust, current operating budget, town meeting), State Grants (Dam & Seawall)	High	Low	Low	Ongoing
Complete flood-proofing work on well pumps 2 and 7.	FL	DPW, USGS	Local (capital trust, current operating budget, town meeting), State (MassDEP Grants), Federal (FMA/BRIC)	Low	Medium	High	0-1 years
Plan and site new wells to supply the town water system.	DR, XT, WF	DPW	State/ Federal (CDBG)	High	High	High	Ongoing
Conduct field inventory of bridges to rank and prioritize projects for increased flooding resiliency and storm-hardening. Design and implement priority resizing or replacement projects. Known problem areas should be areas of focus, and they include Elm Street Bridge, Lincoln	FL, SS, ST, HU	DPW	Local (capital trust, current operating budget, town meeting), State (MVP Action Grant, Mass Works Infrastructure Grant), Federal (FMA/BRIC)	High	High	High	1-2 years for inventory, 3-5 years for design, 5+ years for implementation

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Street Bridge, culverts on Lincoln Street, Blackstone Street, and Shore Drive.							
Extend Rathbun Street to develop a connector that links the existing Rathbun Street to Elm Street and provides a more direct route for emergency access to the southeast portion of town.	All	DPW, BOS	Local (capital trust, current operating budget, town meeting), State (Mass Works Infrastructure Grant), Federal (BRIC)	High	High	High	5+ years
Pursue public facilities upgrades that would increase resiliency, including purchasing generators for the Recycling Center / Animal Control facility and library.	All	DPW, BOS	Local (capital trust, current operating budget, town meeting), Federal (BRIC)	Medium	High	High	3-5 years
Install central air conditioning in the Town's schools to protect children from the impacts of increasing heat.	XT, DR	DPW, BOS	Local (capital trust, current operating budget, town meeting), Federal (BRIC)	Medium	Medium	Medium	3-5 years
Purchase an improved communications system to support Police, Fire, and the Department of Public Works staff in providing emergency response during hazard events.	All	Police, Fire, DPW	Local (capital trust, current operating budget, town meeting), Federal Homeland Security Grant funding through CRHSAC and MEMA	Medium	High	Medium	3-5 years
Establish a second community center that would double as an emergency center to serve residents on the	All	BOS, Council on Aging	Local (capital trust, current operating budget, town meeting)	Medium	High	High	5+ years

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other side of Town and provide easier access to services for all residents.							
Preparedness, Coordination & Response Action Strategies							
Continue to participate in National Flood Insurance Program (NFIP) (or other) training offered by the State and/or FEMA that addresses flood hazard planning and management. Hire a floodplain manager.	FL, SS, ST, HU	DPW, PB	Local (capital trust, current operating budget, town meeting), State (LPA) Federal (FMA)	High	High	Low	Ongoing
Investigate Community Rating System (CRS) benefits and requirements and decide whether to participate.	FL, SS, ST, HU	DPW, PB	Local (capital trust, current operating budget, town meeting)	Low	Low	Low	1-2 years
Road information coordination and planning for snow removal	SS	DPW, MassDOT, Mass State Police, CMRPC	Local (capital trust, current operating budget, town meeting), Federal Grants (HMGP/BRIC), State (LPA), Private Contracts	High	High	Low	Ongoing
Evacuation Plan updates; where possible, ensure that routes are outside of hazard areas	All	Local Emergency Management, DPW, CMRPC, MassDOT	Local (capital trust, current operating budget, town meeting), Federal Grants (Homeland Security via MEMA and CRHSAC)	High	High	Low	Update every 5 years

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Improve vegetation and debris management along P&W Railroad rights-of-way; recurrent brush fires reported near tracks.	DF, WF	Gennessee / P&W Railroad, Fire, DPW	Private (Genessee / P&W Railroad)	High	High	Low	Ongoing
Complete a study on how development in town, such as solar farms, affects flooding in town, looking at problems and enforcement mechanisms. Create and enforce a solar development / land use bylaw	FL	DPW, Building Commissioner	Local (capital trust, current operating budget, town meeting), State (EEA Planning Assistance Grant), Federal (BRIC/FMA)	High	High	Medium	0-5 years
Work with homeowners to mitigate localized flooding caused by development.	FL	DPW	Local (capital trust, current operating budget, town meeting), State (MEMA Grants) and Federal (BRIC, FMA)	High	High	High	Ongoing
Investigate rural firefighting capabilities for the town. Investigate options for having more rural firefighting assets such as dry hydrants and cisterns.	WF	Fire	Federal (FEMA Assistance to Firefighters Grants)	Medium	Medium	Low / Medium	3-5 years
Complete a feasibility study for flood-proofing well pumps 2 and 7.	FL	DPW	Local (capital trust, current operating budget, town meeting), Federal (FMA/BRIC)	High	High	Low	0-3 years

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Coordinate with Liberty Gas and the State to develop emergency preparedness procedures regarding the Blackstone Street Natural Gas Regulator Station.	All	All Town Departments, Liberty Gas, State Agencies (MEMA)	Local (capital trust, current operating budget, town meeting), State (LPA), Federal Homeland Security Grant funding through CRHSAC and MEMA	High	High	Low	0-3 years
Coordinate with hydropower plant in Rhode Island to prevent flooding near the Blackstone Valley Boys and Girls Club.	FL	DPW	Local (capital trust, current operating budget, town meeting), State (LPA, MVP Action Grant), Federal Grants (BRIC, FMA)	High	High	Low	0-3 years
Review communications regarding downstream management of Blackstone River, especially in coordination with neighboring Woonsocket. Ensure that both towns are anticipating the impacts of development on water wells and flood storage area.	FL, DF	DPW	Local (capital trust, current operating budget, town meeting)	High	High	Low	0-2 years
Provide more resilient storage facilities for vital information, including birth, death, and marriage records, voter registration data, and associated equipment. Coordinate with the Town Clerk, Treasurer, Assessor, and Planning Board to	All	BOS, Town Clerk, Treasurer, Assessor, Planning Board	Local (capital trust, current operating budget, town meeting)	High	Medium	Low / Medium	1-3 years

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assess all vulnerable records information and ensure that the Town protects critical data.							
Complete a Town-wide dam assessment of all public, private, and beaver dams, focusing on reducing the risk of flooding from dam failures during intense storm events and protection of ecosystems that provide flood storage and other resilience benefits.	DF, FL, SS, ST, HU	DPW	Local (capital trust, current operating budget, town meeting), State (MVP Action Grant), Federal (FMA/BRIC)	High	High	Medium	2-3 years
Education & Awareness Strategies							
Continue to provide information to residents and businesses on water conservation through reduction in use, low-impact landscaping and other low-cost measures (in part to conserve water for firefighting)	DR, WF	DPW, CC, Fire	Local (capital trust, current operating budget, town meeting)	High	Medium	Low	Ongoing

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Continue to provide information to residents and businesses on generator safety and sump pump usage; Blackstone has seen generator safety problems during past floods when power was lost and homeowners switched to generator power for pumps	FL, SS, ST, HU	Fire, DPW	Local (capital trust, current operating budget, town meeting), Federal Grants (Assistance to Firefighters Grants, Fire Prevention and Safety Grant)	High	Medium	Low	Ongoing
Increase education and outreach (on social media and through schools, the senior center, and community-based organizations) on all hazards in town, especially thunderstorms, snowstorms, and invasive species.	All	All Town Departments	Local (capital trust, current operating budget, town meeting)	High	High	Low	Ongoing
Investigate/join the Central Massachusetts Stormwater Coalition to aid in public outreach and funding of drainage improvements.	FL, SS, ST, HU	DPW, CC, PB	Local (current operating budget), State (LPA)	Medium	Medium	Low	1-2 years
Continue education program begun under NPDES MS4 permit to supplement pollution prevention effort with storm drain safety/clearance and related topics	FL, SS, ST, HU	DPW	Local (capital trust, current operating budget, town meeting)	High	Medium	Low	Ongoing

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Local Plan & Regulation Strategies							
Conduct a townwide stormwater drainage improvement study. Include an inventory and visual assessment as well as hydrological modeling in this study.	FL	DPW	State (MVP Action Grant), Federal (FMA/BRIC)	High	High	Medium / High	0-3 years
During next municipal facilities or capital improvement planning process; review options for relocating departments (esp. public safety departments) away from current Town Hall/Public Safety/Senior Center building, which potentially may flood and is adjacent to 100-year flood zone.	All	Building Commissioner, PB, Fire Police	Local (capital trust, current operating budget, town meeting)	Medium	High	High	1-2 years
In tandem with water conservation outreach listed above, conduct enhanced enforcement of water usage restrictions (in part to conserve water for firefighting).	DR, WF	DPW, CC, Fire	Local (capital trust, current operating budget, town meeting)	High	Medium	Low	Ongoing
Investigate options for improving the enforcement of zoning and land use regulations as well as the building code.	All	Building Commissioner / Zoning Agent, ZBA, BOS, PB	Local (operating budget, town meeting)	Medium	Medium	Medium	0-3 years

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Establish a comprehensive emergency awareness plan to build awareness of town resources and make Town residents aware of the many planning efforts, agreements, shelters, etc. which are focused on making the Town more resilient. Ensure that all residents know how to access these resources when they are needed.	All	DPW, Fire, Police, Health Department, PB	Local (capital trust, current operating budget, town meeting), State (EEA Planning Assistance Grant, DLTA), Federal (BRIC, Homeland Security Grant funding through CRHSAC and MEMA)	High	High	Low / Medium	1-2 years
Develop a comprehensive plan for beaver management to mitigate against unpredictable flooding / impoundment impacts. Investigate options for expanded beaver control.	FL, DF	DPW, PB	Local (capital trust, current operating budget, town meeting), State (MVP Action Grant), Federal (FMA/BRIC)	High	Medium	Low / Medium	2-3 years
Assess green infrastructure opportunities for stormwater management and develop a list of specific priorities. Review Town regulations and update as necessary to support green infrastructure and low-impact development. Consider projects in areas that are prone to flooding, such as the Harris Pond Village neighborhood, including	FL, ST, HU	PB, DPW, CMRPC	Local (capital trust, current operating budget, town meeting), State (EEA Planning Assistance Grant, DLTA), Federal (BRIC)	Medium	Medium	Medium	2-3 years

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Shore Drive and the Precious Blood Cemetery.							
Incorporate hazard mitigation goals into the Open Space and Recreation planning process.	All	PB, Parks	Local (capital trust, current operating budget, town meeting), CMRPC	High	Medium	Medium / High	Ongoing
Review and update local plans, bylaws, and development review processes (planning, zoning, stormwater management, conservation, etc.) to ensure new construction will not be affected by Hazards.	All	All Town Departments	Local (capital trust, current operating budget, town meeting)	Medium	High	Low	Ongoing
Monitor implementation of Hazard Mitigation Plan. Once a year, meet to discuss the progress of mitigation strategies.	All	All Town Departments	Local (capital trust, current operating budget, town meeting)	High	High	Low	Ongoing

'Hazards Addressed' abbreviations:

DF	Dam Failure	DR	Drought
EQ	Earthquake	FL	Flooding
HU	Hurricane	IS	Invasive Species
LG	Lightning Strike	OT	Other
SS	Severe Snowstorm / Ice Storm / Nor'easter	ST	Severe Thunderstorm / Wind / Tornado
WF	Wildfire / Brushfire	XT	Extreme Temperatures

Who? Agencies Involved' abbreviations:

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CMRPC	Central Mass. Regional Planning Commission	CC	Conservation Commission
DPW	Department of Public Works	PB	Planning Board
ZBA	Zoning Board of Appeals		

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8.0 PLAN ADOPTION, IMPLEMENTATION, AND MAINTENANCE

8.1 PLAN ADOPTION

Update paragraph after plan finalization

A public meeting was held on June 25th, 2024 as part of the Board of Selectmen's meeting in order detail the planning process to date and to solicit comments and feedback from the public on the draft Blackstone Hazard Mitigation Plan then being developed. The draft plan was provided to the Town for distribution and posted on Blackstone's town website on DATE for a two-week public review and input period. 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 Blackstone Board of Selectmen and certified on [Insert Date].

8.2 PLAN IMPLEMENTATION

Section 8.2 helps meet:

- *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 Blackstone has taken steps to implement findings from the 2017 Hazard Mitigation Plan into the following policy, programmatic areas and plans: the 2018 Municipal Vulnerability Preparedness Plan, the 2018 Master Plan, and the 2024 Open Space and Recreation Plan.

The implementation of the 2024 HMP plan update began upon its formal adoption by the Board of Selectmen and approval by MEMA and FEMA. Town departments and boards responsible for ensuring the development of policies, ordinance revisions, and programs as described in Section 6 and Section 7 of this plan will be notified of their responsibilities immediately following approval. The Hazard Mitigation Team will oversee the implementation of the plan.

Incorporation with Other Planning Documents

Existing plans, studies, reports, and municipal documents were incorporated throughout the planning process. This included a review and incorporation of significant information from the following key documents:

- ***Blackstone Comprehensive Emergency Management Plan*** (particularly the Critical Infrastructure Section) – the Critical Infrastructure section was used to help identify infrastructure components in Town that have been identified as crucial to the function of the Town; this resource was also used to identify potentially vulnerable populations and potential emergency response shortcomings.
- ***Regional Evacuation Plan*** – Funded by Homeland Security via the Commonwealth of Massachusetts and the Central Regional Homeland Security Advisory Council, the 2017 regional evacuation plan prepared by CMRPC was used to identify evacuation routes and shelters. This plan will soon be updated by CMRPC.
- ***Blackstone Open Space and Recreation Plan*** – This Plan was used to identify the natural context within which mitigation planning would take place. This proved useful insofar as it identified water bodies, rivers, streams, infrastructure components (i.e., water and sewer, or

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the lack thereof), as well as population trends. This was incorporated to ensure that the Town's mitigation efforts would be sensitive to the surrounding environment.[106]

- ***Blackstone Zoning Bylaw*** – Zoning was used to gather identify those actions that the town is already taking that are reducing the potential impacts of a natural hazard (i.e., floodplain regulations) to avoid duplicating existing successful efforts.[107]
- ***Blackstone Master Plan*** – This plan was used to identify the main priorities for the Town so that the Hazard Mitigation Plan's strategies can align with these priorities.[108]
- ***Blackstone Municipal Vulnerability Preparedness Plan –*** The medium and high-priority recommendations from this plan were incorporated into the Hazard Mitigation Plan's mitigation strategies.[109]
- ***ResilientMass State Hazard Mitigation and Climate Adaptation Plan*** - This plan was used to ensure that the town's HMP data and priorities, especially in the hazards section of the plan, are consistent with the State's data and priorities.[110]
- ***2022 Massachusetts Climate Change Assessment*** - This plan was used to ensure that the town's HMP data and priorities, especially in the hazards section of the plan, are consistent with the State's data and priorities.[111]

A Fiscal Year 2023-2028 Capital Improvement Plan for the Town has also been drafted and was still being finalized at the time of this plan update's completion; this plan will inform how the Town invests resources into town priorities, including several which directly relate to mitigation strategies included in this plan. The Local HMP Planning Committee would also like to note that the Town recently completed an Emergency Action Plan for coordination between the Town and Liberty Gas, an Emergency Dispensing Site Plan to help the Town respond in the case of a public health emergency, as well as a NPDES MS4 Permit Action Plan. In addition, they would like to note that the Town, in collaboration with the Red Cross, recently completed a site evaluation for the Hartnett Regional Middle School and the Kennedy Elementary School, which are used by the Town as emergency shelters. These documents informed mitigation strategies included in this plan update.

After this plan has been approved by both FEMA and the local government, links to the plan will be emailed to all Town staff, boards, and committees, with a reminder to review the plan periodically and work to incorporate its contents, especially the action plan, into other planning processes and documents. In addition, during annual monitoring meetings for the Hazard Mitigation Plan implementation process, the Hazard Mitigation Team will review whether any of these plans

[106] The Town of Blackstone, with assistance from PGC Associates, LLC, "Open Space and Recreation Plan 2023: Blackstone, Massachusetts," Drive.google.com, The Town of Blackstone, March 26, 2024, https://drive.google.com/file/d/109n9h_ugACI-6ho22VfxZzY5Vb7pW19Z/view

[107] "Chapter 123: Zoning," Townofblackstone.org.

[108] PGC Associates, LLC., "Town of Blackstone Master Plan 2018," Townofblackstone.org, The Town of Blackstone, November 1, 2018, https://www.townofblackstone.org/DocumentCenter/View/882/Blackstone-Master-Plan-December-2018---Part-1-PDF?bidId=.

[109] Fuss & O'Neill, "Town of Blackstone Community Resilience Building Workshop Summary of Findings," Mass.gov, Massachusetts Executive Office of Energy and Environmental Affairs, May 2018, https://www.mass.gov/doc/2017-2018-mvp-planning-grant-report-blackstone/download.

[110] "ResilentMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan"

[111] "2022 Massachusetts Climate Change Assessment"

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are in the process of being updated. If so, the Hazard Mitigation Team will remind people working on these plans, policies, etc., of the Hazard Mitigation Plan, and urge them to incorporate the Hazard Mitigation plan into their efforts. The Hazard Mitigation Team will also review current town programs and policies to ensure that they are consistent with the mitigation strategies described in this plan. The Hazard Mitigation Plan will also be incorporated into updates of the Town's Comprehensive Emergency Management Plan.

8.3 Plan Monitoring and Evaluation

Section 8.3 helps meet:

- *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's Emergency Management Director will call meetings of all responsible parties to review plan progress, on a yearly basis and/or as is needed based on the occurrence of hazard events. The public will be notified of these meetings in advance through a posting of the agenda at Town Hall. Responsible parties identified for specific mitigation actions will be asked to submit their reports in advance of meetings.

Meetings will involve evaluation and assessment of the plan. Responsible parties will review the plan's effectiveness at achieving its goals and stated purpose at these meetings. The following questions will serve as the criteria that are used to evaluate the plan:

Plan Mission and Goal

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

Hazard Identification and Risk Assessment

- Have there been any new occurrences of hazard events since the plan was last reviewed? If so, these hazards should be incorporated into the Hazard Identification and Risk Assessment.
- Have any new occurrences of hazards varied from previous occurrences in terms of their extent or impact? If so, the stated impact, extent, probability of future occurrence, or overall assessment of risk and vulnerability should be edited to reflect these changes.
- Is there any new data available from local, state, or Federal sources about the impact of previous hazard events, or any new data for the probability of future occurrences? If so, this information should be incorporated into the plan.

Existing Mitigation Strategies

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- 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 impact from recent occurrences of hazards? If there are improvements, these should be incorporated into the plan.

Proposed Mitigation Strategies

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

Review of the Plan and Integration with Other Planning Documents

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

Following these discussions, it is anticipated that the planning team 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 plan. The team will review and update the Hazard Mitigation Plan every five years.

Public participation will be a critical component of the Hazard Mitigation Plan maintenance process. The Hazard Mitigation Team will hold all meetings in accordance with Massachusetts open meeting laws, and the public will be invited to attend these meetings. The public will be notified of any changes to the Plan via the meeting notices board at Town Hall, and copies of the revised Plan will be made available to the public at Town Hall.

8.4 Potential Federal and State Funding Sources

8.4.1 Federal Funding Sources

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

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Table 15: Federal Hazard Mitigation Funding

Program	Type of Assistance	Availability	Managing Agency	Funding Source
National Flood Insurance Program (NFIP)	Pre-disaster insurance	Any time (pre & post disaster)	DCR Flood Hazard Management Program	Property Owner, FEMA
Community Rating System (CRS) (Part of the NFIP)	Flood insurance discounts	Any time (pre & post disaster)	DCR Flood Hazard Management Program	Property Owner
Hazard Mitigation Grant Program (HMGP)	Post-disaster cost-share grants	Post disaster program	MEMA	75% FEMA/ 25% non- federal
Building Resilient Infrastructure and Communities (BRIC)	National, competitive cost-share grant program for projects & planning	Annual, pre-disaster mitigation program	MEMA	75% FEMA/ 25% non- federal
Flood Mitigation Assistance (FMA) Program	Cost share grants for pre- disaster planning & projects	Annual pre-disaster grant program	MEMA	75% FEMA/ 25% non- federal
Public Assistance	Post-disaster aid to state & local governments	Post Disaster	MEMA	FEMA/ plus a non-federal share
Small Business Administration (SBA) Mitigation Loans	Pre- & post-disaster loans to qualified applicants	Ongoing	MEMA	Small Business Administration
Hazard Mitigation Grant Program Post-Fire (HMGP-PF)	Cost-share post-wildfire disaster mitigation measures	Annual, within six months after FMAG declaration	FEMA	75% FEMA/25% non-federal
Assistance to Firefighters Grants (AFG)	Training & equipment for wildfire-related hazards	Annual	FEMA	FEMA
Fire Prevention & Safety Grant Program (AFG) (FP&S)	Cost-share funding to support projects that protect people from fire-related hazards	Annual	FEMA	95% FEMA, 5% non-federal
Fire Management Assistance Grants (F-MAG)	Cost-share funding to mitigate & manage major disasters caused by fire	Any time (pre- & post disaster)	FEMA	75% FEMA/25% non-federal

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Emergency Management Performance Grant (EMPG)	Pre- & post-disaster management and implementation grants	Annual	FEMA	50% FEMA/50% non-federal match
Homeland Security Grant Program (HSGP)	Funding to prevent, respond to, and recover from acts of terrorism	Annual	FEMA	FEMA
National Dam Safety Program (State Assistance Grant Program) (NDSP)	Funding to improve dam safety & State dam safety programs	Annual	FEMA	FEMA, BIL
Rehabilitation of High Hazard Potential Dam Program (State Dam Safety Divisions) (HHPD)	Cost-share funding to plan and rehabilitate HHPD	Annual	FEMA	65% FEMA/35% non-federal
National Earthquake Hazards Reduction Program's State Assistance Program (NEHRP)	Cost-share funding for pre-earthquake risk management	Annual	FEMA	75% FEMA/25% non-federal
Emergency Food and Shelter Program (EFSP)	Grant funding for supplemental food & shelter for those experiencing/at risk of experiencing	Annual	FEMA	FEMA
Public Health Crisis Response Cooperative Agreement (PHCRCA)	Funding to support surge needs of existing public health programs responding to public health emergencies	Annual for ABU roster	CDC	Varies
Army Corp of Engineers Planning Assistance	Water supply, conservation, wetlands, & dam safety	Any time (pre & post disaster)	U.S. Army Corps of Engineers	50% Federal/ 50% non-federal
Forest Service Community Wildfire Defense Grant (USDA-FSCWDG)	Grant funding to plan for and reduce wildfire risk	Annual	USDA-FS	75% USDA, 25% non-federal

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Emergency Watershed Protection Program (EWP)	Technical assistance and funding for helping communities mitigate natural disaster risks which affect watersheds	Ongoing	USDA-NRCS	75% USDA, 25% non-federal (90% USDA, 10% non-federal in limited resource areas)
Agricultural Management Assistance (Drought Mitigation Funding Program) (AMA)	Technical assistance for agricultural producers to manage financial risks	Ongoing	USDA-NRCS	75% USDA, 25% non-federal
USDA Community Facilities Direct Loan & Grant Program (Rural Development) (CFDLGP)	Improve essential community facilities	Annual	USDA-RD	Varies
National Culvert Removal, Replacement, & Restoration Grant (NCRRRG)	Competitive grant funding to replace, remove, and repair culverts or weirs	Annual	US DOT	Varies
Bridge Investment Program (BIP)	Competitive grant program for improving the conditions of existing bridges	Annual	US DOT	80% FHWA, 20% other

The FEMA web pages identify several funding opportunities. Please refer to https://www.fema.gov/grants. Some programs 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 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
- Incentivize proactive floodplain management

Communities can CRS earn 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

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risk communication with flood warning systems, and (3) enhancing infrastructural resilience to flood damage. Please refer to https://www.floodsmart.gov/ and https://www.fema.gov/floodplain-management/community-rating-system for more information.

HAZARD MITIGATION ASSISTANCE

The HMA grant programs provide funding opportunities for pre- and post-disaster mitigation. While the statutory origins of the programs differ, all share the common goal of reducing the risk of loss of life and property due to 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)

HMGP assists in implementing long-term hazard mitigation measures following Presidential disaster declarations. Funding is available to implement projects in accordance with State, Tribal, and local priorities. Please refer to http://www.fema.gov/hazard-mitigation-grant-program for additional information.

HMGP funds may be used to fund projects that will reduce or eliminate the losses from future disasters. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the 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 projects include, but are not limited to:

- Acquisition of real property for willing sellers and demolition or relocation of buildings to convert the property to open space use
- Retrofitting structures and facilities to minimize damages from high winds, earthquake, flood, wildfire, 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
- Post-disaster building code related activities that support building code officials during the reconstruction process

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

The Hazard Mitigation Grant Program Post-Fire (HMGP-PF) is a program aimed at providing financial funding to localities in order to reduce risk of fire damage after a fire has occurred. Funds are determined through a Benefit-Cost Analysis software. For more information, please refer to: Hazard Mitigation Grant Program Post Fire | FEMA.gov

Building Resilient Infrastructure and Communities (BRIC)

The Building Resilient Infrastructure and Communities program aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment

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in community resilience. Examples of BRIC projects are ones that demonstrate innovative approaches to partnerships, such as shared funding mechanisms, and/or project design. For example, an innovative 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 is replacing the Pre-Disaster Mitigation grant program. More information on the BRIC program can be found here: https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities.

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: https://www.mass.gov/service-details/building-resilient-infrastructure-and-communities-bric-flood-mitigation-assistance-fma-grant-programs.

FLOOD MITIGATION ASSISTANCE (FMA)

Flood Mitigation Assistance (FMA) provides funds on an annual basis so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the National Flood Insurance Program. Please refer to the FMA website: http://www.fema.gov/flood-mitigation-assistance-grant-program.

Three 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.
- **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 elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive loss properties; these include 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: https://www.mass.gov/service-details/building-resilient-infrastructure-and-communities-bric-flood-mitigation-assistance-fma-grant-programs.

DISASTER ASSISTANCE

Disaster assistance is money or direct assistance to individuals, families and businesses in an area 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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In the event of a Declaration of Disaster, assistance from FEMA is grouped in 3 categories:

A. Housing Needs

- **Temporary Housing** (a place to live for a limited period of time): Money is 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 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 the disaster, including:
- Disaster-related medical and dental costs.
- Disaster-related funeral and burial cost.
- Clothing; household items (room furnishings, appliances); tools (specialized or protective clothing and equipment) required for your job; necessary educational materials (computers, school books, supplies)
- Fuels for primary heat source (heating oil, gas).
- Clean-up items (wet/dry vacuum, dehumidifier).
- Disaster damaged vehicle.
- 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.
- Other expenses that are authorized by law.

C. Additional Services

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

DISASTER LOANS AVAILABLE FROM THE 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 three types of disaster loans to qualified homeowners

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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: This loan provides economic relief to small businesses and nonprofit organizations that have suffered damage to their home or personal property.
- Military reservist loans: SBA provides 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: https://www.sba.gov/funding-programs/disaster-assistance.

DISASTER ASSISTANCE FROM OTHER ORGANIZATIONS AND ENTITIES

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 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 the federal, state, tribal, regional, and local levels.

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

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

FIRE MANAGEMENT ASSISTANCE GRANTS (F-MAG)

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

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.

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EMPG supports efforts in building and strengthening capabilities in areas related to protection, mitigation, prevention, response and recovery. As of the 2024 fiscal year the grant has a total available funding of $319.55 million. Please find more about this grant program at the link here: Emergency Management Performance Grant | FEMA.gov..

HOMELAND SECURITY GRANT PROGRAM (HSGP)

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

- State Homeland Security Program (SHSP)
- Urban Area Security Initiative (UASI)
- Operation Stonegarden (OPSG)

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

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

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

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

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

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

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

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

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

EMERGENCY FOOD AND SHELTER PROGRAM (EFSP)

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

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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).

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, and 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 are only planning level of detail; they do not include detailed design for project construction. The program can encompass many types of studies dealing with 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. Please refer to:
https://www.nae.usace.army.mil/missions/public-services/planning-assistance-to-states/.

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. This is primarily done through the revision and development of community wildfire protection plans and the assistance in implementing new projects in said plans. For more information, please refer to: Community Wildfire Defense Grant Program | US Forest Service (usda.gov).

EMERGENCY WATERSHED PROTECTION PROGRAM (EWP)

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

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

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

USDA COMMUNITY FACILITIES DIRECT LOAN & GRANT PROGRAM

The UDSA Community Facilities Direct Loan & Grant program provides affordable funding to develop essential community facilities in rural areas. An essential community facility is defined as a

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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, 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. Funds can be used to purchase, construct, and / or improve essential community facilities, purchase equipment and pay related project expenses. For more information, please refer to: https://www.rd.usda.gov/programs-services/community-facilities/community-facilities-direct-loan-grant-program.

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

The National Culvert Removal, Replacement, and Restoration Grant Program (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 about this program can be found at this link: Aquatic Organism Passage - Culvert Hydraulics - Hydraulics - Bridges & Structures - Federal Highway Administration (dot.gov).

BRIDGE INVESTMENT PROGRAM (BIP)

The Bridge Investment Program (BIP) gives 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 BIP, please refer to: BIP - Funding Programs - Management and Preservation - Bridges & Structures - Federal Highway Administration (dot.gov).

8.4.2 STATE FUNDING SOURCES

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

Table 16: State Hazard Mitigation Funding

Program	Type of Assistance	Availability	Managing Agency	Funding Source
604b	Grants focused on nonpoint source pollution assessment and watershed planning	Annual	Mass DEP	State funding (match not required but recommended)
Section 319 Nonpoint Source Competitive Grants Program	Competitive grant program funding projects that address the prevention, control, and abatement of nonpoint source (NPS) pollution	Annual	Mass DEP	State funding

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Water Quality Monitoring Grant Program	Reimbursement funding for monitoring and/or data collection efforts that support water quality assessments	Annual	Mass DEP	State funding
Statewide Water Management Act Grant	Reimbursement grant funding for projects to help public water suppliers plan and manage water use	Annual	Mass DEP	Reimbursement grant
Massachusetts Gap Energy Grant Program (Gap III)	New program providing grant assistance up to ($200,000 per community) for implementing energy efficiency and clean energy generation projects at water and wastewater plants	Annual (likely)	Mass DEP	State funding
State Revolving Fund	Low-interest loans	Annual	Mass DEP	Municipal funding with state loan
Municipal Vulnerability Preparedness (MVP) Action Grants	Competitive climate adaptation grants	Annual	EEA	75% EEA/ 25% non-state match
Planning Assistance Grants (EEA PAG)	Competitive grants that support efforts to plan, regulate (zone), and act to conserve and develop land consistent with	Annual	EEA	75% EEA / 25% non-state match
Dam and Seawall Repair or Removal Program	Competitive grants for dam and seawall repair and removal, as well as construction loans	Annual	EEA	State funding
Massachusetts Land & Water Conservation Fund Grant Program (LWCF)	Federal grant program to help improve access to and protection for public lands and waters	Annual	EEA	Federal program that funds up to 50% of total costs for acquisition, development, and renovation

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Land Acquisition for Natural Diversity (LAND)	Financial assistance to municipalities for the acquisition of conservation land	Annual	EEA	Reimbursement grant, the reimbursement rate varies per Town
Drinking Water Supply Grant	Competitive grants for protection of drinking water supplies	Annual	DCS	State funding
Land and Recreation Grants and Loans	Varies, though primarily grant funding for conservation and recreation projects	Varies, generally annually	DCS	Varies
Water Quality Management Planning Grant	Competitive grant for water quality assessment and management planning	Annual	DCS	State funding
Forest Legacy Grant Program (USDA-FS) (FLGP)	Grant funding to protect environmentally important forestland from conversion	Annual	DCR	75% USDA FS, 25% non-federal
Volunteer Fire Assistance Program (VFA)	Reimbursement grant program that funds technical, financial and other assistance to fire departments for forest fire related purposes	Annual	DCR	State funding
Culvert Replacement Municipal Assistance Grant Program	Competitive grants for replacing an undersized, perched, and/or degraded culvert located in an area of high ecological value	Annual	DER	State funding

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Division of Ecological Restoration Priority Project Program	State competitive grant program that funds projects that restore and protect the State's rivers, wetlands, and watersheds (priority projects may differ each year)	Annual	DER	State funding
Mass Wildlife Habitat Management Grant Program (MWHMGP)	Reimbursement grant funding to assist municipalities enhance wildlife habitat and increase recreational opportunities on protected lands	Annual	DFW	USDA NRCS
Agricultural Climate Resiliency and Efficiencies Program (ACRE)	Competitive, reimbursement grant funding that supports practices that mitigate the agricultural sector's vulnerability to climate change	Annually through Climate Smart Agriculture Program (CSAP)	MDAR	MDAR
Agricultural Preservation Restriction Program (APR)	Financial assistance in exchange for permanent deed restriction to protect the land's agricultural viability	Any time for owners of at least 5 acres of farmland	MDAR	MDAR
Hazard Mitigation Planning Grant Program (HMPG)	Grant program for communities, after a disaster, to reduce or eliminate future risk to lives and property from natural hazards	Annual	FEMA	75% federal/25% state/local match
Hazard Mitigation Grant Program (State) (HMGP)	Sub-grant programs for Hazard Mitigation Grant program	Annual	MEMA	State funding
Community Development Block Grants (CDBG)	Competitive community development grants	Annual	EOHED	US Department of Housing and Urban Development

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Emergency Solutions Grant (ESG)	Competitive grant funding designed to support services that assist those experiencing/at risk of experiencing homelessness	Annual	EOHED	MA EOHLC
Mass Works	Competitive infrastructure grants	Annual	EOHED	State funding
Community Preservation Act (CPA)	Establishes a local community preservation fund through tax surcharge to support a variety of project related to conservation and housing	Ongoing	Department of Revenue (DOR)	Statewide Community Preservation Trust Fund / local Community Preservation Fund
Special appropriations and legislative earmarks	Varies	Infrequent, after natural disasters or legislature vote	Massachusetts General Legislature	State funding
District Local Technical Assistance (DLTA)	Funding to support planning and technical assistance for housing, economic growth, and regional projects	Varies, generally annually	Massachusetts General Legislature, CMRPC	State funding
Local Planning Assistance (LPA)	Planning and technical assistance	Annual	CMRPC	Planning assistance hours
Support and Incentive Grant	Reimbursement grant funding designed to assist in providing enhanced 911 service	Annual	MA EOPSS	MA EOPSS
Municipal Small Bridge Program	Competitive grants for small bridge replacement, preservation, and rehabilitation projects	Annual	Mass DOT	State funding

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Chapter 90 Program (Transportation Capital Improvement Projects) (Chpt. 90)	Reimbursable grants to support capital improvements on local public ways	Ongoing	Mass DOT	State funding
State Transportation Improvement Program (STIP)	Competitive funding opportunity for transportation projects along federal-aid roadways	Annually updated five-year programming document	MassDOT	MassDOT
Complete Streets (CS)	Reimbursement grant funding to provide safe and accessible options for al travel modes	Annually available to municipalities that adopt a Complete Street Policy	MassDOT	State funding

The Community Grant Funder web page includes the municipal grant programs listed above, as well as other funding opportunities: https://www.mass.gov/lists/community-grant-finder. Some programs in Table 15 are described in more detail on the following pages.

604B

The Water Quality Management Planning Grant Program provides funding opportunities to regional planning agencies, councils of governments, conservation districts, counties, cities and towns, federally and state recognized tribes, and other substate public planning agencies and interstate agencies to determine and correct water quality issues in Massachusetts. For more information on this program, please refer to: Grants & Financial Assistance: Watersheds & Water Quality | Mass.gov

SECTION 319 NONPOINT SOURCE COMPETITIVE GRANTS PROGRAM

Section 319 of the Clean Water Act provides funding opportunities for prevention, control, and abatement of nonpoint source (NPS) pollution. These grants are available to eligible Massachusetts public or private organization: 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, these entities' projects must include: have measures that address the prevention, control, and abatement of NPS pollution, target major sources of NPS pollution within the watershed, contain an appropriate method for evaluating the project results, and address activities in the current Massachusetts NPS Management Program Plan. For more information on this program, please refer to: Grants & Financial Assistance: Watersheds & Water Quality | Mass.gov

WATER QUALITY MONITORING GRANT PROGRAM

The Water Quality Monitoring Grant Program provides funding opportunities to eligible entities and organizations to increase the amount of external data on water quality in Massachusetts. For more information, please refer to: Grants & Financial Assistance: Watersheds & Water Quality | Mass.gov.

STATEWIDE WATER MANAGEMENT ACT GRANT

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The Statewide Water Management Act Grant provides grant funding for projects which improve the ecological conditions of specific watershed, projects aimed at reducing water demand and projects that address the following: improve or increase instream flow, keeping wastewater local, stormwater management, reduce impervious cover and/or improve water quality, water supply operational improvements, habitat improvement, reduction of wastewater inflow and infiltration, and other projects that can be demonstrated to mitigate the impacts of water withdrawals. This program awards approximately 10 grants a year and has a reimbursement rate of 80%. Grants are awarded to eligible public water suppliers and municipalities with Water Management Act permits. For more information, please refer to: Water Management Act Grant Programs for Public Water Suppliers | Mass.gov.

MASSACHUSETTS GAP ENERGY GRANT PROGRAM (GAP III)

Through a partnership between the Massachusetts Department of Energy Resources (DOER) and the Massachusetts Clean Energy Center (MassCEC), this grant program provides funding to fill the last financial "gap" needed for clean energy projects by a variety of organizations to promote clean and efficient energy projects. In 2022, the GAP III program awarded a total of $8.1 million in grants. For more information about this program, please refer to: Massachusetts' Gap Energy Grant Program | Mass.gov.

PLANNING ASSISTANCE GRANTS (EEA PAG)

These 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's Sustainable Development Principles. Top priorities of the program include: zoning for sustainable housing production, mitigation of climate change through zoning and other regulatory actions, and zoning that results in permanent land conservation. For more information about these grants, please refer to: Planning Assistance Grants | Mass.gov.

STATE REVOLVING FUND

This statewide loan program through the Massachusetts Department of Environmental Protection assists communities in funding local drinking water, wastewater, and storm water infrastructure improvements.

MUNICIPAL VULNERABILITY PREPAREDNESS ACTION GRANT PROGRAM

The MVP Action Grant offers financial resources to municipalities that are seeking to advance priority climate adaptation actions to address climate change impacts resulting from extreme weather, sea level rise, inland and coastal flooding, severe heat, and other climate impacts. Towns are eligible for this competitive grant program after successfully completing an MVP planning grant. A variety of project types are eligible for funding, but projects must address local vulnerabilities to climate change and incorporate MVP Core Principles. Grant application information can be found here: https://www.mass.gov/service-details/mvp-action-grant. MVP Core Principles can be found here: https://www.mass.gov/doc/mvp-core-principles/download.

DAM AND SEAWALL REPAIR OR REMOVAL PROGRAM

The EEA funds projects for the repair and removal of dams, levees, seawalls, and other forms of inland and coastal flood control. For additional information, please refer to https://www.mass.gov/service-details/dam-and-seawall-repair-or-removal-program-grants-and-funds.

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MASSACHUSETTS LAND & WATER CONSERVATION FUND GRANT PROGRAM (LWCF)

This program 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.

LAND ACQUISITION FOR NATURAL DIVERSITY (LAND)

This 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 52-70%. For more information, please refer to: Local Acquisitions for Natural Diversity (LAND) Grant Program | Mass.gov.

DRINKING WATER SUPPLY GRANT

The DWSP grant 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. It is a reimbursement program.

LAND AND RECREATION GRANTS AND LOANS

The Division of Conservation Services (DCS) manages several grant or 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: https://www.mass.gov/land-and-recreation-grants-loans/need-to-know.

WATER QUALITY MANAGEMENT PLANNING GRANT

This grant program is authorized under the federal Clean Water Act Section 604(b) for water quality assessment and management planning. Eligible entities include: regional planning agencies, councils of governments, conservation districts, counties, cities and towns, and other substate public planning agencies and interstate agencies. No local match is required.

FOREST LEGACY GRANT PROGRAM (USDA-FS) (FLGP)

The Forest Legacy Program 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 conservationist use. For more information about the program, please refer to: Forest Legacy Program | Mass.gov.

VOLUNTEER FIRE ASSISTANCE PROGRAM (VFA)

The Volunteer Fire Assistance Program (VFA) was born from a collaborative effort between the US Forest service and the Massachusetts DCR Bureau of Forest Fires and Forestry. This program aims to provide funding for volunteer fire departments in towns of under 10,000 people. For more information, please refer to: Volunteer Fire Assistance (VFA) Program | Mass.gov.

CULVERT REPLACEMENT MUNICIPAL ASSISTANCE GRANT PROGRAM

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This program provides funding opportunity for local governments to replace undersized, perched, and/or degraded culverts in areas of high ecological value. For more information on this program, please refer to: Culvert Replacement Municipal Assistance Grant Program | Mass.gov

DER PRIORITY PROJECTS

The Priority Project Program is an opportunity under the Division of Ecological Restoration 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 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. More information on the Priority Projects program can be found here: https://www.mass.gov/how-to/become-a-der-priority-project. This program can be used to remove significant or high hazards dams that communities no longer want to maintain, which may improve the health and resilience of aquatic systems.

MASS WILDLIFE HABITAT MANAGEMENT GRANT PROGRAM (MWHMGP)

This is a program dedicated to the protection and restoration of wildlife habitat. MWHMGP awards grants of $10,000 to $75,000 to private landowners with habitat restoration projects. Teh program also places emphasis on the protection of endangered species and the expansion of outdoor recreation opportunities, the enhancement of ecological communities disproportionally susceptible to climate change. For more information about this program, please refer to: MassWildlife Habitat Management Grant Program | Mass.gov.

AGRICULTURAL CLIMATE RESILIENCY AND EFFICIENCIES PROGRAM (ACRE)

ACRE is a competitive grant program available to eligible farmers that funds materials and labor to improve climate change resilience, economic resiliency and to forward the goals of the Massachusetts Local Food Action Plan. For more about this program, please refer to: Agricultural Climate Resiliency & Efficiencies (ACRE) Program | Mass.gov.

AGRICULTURAL PRESERVATION RESTRICTION PROGRAM (APR)

APR 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, actively devoted to agriculture for at least the past 2 tax years and 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, as well as various other considered criteria. For more information, please refer to: Agricultural Preservation Restriction (APR) Program Details | Mass.gov.

HAZARD MITIGATION PLANNING GRANT PROGRAM (HMPG)

This program provides funding for cities, towns, state agencies and certain non-profit organizations for natural disaster mitigation after a Presidential Disaster Declaration has been issued. Grants on average are awarded from $100,000 to $500,000. For more information, please refer to: Hazard Mitigation Grant Program | Mass.gov.

HAZARD MITIGATION GRANT PROGRAM (STATE) (HMGP)

HMGP provides funds to areas after a natural disaster with the purpose of lowering risk of damage

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and loss of life from future natural disasters. This grant program seeks to reduce the reliance on taxpayer-funded federal assistance for disaster recovery. For more information about this program, please refer to: Hazard Mitigation Grant Program (HMGP) | Mass.gov.

COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG)

CDBG remains the principal source of revenue for 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 Community Development (HCD). The program can fund certain critical infrastructure projects, and necessary housing improvements that benefit populations that may be more vulnerable to certain natural hazards. The program can also fund the rehabilitation of municipal buildings such as town halls, which in many cases, also serve as Emergency Operations Centers for their communities.

EMERGENCY SOLUTIONS GRANT (EFG)

The Emergency Solutions Grant funds necessary services to help house/rehouse those who are homeless or at risk of homelessness and to provide shelter for those in need of emergency shelter. For more information on this program, please refer to: Emergency Solutions Grant Program (ESG) | Mass.gov.

MASSWORKS INFRASTRUCTURE PROGRAM

The MassWorks Infrastructure Program provides a one-stop shop for municipalities and other eligible public entities seeking public infrastructure funding to support economic development and job creation. Although not specific to natural hazards per se, these infrastructure enhancements under MassWorks could also address identified needs for hazard mitigation. 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. Please refer to http://www.mass.gov/hed/economic/eohed/pro/infrastructure/massworks/ for additional information.

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 by creating affordable housing, which benefits residents who may be most vulnerable to natural hazards. More information on the CPA program can be found here: https://www.communitypreservation.org/about.

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

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issued 12 state of emergency declarations. Additionally, individual legislators may seek specific project funding for projects through the legislative budgeting and appropriations process.

DISTRICT LOCAL TECHNICAL ASSISTANCE

District Local Technical Assistance (DLTA) is funding allocated by the Massachusetts General Assembly (Legislature) to the Central Massachusetts Regional Planning Commission (CMRPC) to provide technical assistance to member communities on eligible projects. DLTA planning dollars help cities and towns take on necessary projects that they don't have the staff capacity to address on their own, and to 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 these funds to projects and activities that result in change in the municipality(ies) receiving these DLTA Fund services, whether in law, regulation, program management, or practice, that serve to further these objectives. 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 also 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.

LOCAL PLANNING ASSISTANCE

The Local Technical Assistance (LTA) program was initiated to improve the direct services of this agency to its member communities. Under the LTA program each community annually receives a set number of hours of technical assistance to be used in any reasonable planning project authorized by the community's commissioner.

SUPPORT AND INCENTIVE GRANT

The Support and Incentive Grant provides opportunity funding to public safety answering points (PSAPs) and regional emergency communication centers (RECC) 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 you must be an existing regional public safety answering point or regional emergency communication center that is expanding. For more on this program, please refer to: Apply for the Support & Incentive Grant | Mass.gov.

MUNICIPAL SMALL BRIDGE PROGRAM

The Municipal Small Bridge Program offers funding opportunities to Massachusetts municipalities for small bridge replacement, preservation, and rehabilitation projects. For more information about this program, please refer to: Municipal Small Bridge Program | Mass.gov

CHAPTER 90 FUNDS

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This statewide program reimburses communities for roadway projects, such as resurfacing and related work and other work incidental to the above such as 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, street lighting (excluding operating costs), and for such other purposes as the Department may specifically authorize. Maintaining and upgrading critical infrastructure and evacuation routes is an important component of hazard mitigation. Chapter 90 funds could be used for roadway improvements.

STATE TRANSPORTATION IMPROVEMENT PROGRAM (STIP)

STIP is an annual list of transportation infrastructure projects, funded and planned through the combined effort of MassDOT and other state agencies. For more on this program, please refer to: State Transportation Improvement Program (STIP) | Mass.gov.

COMPLETE STREETS (CS)

The Complete Streets 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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APPENDIX A

Maps

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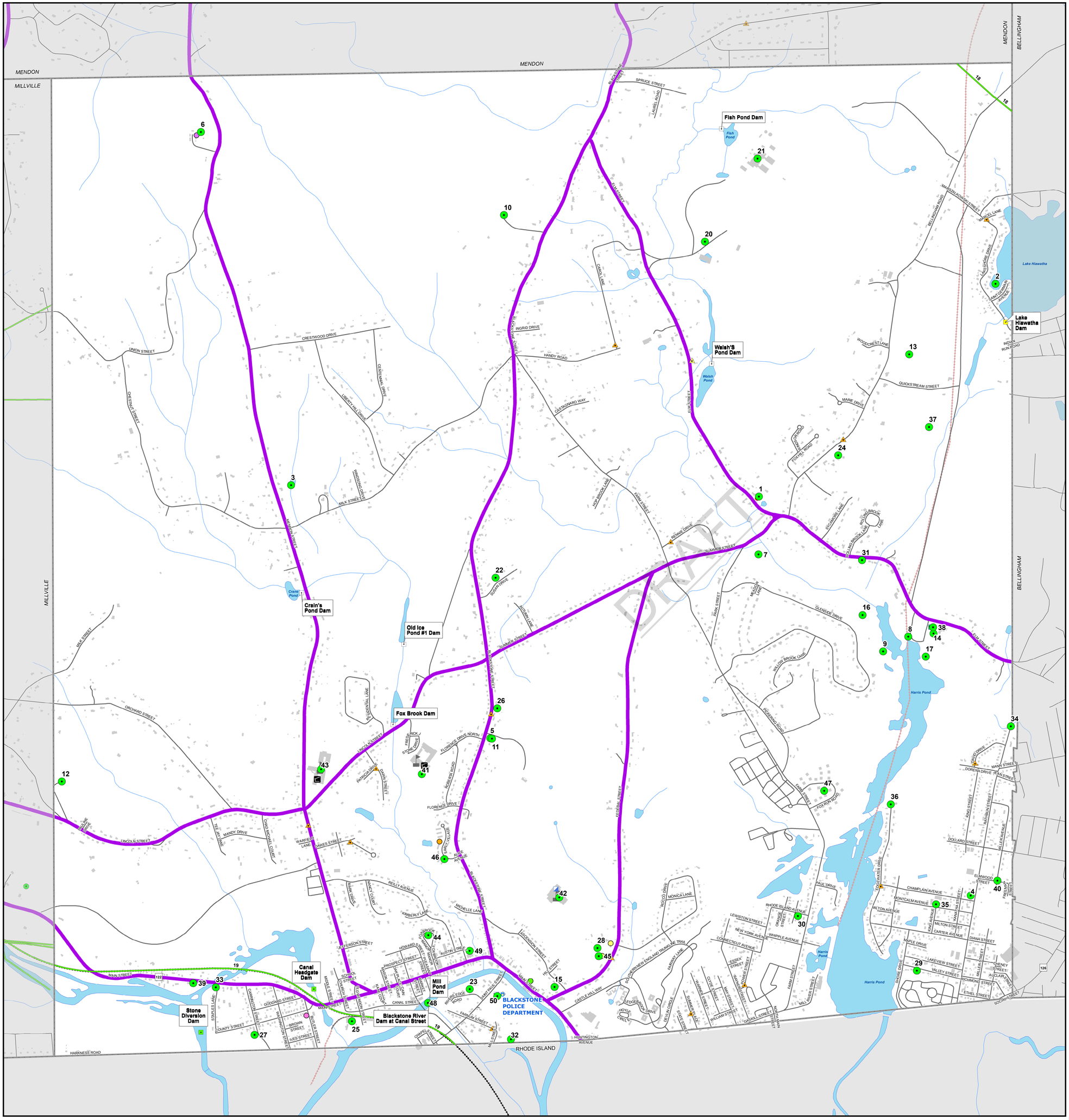
Hazard Mitigation Plan
Map 1
Critical Infrastructure and Facilities
Town of Blackstone, Massachusetts

June 2024



Legend

- Assisted Living
- Elderly Housing
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Power Plant
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Water Treatment Plant
- Town Halls
- Local Police
- Fire Station
- Schools (Pre-K through High School)
- Active Rail Line
- Out of Service/Abandoned Rail Line

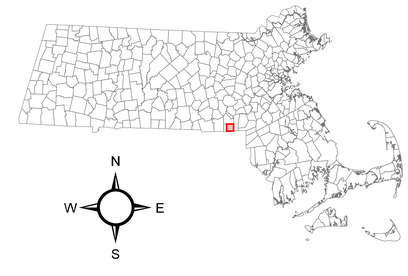
- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Dams (2/2012)

- Significant Hazard
- Low Hazard
- N/A

Locally Defined

- Critical Infrastructure
- Critical Infrastructure
- Critical Infrastructure



0.25 0.125 0 0.25 0.5 Miles

Data provided by participating municipalities, CMRPC, massDOT, MassGIS, FEMA and NOAA.
Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution intrepreting positional accuracy.

Produced by the Central Massachusetts Regional Planning Commission.
One Mercantile St. Suite 520, Worcester, MA 01608

CMRPC
Central Massachusetts Regional Planning Commission

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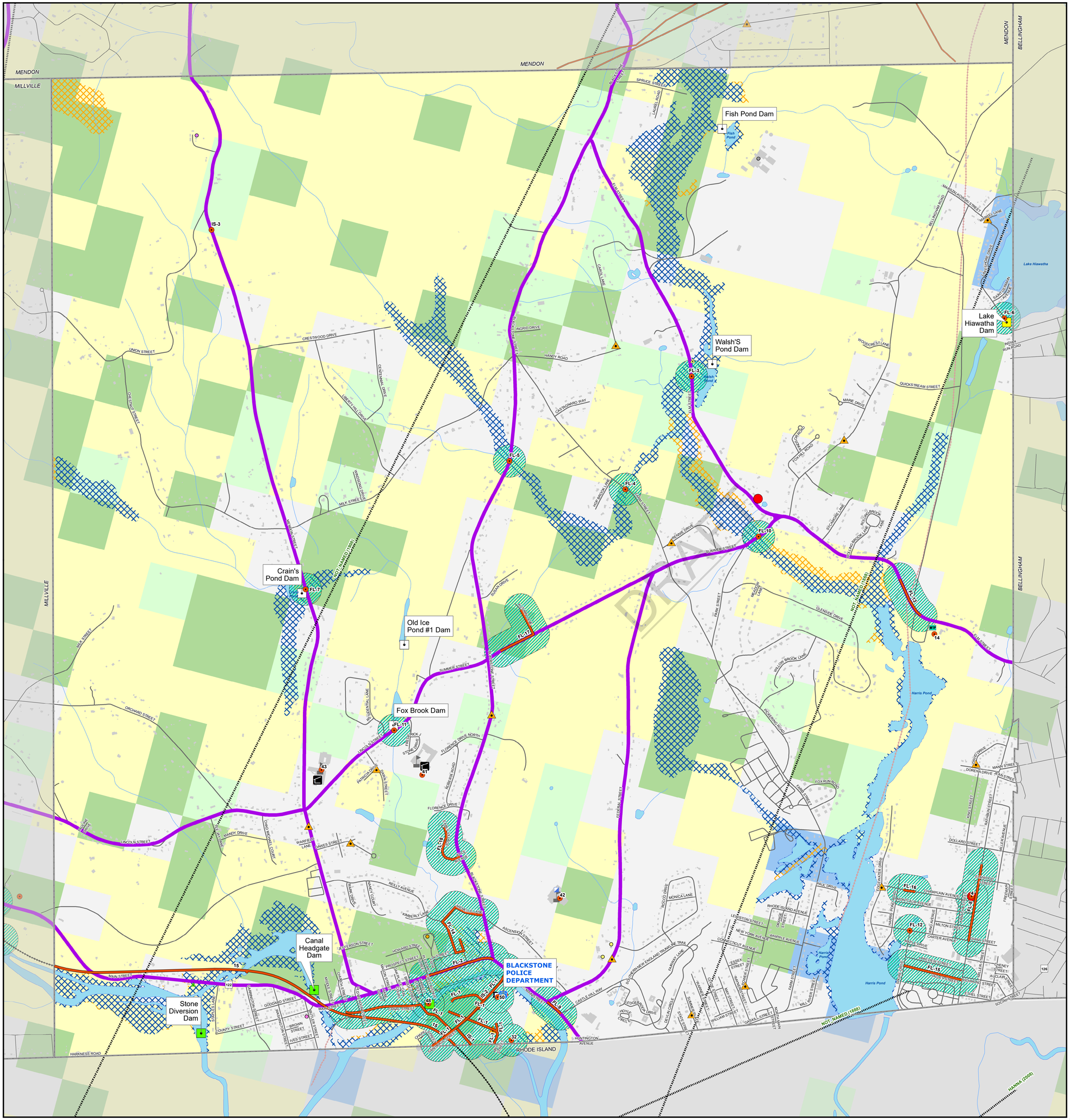
Hazard Mitigation Plan

Map 2
Hazards
Town of Blackstone, Massachusetts

June 2024



Legend

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- Active Rail Line
- Out of Service/Abandoned Rail Line

- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Hazards

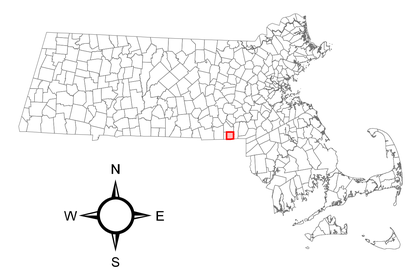
Dams (2/2012)
- High Hazard
- N/A

FEMA DFIRM Flood Zones
- 100-year Flood Area*
- 500-year Flood Area
- Repetitive Loss Property Areas
- NOAA Historic Hurricane Tracks (1842-2022)

USDA Wildfire Hazard Potential, Version 2023
- 1: Very Low
- 2: Low
- 3: Moderate
- 4: High
- 5: Very High
- 6: Non-burnable
- 7: Water

Locally Defined Hazards

- Hazard
- Hazard
- Possible Flood Area
- Hazard



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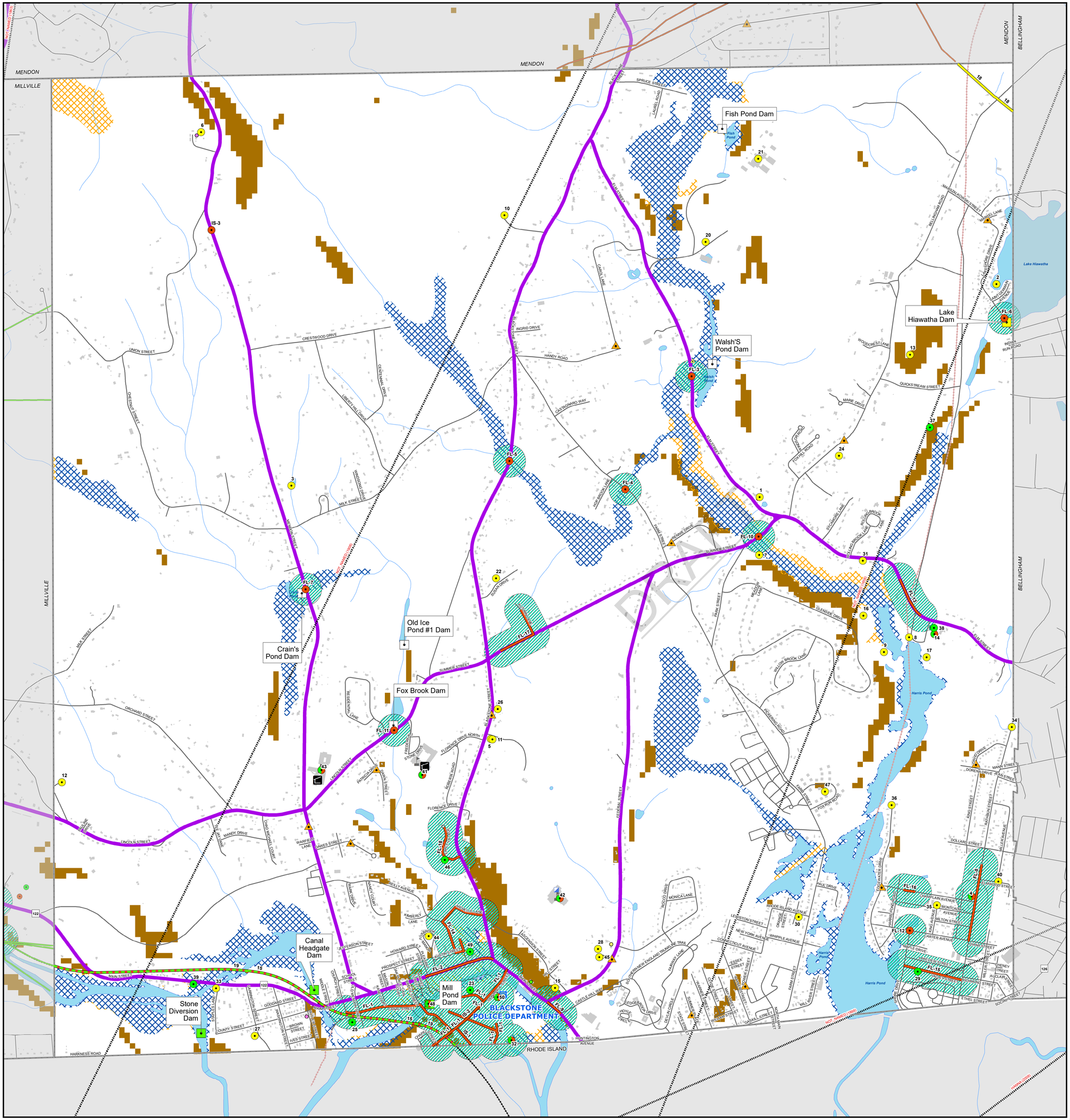
Hazard Mitigation Plan
Map 3
Vulnerable Critical Infrastructure and Facilities
Town of Blackstone, Massachusetts
June 2024



Legend

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- Water Treatment Plant
- Town Halls
- Local Police
- Fire Station
- Schools (Pre-K through High School)
- Active Rail Line
- Out of Service/Abandoned Rail Line

- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Hazards

Dams (2/2012)
- Significant Hazard
- Low Hazard
- N/A

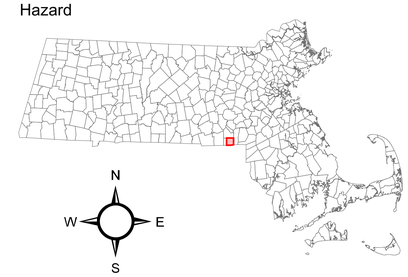
FEMA DFIRM Flood Zones
- 1% Annual Chance Flood Hazard or Regulatory Floodway
- 0.2% Annual Chance Flood Hazard

- High Slope (15% and above)
- Repetitive Loss Property Areas

IBTrACS Historical Hurricane Tracks (1842-2020)

Locally Defined

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



0.25 0.125 0 0.25 0.5 Miles

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CMRPC Central Massachusetts Regional Planning Commission

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Key to Locally Identified Hazards and Critical Infrastructure and Facilities in Appendix A Maps

Facility/Infrastructure/Hazard	Type	Map ID	Vuln. (Town)	Vuln. (GIS)
Flooding – Saint Paul St/Rivers Edge Rd/Farnum St/Canal St	H	FL-1	N/A	N/A
Flooding – Main St from appx. 1st Ave to Blackstone St	H	FL-2	N/A	N/A
Flooding – Elm St & Mill Brook	H	FL-3	N/A	N/A
Flooding – Farm St & Hop Brook	H	FL-4	N/A	N/A
Flooding – Blackstone St & Hop Brook	H	FL-5	N/A	N/A
Flooding – Lakeshore Dr & Quick Stream	H	FL-6	N/A	N/A
Flooding – Mendon St & Fox Brook	H	FL-7	N/A	N/A
Flooding – Rathbun St near Fire Station	H	FL-8	N/A	N/A
Flooding – Main St between Federal St & Castle Hill Way	H	FL-9	N/A	N/A
Flooding – Mill River flooding/failed dam site	H	FL-10	N/A	N/A
Flooding – Lincoln St & Fox Brook	H	FL-11	N/A	N/A
Flooding – Carter Ave & Shore Dr	H	FL-12	N/A	N/A
Flooding – Elm St (North of Harris Pond)	H	FL-13	N/A	N/A
Flooding – Fox Brook, high water hazard	H	FL-14	N/A	N/A
Flooding – Valley St	H	FL-15	N/A	N/A
Flooding – Champlain Ave	H	FL-16	N/A	N/A
Flooding – Summer St / Autumn Lane	H	FL-17	N/A	N/A
Flooding – Early Village / Alice Ave	H	FL-18	N/A	N/A
Invasive Species – Bittersweet on Canal St	H	IS-1	N/A	N/A
Invasive Species – Wisteria along St. Paul St	H	IS-2	N/A	N/A
Invasive Species – Red Flame Bushes, Mendon St by the Gas Line	H	IS-3	N/A	N/A
Fire Department – Fire Station #3 - sewer lift station nearby	CI	1		
Fire Department – Dry Hydrant - Lake Shore Drive (Lake Hiawatha)	CI	2		
Fire Department – Dry Hydrant - Wojcik's Farm Pond	CI	3		
Fire Department – Fire Station #2 / Backup Emergency Operations Center - flooding hazard	CI/H	4	Y	Y
Communications – Radio Repeater Blackstone St Water tank	CI	5	Y	
Communications – AT&T Tower	CI	6		
Water Supply – Well Pumps #2,7	CI	7	Y	
Water Supply – Well Pump #5a	CI	8	Y	
Water Supply – Well Pump #8	CI	9	Y	
Water Supply – Storage Tank - Near 315 Blackstone St	CI	10	Y	
Water Supply – Water Tank - 128 Blackstone St	CI	11	Y	
Water Supply – Storage Tank - Lincoln St near Millville line	CI	12	Y	
Water Supply – Storage Tank - 45 Bellingham Rd	CI	13	Y	
Water Supply – DPW Offices and Garage / Corrosion Facility - sewage lift station on site, has no backup generator	CI/H	14	Y	Y
Water Supply – Well Pump #4	CI	15	Y	
Water Supply – Well Pump #9	CI	16	Y	
Water Supply – Well Pump #6	CI	17	Y	
Utilities – Algonquin Natural Gas Pipeline	CI	18	Y	
Utilities – Providence Worcester RR - Wildfires along rail line	CI/H	19	Y	Y
Utilities – Kimball Sand Co.	CI	20		
Utilities – ANP Blackstone Natural Gas Power Plant	CI	21		
Daycare – Bouchard, 4 Susan Dr	CI	22		
Daycare – Growing Einsteins Daycare - 5 Rivers Edge Drive	CI	23	Y	Y
Daycare – Hart, 21 Bellingham Rd	CI	24		

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Daycare – Boys & Girls Club - Afterschool Programs, 115 Canal St	CI	25	Y	Y
Daycare – Battaglia Home Daycare	CI	26		
Daycare – Languirand Home Daycare	CI	27		
Daycare – Little People's Day Care Center, Inc	CI	28		
Daycare – Viveiros Home Daycare	CI	29		Y
Daycare – Wainwright Home Daycare	CI	30	Y	
Daycare – St. Amant Home Daycare	CI	31		
Sewer – Mill Street Sewer Lift Station - flooding hazard	CI/H	32	Y	Y
Sewer – Staples Lane Sewer Lift Station	CI	33		
Sewer – Rathburn Street Sewer Lift Station	CI	34		
Sewer – Montcalm Ave Sewer Lift Station	CI	35		
Sewer – Edgewater Drive Sewer Lift Station	CI	36		
Sewer – Quickstream Street Sewer Lift Station	CI	37	Y	Y
Sewer – Elm Street Sewer Lift Station	CI	38		Y
Sewer – Upper Main Street Sewage Lift Station	CI	39		Y
Sewer – Elmwood Street Sewer Lift Station	CI	40		
Schools – Blackstone-Millville Regional High School (sewer lift station nearby) - snow load hazard	CI/H	41	Y	Y
Schools – Hartnett Regional Middle School - Primary Emergency Shelter - snow load hazard	CI/H	42	Y	Y
Schools – Kennedy and Maloney Elementary Schools (Kennedy is an Emergency Shelter) - snow load hazard	CI/H	43	Y	Y
Housing – Fox Brook Manor, Blackstone Housing Authority	CI	44		
Housing – DuCharme Estates	CI	45		
Housing – Early Village, Blackstone Housing Authority (sewer lift station nearby)	CI	46		Y
Housing – The Hamlet of Blackstone (over 55 community)	CI	47		
Saranac Dam / Blackstone River Dam at Canal Street - flooding hazard	CI/H	48	Y	Y
Town Facilities – Public Library	CI	49	Y	Y
Town Facilities – Blackstone Municipal Center / Public Safety Building / Senior Center / Emergency Operations Center - snow load hazard	CI/H	50	Y	Y

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APPENDIX B

Public Survey Materials and Results

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Blackstone Hazard Mitigation Plan

Survey Responses Needed

The Town of Blackstone is in the process of updating its Hazard Mitigation Plan and is requesting input from residents to inform this plan. An updated HMP will help the Town assess and reduce community risk from natural hazards.

You are invited to submit your thoughts on natural hazards, such as flooding, snowstorms, or thunderstorms, in the Blackstone Hazard Mitigation Plan Community Survey.

Take our survey using the QR code below.

Tip: Open your phone camera, point at the QR code, and click the pop-up link to take the survey.

Link to the survey: https://www.surveymonkey.com/r/YSTHFQM

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Blackstone Hazard Mitigation Plan Community Survey

Blackstone Hazard Mitigation Plan

In October 2023, the Town of Blackstone 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 Blackstone.

By participating in this survey, you will help the Town of Blackstone understand the current and future natural hazards that residents are most concerned about. Survey responses will be accepted until January 24th, 2024.

1. Check all that apply.

- [ ] I live in Blackstone.
- [ ] I work in Blackstone.
- [ ] I frequently visit Blackstone.

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

- [ ] I have not been impacted by natural hazards in Blackstone
- [ ] 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)

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3. Where have you observed hazard impacts in Blackstone, 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 Blackstone (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 Blackstone? 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

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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 Blackstone 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; encourage cutting/trimming dead trees beside/hanging over roads; etc.

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

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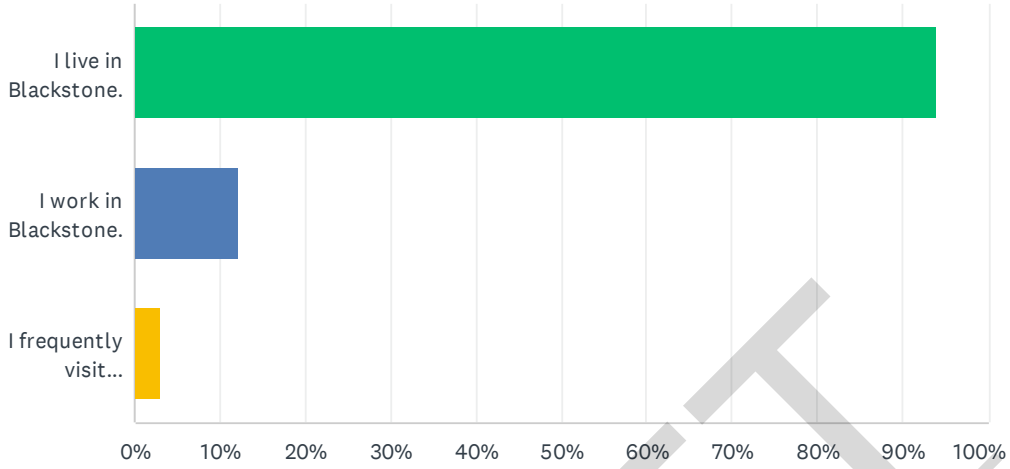
Q1 Check all that apply.

Answered: 33 Skipped: 0



ANSWER CHOICES	RESPONSES	
I live in Blackstone.	93.94%	31
I work in Blackstone.	12.12%	4
I frequently visit Blackstone.	3.03%	1
Total Respondents: 33		

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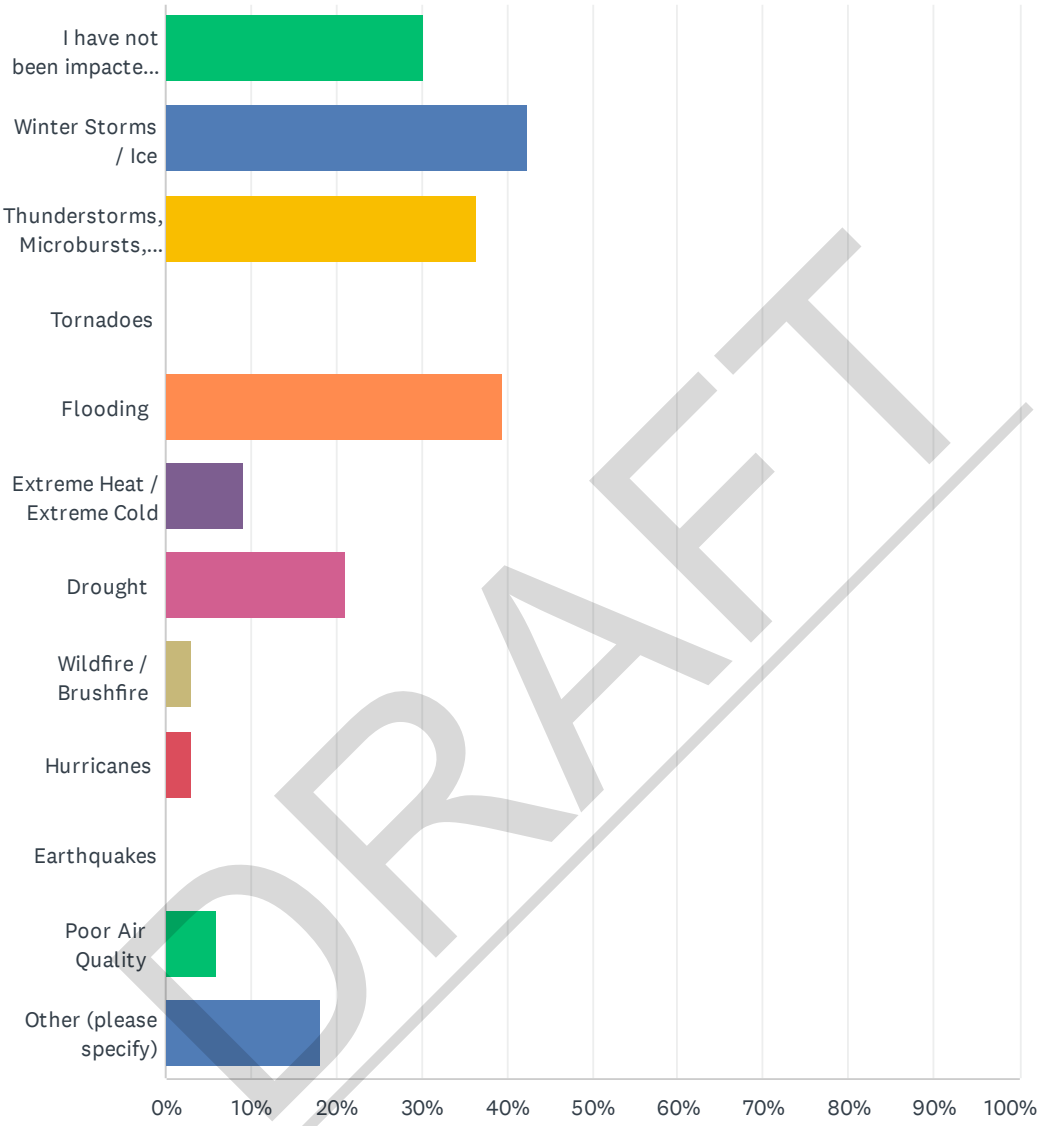
Q2 Has your family or property, in Blackstone, been impacted by any of the following natural hazards? Select all that apply:

Answered: 33 Skipped: 0



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ANSWER CHOICES	RESPONSES	
I have not been impacted by natural hazards in Blackstone	30.30%	10
Winter Storms / Ice	42.42%	14
Thunderstorms, Microbursts, and/or Extreme Wind	36.36%	12
Tornadoes	0.00%	0
Flooding	39.39%	13
Extreme Heat / Extreme Cold	9.09%	3
Drought	21.21%	7
Wildfire / Brushfire	3.03%	1
Hurricanes	3.03%	1
Earthquakes	0.00%	0
Poor Air Quality	6.06%	2
Other (please specify)	18.18%	6
Total Respondents: 33		

#	OTHER (PLEASE SPECIFY)	DATE
1	Do not live in Blackstone, Millville Resident	3/26/2024 5:58 PM
2	Solar Farm on Blackstone putting in the retention ponds like they promised. All the Abutters, this was in thier plans. No retention ponds and it floods back yards. Also the cattle crossinbg on Summer was closed and the water backs up in our yard washing out the soil. Retention were in	2/29/2024 4:18 PM
3	Flooding Caused by town closing in a cattle crossing under summer st AND Solar Farm not putting in retention ponds that are in their plans	2/29/2024 4:03 PM
4	tap water discolored at times, and slow ground sinking	1/7/2024 8:58 AM
5	Dead trees due to gypsy moth infestation	1/7/2024 8:28 AM
6	Possible sink hole? Behind King St property abutting Dorena property.	1/7/2024 8:08 AM

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Q3 Where have you observed hazard impacts in Blackstone, 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: 27 Skipped: 6

#	RESPONSES	DATE
1	When water is low we cannot water our yards. Kids can't ever (ever is underlined) use water outdoors and I am a homeowner. I cannot keep my...alive. I buy flowers and they always die.	3/26/2024 6:13 PM
2	Flooding on Blackstone St Flooding on Summer St	3/26/2024 6:05 PM
3	Lincoln St	3/26/2024 6:00 PM
4	Flooding on Roads	3/26/2024 5:54 PM
5	Elm st flooding, main st flooding. Old trees falling all over the town ..	3/15/2024 3:47 PM
6	The Fox Brook located next to the Blackstone Library, Blackstone, MA.	3/4/2024 5:45 PM
7	I live on Main Street on the river and my yard is subject to more flooding than ever. In the last 30 years that my family has owned this home, the last few years have seen the most flood encroachment on the yard.	3/3/2024 10:35 AM
8	tree down on road	2/29/2024 4:22 PM
9	(respondent underlined "drought/effects on water supply" and "trees down on roads")	2/29/2024 4:20 PM
10	Cattle Crossing - Same as #2 Spoke to Jimmy Sullivan about this Solar Farm on Blackstone Street, should be held accountable for these retention ponds.	2/29/2024 4:18 PM
11	Sever flooding of the mill river. Impacting a wetland that is part of our property on Rennie Drive	2/29/2024 4:05 PM
12	Flooding from Sealed up Cattle crossing under summer st, which stopped the flow of our culvert. Also flooding due to solar farm on Blackstone st cutting down all those trees and not installing retention ponds as approved in their plans!	2/29/2024 4:03 PM
13	Main Street Flooding/ Sewer Overflow	2/29/2024 3:56 PM
14	The area behind the library is prone to flooding.	2/19/2024 8:18 AM
15	Flooding on Bellingham Rd. REDACTED When there is excessive rain a literal river starts REDACTED back yard and flows so heavily through REDACTED backyard that it overwhelms all the French drain around REDACTED. The past storm the water flowed so hard it over flowed the drains and broke in my basement window. The continues down the road and floods Elm street. Something needs to be addressed with the water level and drainage at the top of the hill on the street. One storm the force of the water push fifty feet of crushed stone 3 feet deep out of all my drains and into my front yard. Have had them all redone with larger stone.	1/7/2024 9:04 AM
16	Jefferson St, river flow floods backyards and basements	1/7/2024 8:58 AM
17	Road flooding in front of CVS	1/7/2024 8:28 AM
18	n/a	1/7/2024 1:17 AM
19	Farm St-down trees, extended power outages Glenside Dr-power outages	1/6/2024 11:08 PM
20	Flooding: washing out roadways, overflowing/topping and dismantling retention ponds. Extreme drought: the town has suffered public water supply issues, residents experienced financial losses as a result.	1/6/2024 10:53 PM
21	Catch basins on farm st(Anderson end) don’t seem to catch water runoff. When it rains water	1/6/2024 6:59 PM

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	runs down the road like a stream. Properties (front yards) are frequently flooded as a result.	
22	Flooding on parts of Farm St, wind damage and trees down on roads, unsafe road conditions during snow storms after plow trucks have been by	1/6/2024 6:53 PM
23	We have an water ban for outdoor water use every year.	12/17/2023 7:36 PM
24	Minor flooding on Mendon Street by the entrance to Goulet Park	12/17/2023 9:30 AM
25	Watched river rise to almost flood the Waterford section in 2004	12/16/2023 3:31 PM
26	Flooding on rathbun street in two areas by turbesi park and by valley street	12/16/2023 2:07 PM
27	Alice Ave floods	12/16/2023 1:39 PM

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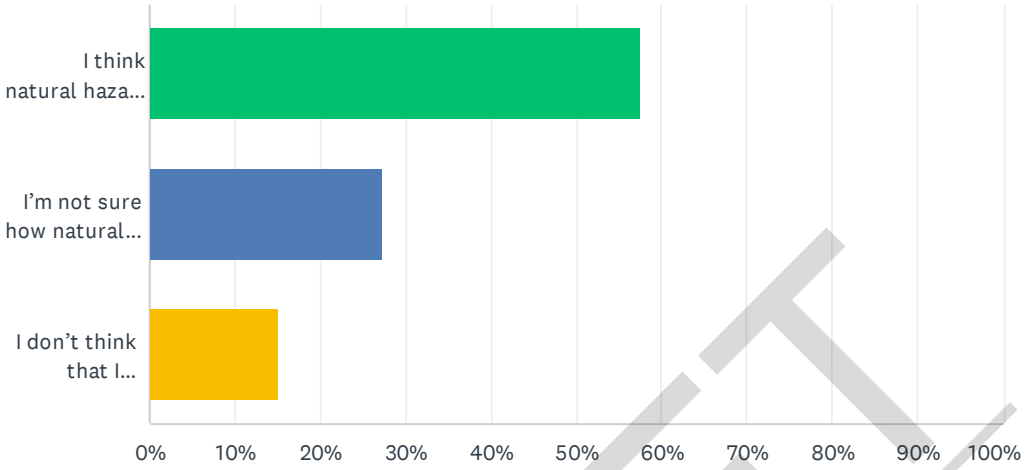
Q4 How much do you think the impacts of natural hazards and climate change will threaten your personal health, safety, or property?

Answered: 33 Skipped: 0



ANSWER CHOICES	RESPONSES	
I think natural hazards and climate change will negatively impact my life.	57.58%	19
I'm not sure how natural hazards and climate change will impact my life.	27.27%	9
I don't think that I personally will be impacted by natural hazards and climate change.	15.15%	5
TOTAL		33

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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: 25 Skipped: 8

#	RESPONSES	DATE
1	wells drying out / contaminated ability to grow food people not wanting to live here because we don't have...water	3/26/2024 6:13 PM
2	air quality, water sources/safety, ability to grow food	3/26/2024 6:05 PM
3	Basement flooding and Yard flooding	3/26/2024 6:00 PM
4	BASEMENT FLOODING - worried about erosion of due to lawn dying due inability to water lawn to continuous water ban	3/26/2024 6:00 PM
5	Wells drying out and contamination issues with my septic tank	3/26/2024 5:58 PM
6	Flooding, basement	3/26/2024 5:54 PM
7	Basement flooding from Fox Brook overflowing.	3/4/2024 5:45 PM
8	I worry about my home flooding beyond my yard with the increase in severity of storms. I worry more broadly about the impact on roadways and infrastructure. Also worried about the impact of insect born illness due to climate change (Lyme, EEE).	3/3/2024 10:35 AM
9	trees falling on the house	2/29/2024 4:22 PM
10	(respondent underlined "basement flooding, wells drying out / contamination of wells, ability to grow food")	2/29/2024 4:20 PM
11	The Water table is very high here due to the water coming from where the solar farm is (Blackstone St) we now after 65 years have water in basement when there is a heavy rain.	2/29/2024 4:18 PM
12	Flooding and erosion , west Nile, insects Wildlife loss of land use.	2/29/2024 4:05 PM
13	Basement flooding -> I live in a basement apartment in an extremely high water table, Future problems with septic and property drainage due to no where for the water to go!	2/29/2024 4:03 PM
14	Power lines w/poles wind	2/29/2024 3:56 PM
15	I am most concerned about property damage both in my house and around my yard.	1/7/2024 9:04 AM
16	basement flooding mold build up), water contamination, falling trees	1/7/2024 8:58 AM
17	Brush fire, air quality, flooding, inflation of utility cost, inflation of cost of food, missed school/work due to natural disasters, loss of life from natural disasters	1/7/2024 8:28 AM
18	Basement flooding. Property loss to possible sink hole.	1/7/2024 8:08 AM
19	That the town will spend money on this climate change hoax...	1/7/2024 1:17 AM
20	The town will not be able to sustain a population growth with climate impacts on our water system.	1/6/2024 10:53 PM
21	Basement flooding, contamination of wells	1/6/2024 6:53 PM
22	My primary concerns are water supply, the potential for property damage from storms, and impacts to down power lines.	12/17/2023 7:36 PM
23	Droughts ans affect on wells	12/17/2023 9:30 AM

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24	Flooding and contamination	12/16/2023 2:07 PM
25	Fence falls	12/16/2023 1:39 PM

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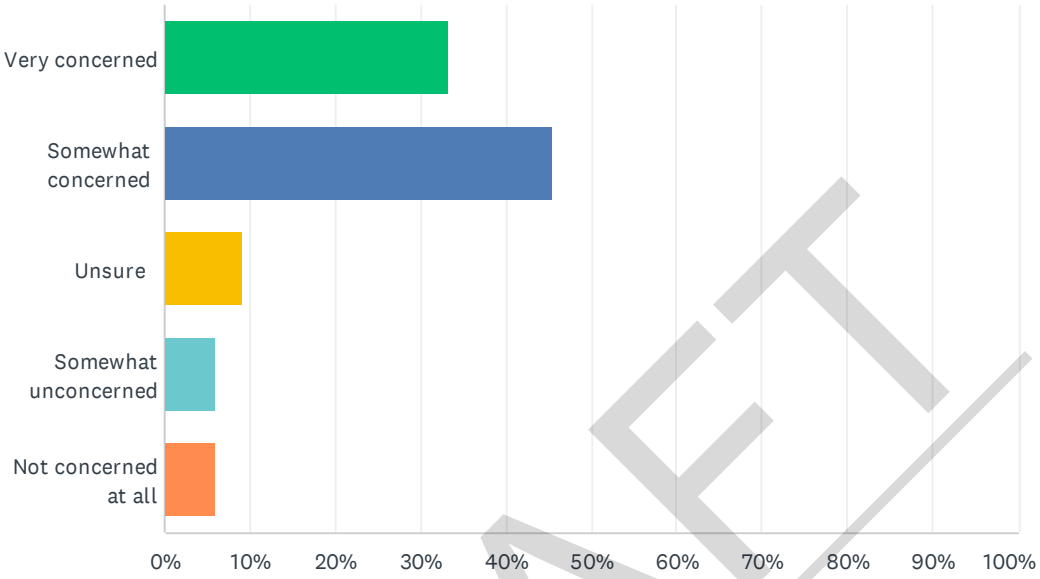
Q6 How concerned are you about the impacts that natural hazards and climate change will have on the Town of Blackstone (the local infrastructure, economy, environment, and/or town residents)?

Answered: 33 Skipped: 0



ANSWER CHOICES	RESPONSES	
Very concerned	33.33%	11
Somewhat concerned	45.45%	15
Unsure	9.09%	3
Somewhat unconcerned	6.06%	2
Not concerned at all	6.06%	2
TOTAL		33

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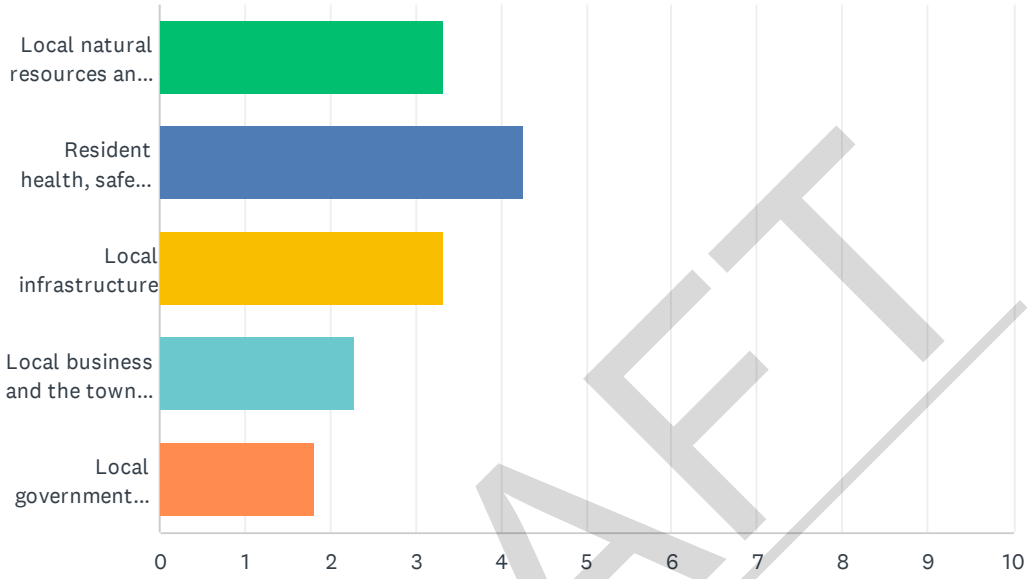
Q7 What community assets are you most concerned about when you consider the potential impact of natural hazards and climate change on the Town of Blackstone? Rank the responses below in order from most concerned (1) to least concerned (5).

Answered: 31 Skipped: 2



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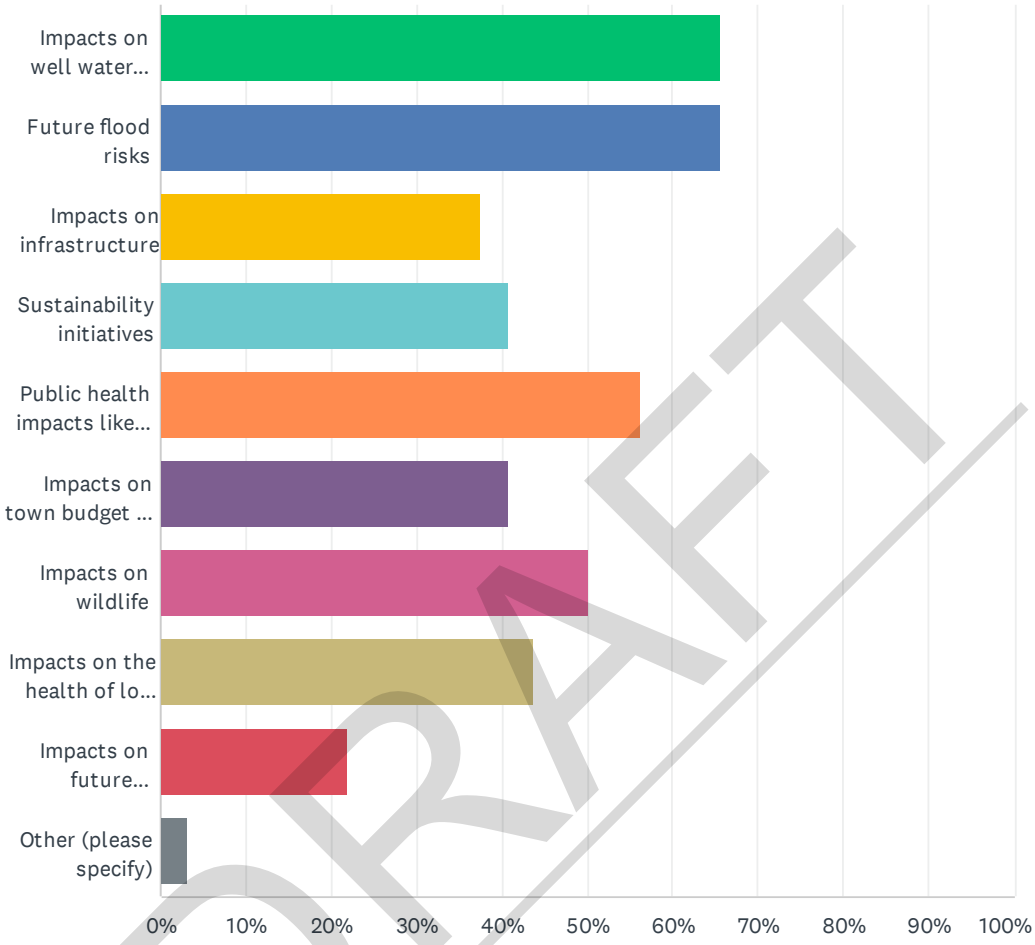
	1	2	3	4	5	TOTAL	SCORE
Local natural resources and environments	19.35% 6	25.81% 8	32.26% 10	12.90% 4	9.68% 3	31	3.32
Resident health, safety, and property	64.52% 20	12.90% 4	12.90% 4	3.23% 1	6.45% 2	31	4.26
Local infrastructure	9.68% 3	45.16% 14	19.35% 6	19.35% 6	6.45% 2	31	3.32
Local business and the town economy	6.45% 2	3.23% 1	22.58% 7	48.39% 15	19.35% 6	31	2.29
Local government resources	0.00% 0	12.90% 4	12.90% 4	16.13% 5	58.06% 18	31	1.81

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: 32 Skipped: 1



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ANSWER CHOICES	RESPONSES	
Impacts on well water quantity / quality	65.63%	21
Future flood risks	65.63%	21
Impacts on infrastructure	37.50%	12
Sustainability initiatives	40.63%	13
Public health impacts like increased risks of vector-borne disease (ex. Lyme disease, West Nile Virus, EEE - Eastern equine encephalitis)	56.25%	18
Impacts on town budget and finances	40.63%	13
Impacts on wildlife	50.00%	16
Impacts on the health of local forests	43.75%	14
Impacts on future development	21.88%	7
Other (please specify)	3.13%	1
Total Respondents: 32		

#	OTHER (PLEASE SPECIFY)	DATE
1	Clean water availability	12/16/2023 3:31 PM

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Q9 What actions should the Town of Blackstone 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; encourage cutting/trimming dead trees beside/hanging over roads; etc.

Answered: 22 Skipped: 11

#	RESPONSES	DATE
1	Dig more wells or any way to get more water (clean) into town	3/26/2024 6:13 PM
2	Improve Stormwater	3/26/2024 6:00 PM
3	More Education	3/26/2024 5:58 PM
4	Education and outreach	3/26/2024 5:54 PM
5	Stop building	3/15/2024 3:47 PM
6	The water from the Fox Brook can't flow under the Main Street bridge/pipe fast enough and backs up. The brook could possibly be damned by beavers or littered from residents, which should be investigated. The brook was dredged in late 80's or early 90's...it needs to be done again!	3/4/2024 5:45 PM
7	Anything to mitigate hazards should be pursued. Invasive plants seem to be overtaking parts of the river in Blackstone above the gorge; this should be addressed. New building has to be done and approved with water and wildlife impacts evaluated.	3/3/2024 10:35 AM
8	dead tree trimmings taken down	2/29/2024 4:22 PM
9	Hold the Solar Farm Accountable, make them put in retention ponds. Fix Cattle Crossing under summer st so it doesnt back up into the yard. have Highway put correct berm from corner of blackstone street to the culvert on summer st. (respondent included the following at the end of the form "Please email me with any questions on what Solar Farm Said to abutters on Blackstone Street")	2/29/2024 4:18 PM
10	Rebuild the dam on summer street to better control the Mill river	2/29/2024 4:05 PM
11	Improve Stormwater Management: I>E> Water comes off the road and down my drive and washes away my gravel driveway. Open Cattle crossing and provide a way to naturally flow up Blackstone street. Solar Farm Made To Construct retention Ponds As Agreed Upon By Abuter.	2/29/2024 4:03 PM
12	ADD: More Municipal / Emergency Assistance/ Response Teams, Equipment: ALL TERRAIN and Personell	2/29/2024 3:56 PM
13	Look into grant funding to improve storm water management	1/7/2024 9:04 AM
14	add more drainage systems, cut dead town-owned trees behind/in front of homes that may fall during storms	1/7/2024 8:58 AM
15	Emergency preparedness	1/7/2024 8:28 AM
16	All listed above in the example.	1/7/2024 8:08 AM
17	Cutting trees over utilities. Everything should be cut back 10 feet and nothing taller than the poles for 20 feet off the road.	1/7/2024 1:17 AM
18	Grant funding Cutting/trimming dead trees over roads and wires Less tree removal for either	1/6/2024 11:08 PM

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	sale or gravel removal including solar panel farms Upgrade first responder facilities, communications and equipment	
19	Improve storm water management	1/6/2024 6:59 PM
20	There should be plans in place on how to support residents and town infrastructure impacted by a climate related event.	12/17/2023 7:36 PM
21	Secure water supply	12/16/2023 3:31 PM
22	Encourage proper pitch of roads and drainage	12/16/2023 2:07 PM

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Blackstone Public Library

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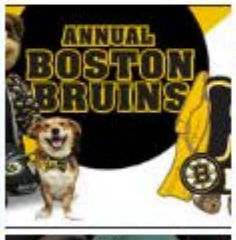

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ENTERING EST. 1845 BLACKSTONE MASSACHUSETTS

Blackstone Hazard Mitigation Plan

Survey Responses Needed

The Town of Blackstone is in the process of updating its Hazard Mitigation Plan and is requesting input from residents to inform this plan. An updated HMP will help the Town assess and reduce community risk from natural hazards.

CMRPC

You are invited to submit your thoughts on natural hazards, such as flooding, snowstorms, or thunderstorms, in the Blackstone Hazard Mitigation Plan Community Survey.

Take our survey using the QR code below.

Tip: Open your phone camera, point at the QR code, and click the pop-up link to take the survey.

Link to the survey: https://www.surveymonkey.com/r/YSTHFQM

DRAFT

You and 1 other

Like Comment Share

Write a comment...

Town of Blackstone, Massachusetts
January 6 at 6:00 PM ·

Blackstone Hazard Mitigation Plan

Survey Responses Needed

The Town of Blackstone is in the process of updating its Hazard Mitigation Plan and is requesting input from residents to inform this plan. An updated HMP will help the Town assess and reduce community risk from natural hazards.

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APPENDIX C:

Meetings

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Blackstone Hazard Mitigation Plan Update
Local Planning Team Kickoff Meeting

Date/Time: Tuesday, October 10th, 2023, 2:00pm
Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

AGENDA

I. Introductions

II. Plan Background

- Review Contract
- Roles and Responsibilities
- Estimated Timeline

III. Project Phases & Preliminary Schedule

Phase	Completion (proposed)
o Assembly of local planning team, kickoff	October 2023
o Information gathering o Natural hazards o Critical infrastructure and facilities	November 2023-March 2024
o Mitigation strategy development	March 2024-June 2024
o Stakeholder and public involvement	November 2023-August 2024
o Plan narrative development	August 2024-October 2024
o Plan submission (initial)	November 2024
o Plan adoption	December2024-January 2025

IV. Local Planning Team Meetings/Council Presentations

- Meeting #1 (kickoff)
- Meeting #2 (hazards and critical infrastructure/facilities) (*can be two meetings*)
- Meeting #3 (mitigation strategies)
- Presentation #1 (summary of draft plan – setting is flexible)
- Presentation #2 (final plan and request for adoption @ BOS) (optional)

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V. Review of Mitigation Strategies

- 2017 HMP Mitigation Strategies

VI. Next Meeting – Natural Hazards and/or Infrastructure

- Date/location
- What to prepare

DRAFT

Blackstone Hazard Mitigation Plan Kickoff Meeting

Sign-In Sheet

Name	Department	E-Mail	Phone
Gregory Gilmore	Police	chief@blackstonepolice.org	5088531212
Colleen M. Strappeni	BOH	cstrappeni@townofblackstone.org	508-883-1212
Gary Bibbo	DPW Asst. Supt	GBibbo@TownofBlackstone.org	508-883-6218
James Sullivan	DPW Supt	J.Sullivan@TownofBlackstone.org	508-962-0191
Kevin Roy	Fire	KRoy@Townofblackstone.org	
Bill Kessler	Fire	bkessler@townofblackstone.org	
Kevin Ryan	BOH		
Lawton	Town Accountant/ Asst Town Admin		

DRAFT

Meeting Name:
Blackstone Hazard Mitigation Plan Kickoff Meeting

Community: Blackstone

Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

Date: October 10th, 2023

Meeting Time: 2:00 PM

Participant Name	Organization	Title	E-mail
Gregory Gilmore	Police	Chief	chief@blackstonepolice.org
Colleen M. Strapponi	Board of Health	Health Agent	healthagent@townofblackstone.org
Gary Bibbo	DPW	Assistant	gbibbo@townofblackstone.org
James Sullivan	DPW	Superintendent	jsullivan@townofblackstone.org
Kevin Roy	Fire Department	Deputy Chief	kroy@townofblackstone.org
Bill Kessler	Fire Department	Chief	bkessler@townofblackstone.org
Kevin Ryan	Board of Health	Vice Chairman	
Lauren Taylor	Town Administrator's Office	Town Accountant / Assistant Town Administrator	ltaylor@townofblackstone.org

DRAFT

Blackstone Hazard Mitigation Plan Update
Local Planning Team Meeting #2
Natural Hazards and Critical Infrastructure

DRAFT

Date/Time: Wednesday, December 13, 2023 9:30 AM
Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

AGENDA

I. Introductions

II. Meeting #1 Recap

III. Community Lifelines

- When should we include them in the planning Process?

IV. Reference Documents

V. Natural Hazards Review

a. Flooding
b. Severe Snowstorms, Ice Storms, and Nor'easters
c. Hurricanes
d. Severe Thunderstorms, Wind, and Tornadoes
e. Wildfires and Brushfires
f. Earthquakes
g. Dam Failure
h. Drought
i. Extreme Temperatures
j. Landslides and Other Hazards

VI. Break

VII. Critical Infrastructure/Facilities and Vulnerable Populations Review

Review previous CI/F/P lists and update as necessary

- Category 1 – Emergency Response Facilities
- Category 2 – Non-Emergency Response Facilities
- Category 3 – Dams
- Category 4 – Populations and Facilities to Protect

X. Next Meeting – Existing Protection Measures Review, Public Forum and Community Survey Planning

- Date/location
- What to prepare

DRAFT

CMRPC
Central Massachusetts Regional Planning Commission

ENTERING
EST. 1845
BLACKSTONE
MASSACHUSETTS

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

Community: Blackstone

Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

Date: December 13th, 2023

Meeting Time: 9:30 AM

Participant Name	Organization	Title	E-mail
Gregory Gilmore	Police	Chief	chief@blackstonepolice.org
Colleen M. Stanapparo	Bott	healthAgent	healthagent@townofblackstone.org
Will Talbot	CMRPC	Ass. Smart Resiliency Planner	wtalbot@cmrpc.org
Gary Bibbo	DPW	Assistant Sector.	GBibbo@townofblackstone.org
Jimmy Sullivan	DPW	supt	JSullivan@TownofBlackstone.org
Karen Testa	COA	Director	Ktesta@townofblackstone.org
CHAD LOVETT	T@B	T. A.	CLOVETT@TownofBLACKSTone.org
Kevin Roy	Fire/EmD	Deputy Chief	KRoy@Townofblackstone.org
Marc Grando	CMRPC		

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Blackstone Hazard Mitigation Plan Update
Local Planning Team Meeting #3

Date/Time: Wednesday, February 14th, 2024, 9:00 AM
Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

AGENDA

I. Introductions

II. Natural Hazards and Critical Infrastructure Meeting Recap

III. Community Lifelines

IV. Reference Documents

V. Discussion of Mitigation Strategies

- Review of last plan's mitigation strategies
- Development of new mitigation strategies
- Discussion of vulnerable populations and facilities

VI. Existing Protection Measures Review

- Review/Update the Existing Protection Matrix

VII. Community Survey

VIII. Public Presentation Planning

- Purpose
- Format
- Date/Time/Location
- Outreach

IX. Next Meeting

- Date/location
- What to prepare

DRAFT

Meeting Name:
Blackstone Hazard Mitigation Plan
Meeting #3

Community: Blackstone

Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

Date: February 14th, 2024

Meeting Time: 9:00 AM

Participant Name	Organization	Title	E-mail
Kevin Roy	Blackstone Fire	Fire Chief	KRoy@townofblackstone.org
Jimmy Sullivan	D.P.W.	SUP P.W.	JSULLIVAN@townofblackstone.org
Colleen M. Strapponi	Bott	~~Health Agent~~	healthagent@townofblackstone.org
Gary Bibbo	D.P.W.	Ass. S.W.S.	GBibbo@Blackstone.org
Will Talbot	CMRPC		wtalbot@cmrpc.org
Marc Comtois	CMRPC		mcomtois@cmrpc.org

Blackstone Hazard Mitigation Plan Update
Local Planning Team Meeting #4

Date/Time: Wednesday, March 27th, 2024, 9:00 AM
Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

AGENDA

I. Introductions

II. Meeting #3 Recap

- Mitigation Strategies Review

III. Community Lifelines

IV. Reference Documents

V. Existing Protection Measures Review

- Review/Update the Existing Protection Matrix

VI. Community Survey Review

- Brainstorm new mitigation strategies from community survey results

VII. Public Presentation Planning

- Purpose
- Format
- Date/Time/Location
- Outreach

VIII. Next Meeting

- Date/location
- What to prepare

DRAFT

CMRPC
Central Massachusetts Regional Planning Commission

ENTERING
EST. 1845
BLACKSTONE
MASSACHUSETTS

Meeting Name:
Blackstone Hazard Mitigation Plan
Meeting [redacted] #4

Community: Blackstone

Date: March 27th [redacted], 2024

Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

Meeting Time: 9:00 AM

Participant Name	Organization	Title	E-mail
Gary Bibbo	DPW	Ass. Supt. Water/Sewer	Gbibbo@Town of Blackstone.org
Colleen M. Thompson	BOH	Health Agent	healthagent@townofblackstone.org
Greg Gilmore	Police	Chief	chief@blackstonepolice.org
Mark Granato	CMRPC	Emergency Planner	mgranato@cmrpc.org
Kevin Roy	Fire/EMD	Chief	KRoy@Townofblackstone.org
Will Talbot	CMRPC	Asst. Planner	Wtalbot@cmrpc.org

Blackstone Hazard Mitigation Plan Update
Local Planning Team Meeting #5

Date/Time: Wednesday, April 10th, 2024, 9:00 AM
Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

AGENDA

I. Introductions

II. Meeting #4 Recap

- Review updates to mitigation strategies.
- Review updates to existing protection measures.
- Make additional updates as needed.

III. Community Lifelines

IV. Reference Documents

VII. Public Presentation Planning

- Purpose
- Format
- Date/Time/Location
- Outreach

VIII. Next Meeting

- Date/location
- What to prepare

DRAFT

Meeting Name:
Blackstone Hazard Mitigation Plan
Meeting #5

Community: Blackstone

Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

Date: April 10th, 2024

Meeting Time: 9:00 AM

Participant Name	Organization	Title	E-mail
Gary Bibbo	DPW	Asst. Supt. Water/Sewer	Gbibbo@TownofBlackstone.org
Kevin Roy	FIRE	FIRE Chief / EMD	KRoy@Townofblackstone.org
Nate Granato	CMRPC	Emergency Preparedness Planner	ngranato@cmrpc.org
Will Talbot	CMRPC	Assistant Planner	wtalbot@cmrpc.org
Colleen M. Stapleton	BOH	Health Agent	healthagent@townofblackstone.org
Jimmy Sullivan	DPW	Supt.	JSullivan@townofblackstone.org

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Blackstone Hazard Mitigation Plan Update
Local Planning Team Meeting #6

Date/Time: Wednesday, June 26th, 2024, 9:00 AM
Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

AGENDA

I. Introductions

II. Meeting #5 Recap

III. Community Lifelines

IV. Reference Documents

V. Public Presentation Review

- Review of any questions and/or comments from the public and/or the Board of Selectmen

VI. Review of Questions from Blackstone HMP Team on Draft Plan

VII. Review of Questions from CMRPC Staff

VIII. Discuss High Hazard Potential Dams

IX. Next Steps

- Two-week public and community lifeline comment period
- Submission for MEMA and then FEMA review
    - Revisions are made as are needed
- FEMA issues conditional approval
- Formal adoption of plan by Board of Selectmen
- Final approval by FEMA

DRAFT

Meeting Name:
Blackstone Hazard Mitigation Plan
Meeting #6

Community: Blackstone

Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

Date: June 26th, 2024

Meeting Time: 9:00 AM

Participant Name	Organization	Title	E-mail
Will Talbot	CMRPC	Assistant Planner	Wtalbot@cmrpc.org
Colleen M. Strappacci	Bott	Health Agent	healthagent@townofblackstone.org
Kevin Roy	EMD/Fire	Chief	KRoy@Townofblackstone.org
Marc Granato	CMRPC	Emergency Planner	mgranato@CMRPC.org
JAMES SULLIVAN	DPW	SUPT	JSULLIVAN@TOWNOFBLACKSTONE.ORG
Flynt Tuller	USACE CENAE-EDW	ICW Lead	flynt.tuller@usace.army.mil
Heather Shields	USACE	Levee Safety Program Manager	Heather.P.Shields@usace.army.mil
Kevin DiRocco	USACE	Senior Geotechnical Engineer	Kevin.J.DiRocco@usace.army.mil
Gary Bibbo	DPW	Asst. Supt. Water/Sewer	Gbibbo@Town of Blackstone.org

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APPENDIX D:

Public Presentation at

Board of Selectmen Meeting

Materials

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PUBLIC PRESENTATION
Blackstone Hazard Mitigation Plan

The Town of Blackstone is hosting a public presentation at a Board of Selectmen meeting on the Town's draft Hazard Mitigation Plan update.

- ***Attend to hear about draft mitigation strategies that can help the Town assess and reduce community risk from natural hazards.***

- ***The draft plan will be posted on the town website for public review for two weeks following this presentation.***

During the BOS meeting on Tuesday, June 25th, 2024 at 6:30pm at the Blackstone Municipal Center, 15 Saint Paul Street, in the John Eldridge Meeting Room, and on cable access channel 8

If you have any comments on the draft plan or would like more information, contact Will Talbot at wtalbot@cmrpc.org.

If you need assistance accessing the Municipal Center, call the Selectmen's office at (508) 883 1500 Ext 101.

CENTRAL MASSACHUSETTS
Regional Planning Commission

Project funding is from the Massachusetts Emergency Management Agency (MEMA).

DRAFT

Town of Blackstone, Natural Hazard Mitigation Plan
Public Presentation: June 25th, 2024

What is hazard mitigation? What is a mitigation plan?

- Hazard mitigation is the effort to reduce loss of life and property by lessening the impact of natural disasters.
- Mitigation is not disaster response; its goal is to reduce hazard impacts before a disaster occurs.
- A mitigation plan identifies natural hazards and the risks they pose to residents, infrastructure, property, and natural resources. It prioritizes projects, policies, education, and procedures for reducing these risks, now and in the future.
- Mitigation helps break the cycle of disaster damage, reconstruction, and repeated damage.

Why should Blackstone complete and adopt this kind of plan?

- Natural hazard mitigation planning establishes a road map for achievable actions that can substantially reduce risks.
- If the town has an active natural hazard mitigation plan approved by the Federal Emergency Management Agency (FEMA), the town is eligible to receive non-emergency federal disaster assistance and mitigation funding as mandated under the Disaster Mitigation Act of 2000.
- This plan is primarily funded by a grant from FEMA through MEMA (with a local in-kind match).
- FEMA and Blackstone's Board of Selectmen adopted the Town's last natural hazard mitigation plan in January 2017, and this plan expired in January 2022.

What natural hazards pose the greatest risks to Blackstone?

- Largest risks: flooding (mostly involving the Blackstone River and associated tributaries, canals, and impoundments), winter storms, severe thunderstorms and wind
- Moderate risks: drought, hurricanes and tropical storms, wildfires
- Lower risks: tornados, dam failures, extreme temperatures, earthquakes

Local partners

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

Chief Kevin Roy and Former Chief Bill Kessler, Fire Department; Health Agent Colleen Strapponi, Health Department; Superintendent James Sullivan and Assistant Gary Bibbo, Department of Public Works; Chief Gregory Gilmore, Police Department; Town Administrator Chad Lovett and Town Accountant / Assistant Town Administrator Lauren Taylor, Town Administrator's Office; Former Director Karen Testa, Council on Aging; Vice Chairman Kevin Ryan, Board of Health.

Planning timeline

- Information gathering via mapping, research, and local input — Oct. 2023 to date
- Draft plan development — April – June 2024
    - Public comments/questions requested within two weeks of the draft plan being posted on the town website
- Public presentation #1 — June 2024
- MEMA review — Summer 2024
- FEMA approval — Fall 2024
- Local adoption — Fall 2024
- 5-year update — 2029

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Recent/ongoing mitigation activities

- Street sweeping and catch basin cleaning
- Maintaining and replacing problem culverts and maintaining and repairing problem roadways when needed and as funding allows
- Installing backup generators at critical public facilities when needed and as funding allows
- Dam monitoring
- Tree trimming program
- Snow removal
- Education and outreach
- Plans and studies

Recommended high priority mitigation strategies in the DRAFT plan

A. Structure and Infrastructure Strategies

- Continued drainage and structural resiliency improvements in the area near the Municipal Center building.
- Complete side wall repairs at the canal side of the Saranac / Blackstone River Dam. Study possible modifications to the canal side structures near the dam, such as removing the top part of the headworks.
- Install/improve generators at critical public facilities where needed, including the DPW garage and the Fire Station #3; also evaluate feasibility of obtaining a mobile generator to serve multiple public facilities.
- Continue to monitor conditions at the Town-owned Lake Hiawatha Dam (High Hazard) to ensure compliance with state mandate on structural conditions.
- Plan and site new wells to supply the town water system.
- Conduct field inventory of bridges to rank and prioritize projects for increased flooding resiliency and storm-hardening. Design and implement priority resizing or replacement projects.
- Extend Rathbun Street to develop a connector that links the existing Rathbun Street to Elm Street and provides a more direct route for emergency access to the southeast portion of town.

B. Preparedness, Coordination, and Response Strategies

- Continue to participate in National Flood Insurance Program (NFIP) (or other) training offered by the State and/or FEMA that addresses flood hazard planning and management. Hire a floodplain manager.
- Road information coordination and planning for snow removal
- Evacuation Plan updates; where possible, ensure that routes are outside of hazard areas
- Improve vegetation and debris management along P&W Railroad rights-of-way
- Complete a study on how development in town, such as solar farms, affects flooding in town, looking at problems and enforcement mechanisms. Create and enforce a solar development / land use bylaw.
- Work with homeowners to mitigate localized flooding caused by development.
- Complete a feasibility study for flood-proofing well pumps 2 and 7.
- Coordinate with Liberty Gas and the State to develop emergency preparedness procedures regarding the Blackstone Street Natural Gas Regulator Station.
- Coordinate with hydropower plant in Rhode Island to prevent flooding near the Blackstone Valley Boys and Girls Club.
- Review communications regarding downstream management of Blackstone River, especially in coordination with neighboring Woonsocket. Ensure that both towns are anticipating the impacts of development on water wells and flood storage area.

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- Provide more resilient storage facilities for vital information, including birth, death, and marriage records, voter registration data, and associated equipment.
- Complete a Town-wide dam assessment of all public, private, and beaver dams, focusing on reducing the risk of flooding from dam failures during intense storm events and protection of ecosystems that provide flood storage and other resilience benefits.

C. Education and Awareness Strategies

- Continue to provide information to residents and businesses on water conservation through reduction in use, low-impact landscaping and other low-cost measures (in part to conserve water for firefighting).
- Continue to provide information to residents and businesses on generator safety and sump pump usage.
- Increase education and outreach (on social media and through schools, the senior center, and community-based organizations) on all hazards in town, especially thunderstorms and snowstorms.
- Continue education program begun under NPDES MS4 permit to supplement pollution prevention effort with storm drain safety/clearance and related topics.

D. Local Plan and Regulation Strategies

- Conduct a townwide stormwater drainage improvement study. Include an inventory and visual assessment as well as hydrological modeling in this study.
- In tandem with water conservation outreach listed above, conduct enhanced enforcement of water usage restrictions (in part to conserve water for firefighting).
- Establish a comprehensive emergency awareness plan to build awareness of town resources and make Town residents aware of the many planning efforts, agreements, shelters, etc. which are focused on making the Town more resilient. Ensure that all residents know how to access these resources when they are needed.
- Develop a comprehensive plan for beaver management to mitigate against unpredictable flooding / impoundment impacts. Investigate options for expanded beaver control.
- Incorporate hazard mitigation goals into the Open Space and Recreation planning process.
- Monitor implementation of Hazard Mitigation Plan. Once a year, meet to discuss the progress of mitigation strategies.

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

Comments and questions should be directed to Will Talbot (wtalbot@cmrpc.org) within two weeks of the draft plan being posted on the town website.

This natural hazard mitigation planning activity is funded by an FY 2023 Hazard Mitigation grant from the Federal Emergency Management Agency through the Mass. Emergency Management Agency

DRAFT

Create a Website Account - Manage notification subscriptions, save form progress and more.

DRAFT

Posted on: June 21, 2024

2024 Blackstone Hazard Mitigation Plan update

Work is now underway on the update of Blackstone's 2017 Natural Hazard Mitigation Plan, which will help guide local efforts to reduce damage from future natural disasters. The Town of Blackstone invites local residents, business operators, property owners, and other interested parties to attend a public presentation on the draft 2024 Blackstone Hazard Mitigation Plan update. This presentation will take place at the Board of Selectmen meeting on Tuesday, June 25th, 2024 in the John Eldridge Meeting Room of the Blackstone Municipal Center at 15 Saint Paul Street; this meeting begins at 6:30pm. The presentation will also be livestreamed on Blackstone Cable Access Television channel 8.

All are encouraged to attend this meeting and to comment on the draft plan, which will be available for review on the Town of Blackstone's website for two weeks following the presentation. This planning process is a chance for the public to help protect Blackstone from flooding, winter storms, thunderstorms, and other natural hazards.

The Natural Hazard Mitigation Plan is being developed by a team of local officials and staff with technical assistance from the Central Massachusetts Regional Planning Commission (CMRPC). Final adoption of the plan is contingent on approval from the Town's Board of Selectmen, the Federal Emergency Management Agency (FEMA), and the Massachusetts Emergency Management Agency (MEMA).

This planning process is funded by a Hazard Mitigation Grant Program (HMGP) grant from the FEMA through MEMA to the Town of Blackstone. The purpose of HMGP is to help communities implement hazard mitigation measures following a Presidential major disaster declaration. Hazard mitigation is any action taken to reduce or eliminate long term risk to people and property from natural hazards. Mitigation planning is a key process used to break the cycle of disaster damage, reconstruction, and repeated damage. Adoption of the final plan will make Blackstone eligible for hazard mitigation project funding from FEMA.

TOWN OF BLACKSTONE HAZARD MITIGATION PLAN

Blackstone Board of Selectmen

June 25th, 2024

Marc Granato, Emergency Preparedness Planner

Will Talbot, Assistant Planner

Andrew Loew, Director, Community Development & Resiliency Planning

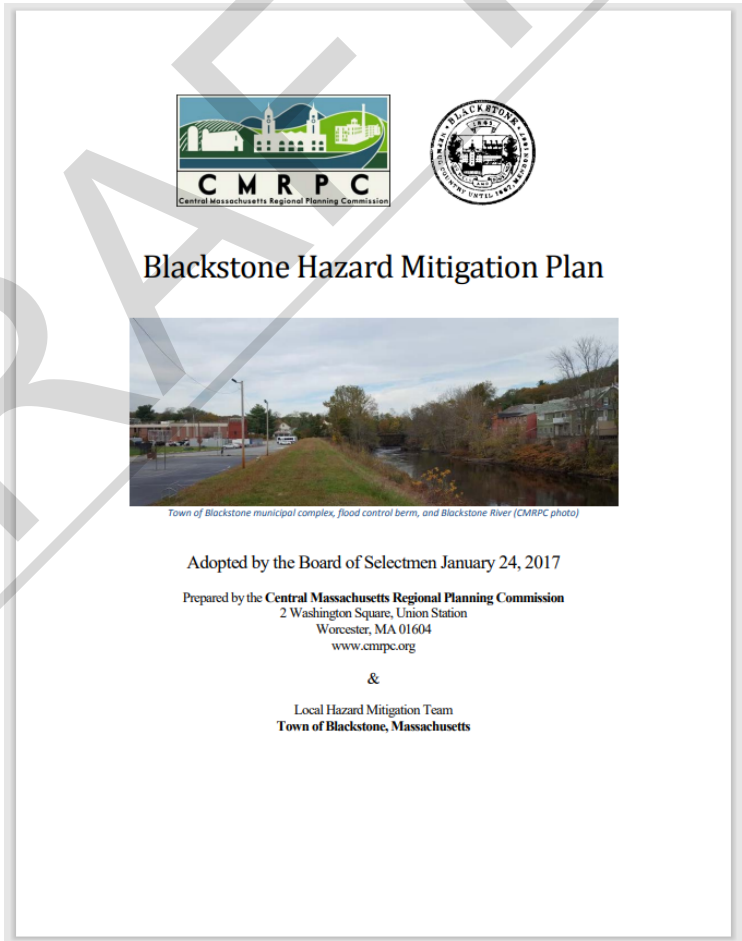
Central Massachusetts Regional Planning Commission

DRAFT

WHY IS BLACKSTONE COMPLETING THIS PLAN?

- The **Federal Disaster Mitigation Act of 2000** requires that cities and towns adopt and update a Hazard Mitigation Plan to be eligible for FEMA mitigation grants.

- This plan will meet FEMA's requirements and help the town make good use of its resources.
- Blackstone's last HMP update was approved in January 2017 and expired in January 2022.



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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)

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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*

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THE BENEFITS OF MITIGATION

National Benefit-Cost Ratio (BCR) Per Peril *BCR numbers in this study have been rounded	Beyond Code Requirements	Federally Funded
Overall Hazard Benefit-Cost Ratio	$4:1	$6:1
Riverine Flood	$5:1	$7:1
Hurricane Surge	$7:1	Too few grants
Wind	$5:1	$5:1
Earthquake	$4:1	$3:1
Wildland-Urban Interface Fire	$4:1	$3:1

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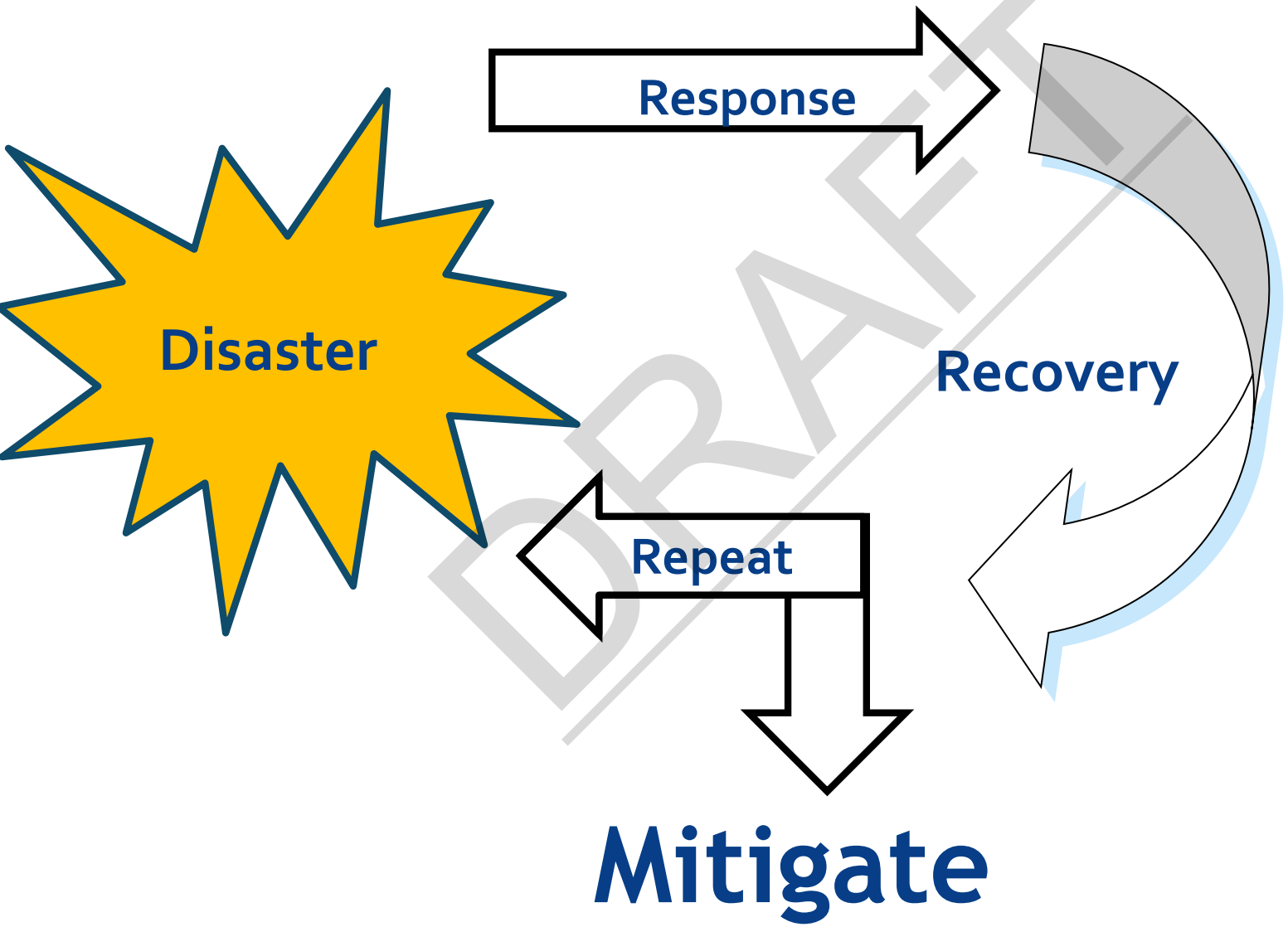
Breaking the Cycle of Risk



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Four Tools & Techniques for Hazard Mitigation

1. Structure & Infrastructure Projects
2. Preparedness, Coordination & Response Actions
3. Education & Awareness Programs
4. Local Plans & Regulations

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STRUCTURE AND INFRASTRUCTURE PROJECTS

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

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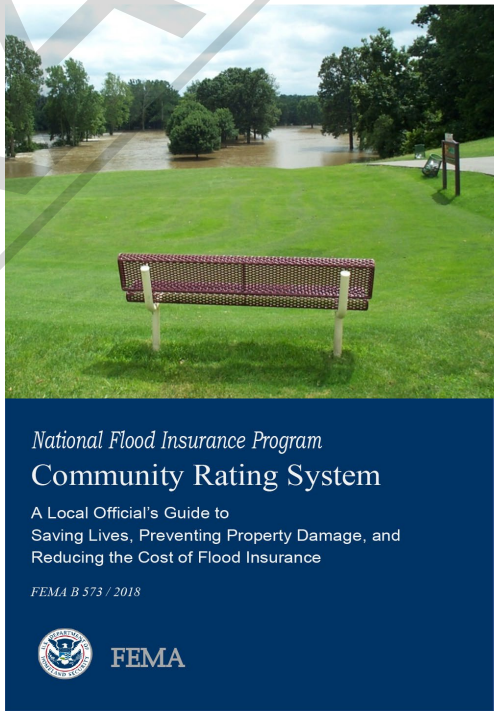
PREPAREDNESS AND RESPONSE

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

NATIONAL FLOOD INSURANCE PROGRAM



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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

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LOCAL PLANS & REGULATIONS

- Planning & Zoning
- Subdivision and Site Plans
- Floodplain regulations
- Wetlands bylaws
- Storm water regulations
- Building Code
- Master Plans
- MVP Plans

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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 Board of Selectmen

DRAFT

DEVELOPMENT OF THE PLAN

CMRPC assisted the Blackstone 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

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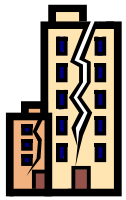
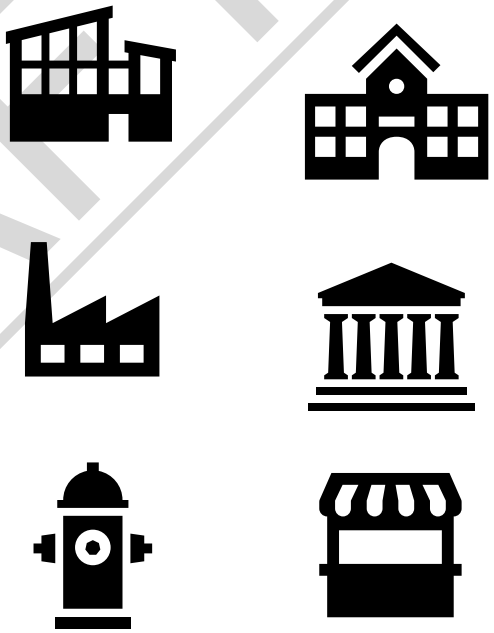


IDENTIFY CRITICAL FACILITIES

Database & GIS maps of critical facilities, infrastructure

Sites identified include:

- Emergency Response Facilities
- Water Supply and Sewer Facilities, Town Facilities, and Utilities
- Dams
- Facilities and populations to protect



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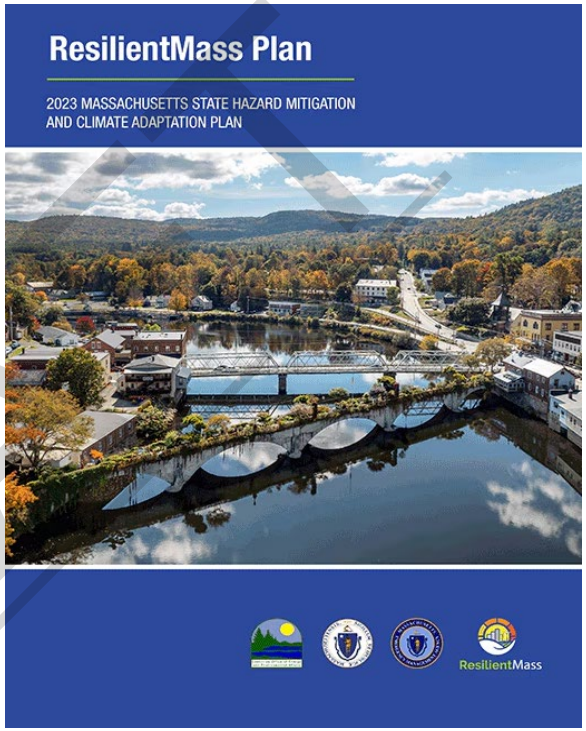
HAZARD IDENTIFICATION & MAPPING

- 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



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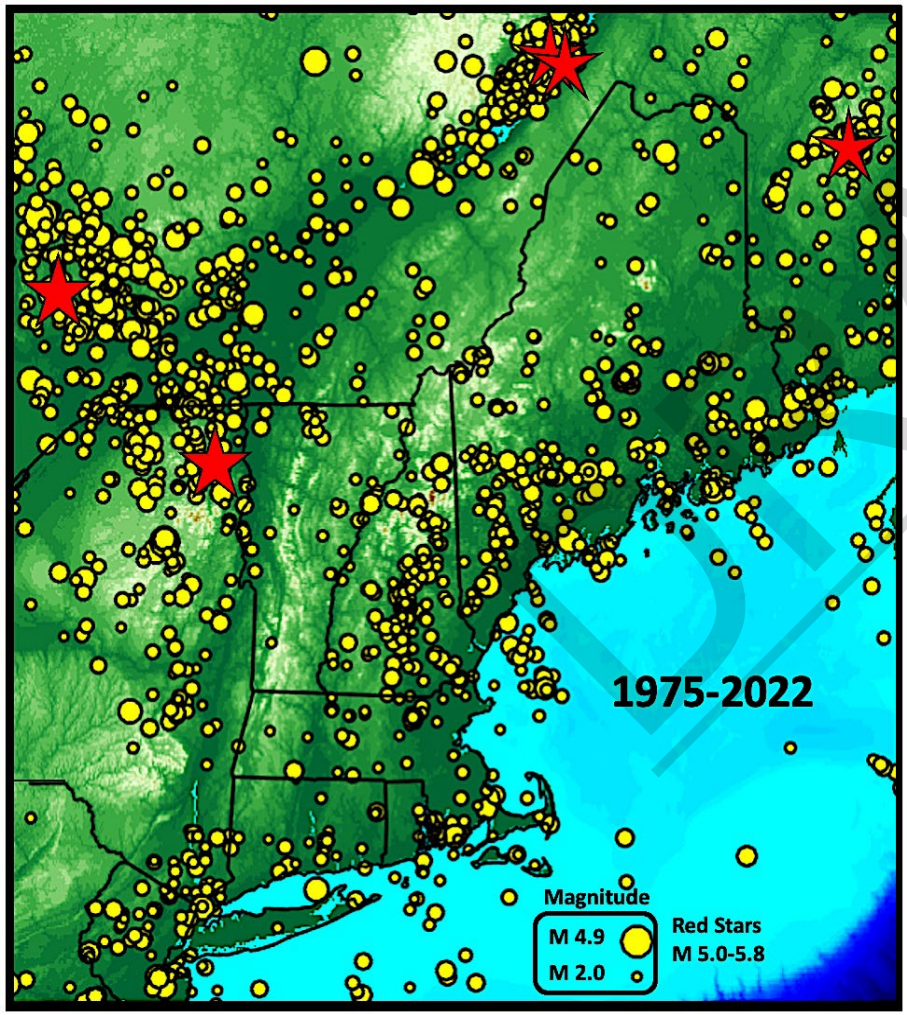
OTHER HAZARDS – GEOLOGIC, WIND, & SNOW

Earthquakes from 1975 to 2022 2+ Magnitude



Recent Declared Hurricanes & Snow Disasters

Disaster	Declaration Date	Incident Period	FEMA ID
Hurricane Lee	09/15/23	09/15/23 - 09/17/23	EM-3599-MA
Mashpee Wampanoag Tribe Tropical Storm Henri	08/22/21	8/20/21 -	3566-EM-Mashpee Wampanoag Tribe

Disaster	Declaration Date	Incident Period	FEMA ID
Massachusetts Severe Winter Storm and Snowstorm	04/18/22	01/28/22 - 01/29/22	DR-4651-MA
Massachusetts Severe Winter Storm and Snowstorm	07/19/18	03/13/18 - 03/14/18	DR-4379-MA

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LOCALLY-IDENTIFIED HAZARD AREAS

Flooding - Downtown Blackstone
Flooding - Elm St & Mill Brook
Flooding - Farm St & Hop Brook
Flooding – Pump Stations 2 and 7 Vulnerability
Flooding – Main Street
Flooding – Blackstone Street
Wildfire – Providence & Worcester RR
Hurricane - Town Hall/Municipal Complex
Invasive Species - Emerald Ash Borer Town Wide
Lightning & High Winds - Federal Street

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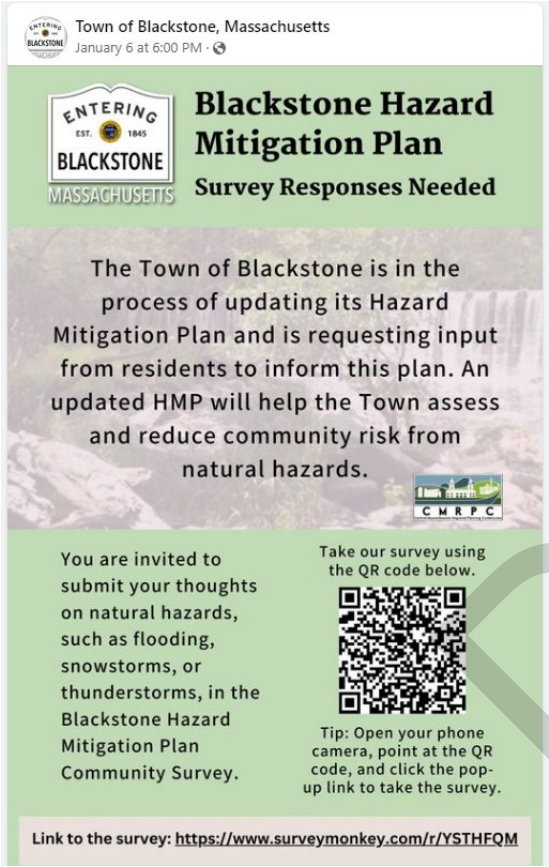
PUBLIC SURVEY – Winter 2023-2024



Blackstone Hazard Mitigation Plan Community Survey

Blackstone Hazard Mitigation Plan

In October 2023, the Town of Blackstone 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 Blackstone.

By participating in this survey, you will help the Town of Blackstone understand the current and future natural hazards that residents are most concerned about. Survey responses will be accepted until March 31st, 2024.

- 33 total responses
- Hazards of greatest concern: Winter Storms / Ice, Flooding, and Thunderstorms / Microbursts / Extreme Wind
- The survey was promoted through town Facebook pages, the Blackstone Enlightener, and a tabling event, as well as being posted in several high traffic locations in town.

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EXISTING MITIGATION MEASURES

MULITIHAZARD

- Comprehensive Emergency Management Plan (CEMP)
- Massachusetts State Building Code
- Education and outreach
- Plans 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

- State permits for dam construction
- DCR dam safety regulations

WIND-RELATED HAZARDS

- Tree trimming program

WINTER-RELATED HAZARDS

- Salting and sanding of roads and plowing

BRUSH FIRE RELATED HAZARDS

- Permits for outdoor burning

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BLACKSTONE MITIGATION STRATEGIES

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

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DRAFT PLAN SELECT HIGH-PRIORITY MITIGATION MEASURES

- Conduct a townwide stormwater drainage improvement study. Include an inventory and visual assessment as well as hydrological modeling in this study.
- Continue drainage and structural resiliency improvements in the area near the Municipal Center building.
- Coordinate with hydropower plant in Rhode Island to prevent flooding near the Blackstone Valley Boys and Girls Club.
- Plan and site new wells to supply the town water system.
- Increase education and outreach (on social media and through schools, the senior center, and community-based organizations) on all hazards in town, especially thunderstorms, snowstorms, and invasive species.

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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 Board of Selectmen 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.

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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.

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DRAFT PLAN

The full draft plan will be available on the Blackstone town website.

Please send any comments on or questions about the plan to wtalbot@cmprc.org by July 12th, 2024 / within two weeks of the draft plan being posted on the town website.

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Hazard Mitigation Plan

Map 1
Critical Infrastructure and Facilities
Town of Blackstone, Massachusetts

June 2024

Legend

- Assisted Living
- Elderly Housing
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Power Plant
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Water Treatment Plant
- Town Halls
- Local Police
- Fire Station
- Schools (Pre-K through High School)
- Active Rail Line
- Out of Service/Abandoned Rail Line

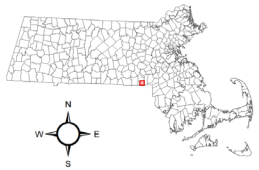
Town Boundaries · Structures · Water Bodies · Streams · Roads · Regionwide Evacuation Routes

Dams (2/2012)

Significant Hazard · Low Hazard · N/A

Locally Defined

Critical Infrastructure · Critical Infrastructure · Critical Infrastructure



0.25 0.125 0 0.25 0.5 Miles

Data provided by participating municipalities, CMRPC, massDOT, MassGIS, FEMA and NOAA.
Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution interpreting positional accuracy.

Produced by the Central Massachusetts Regional Planning Commission.
One Mercantile St. Suite 520, Worcester, MA 01608

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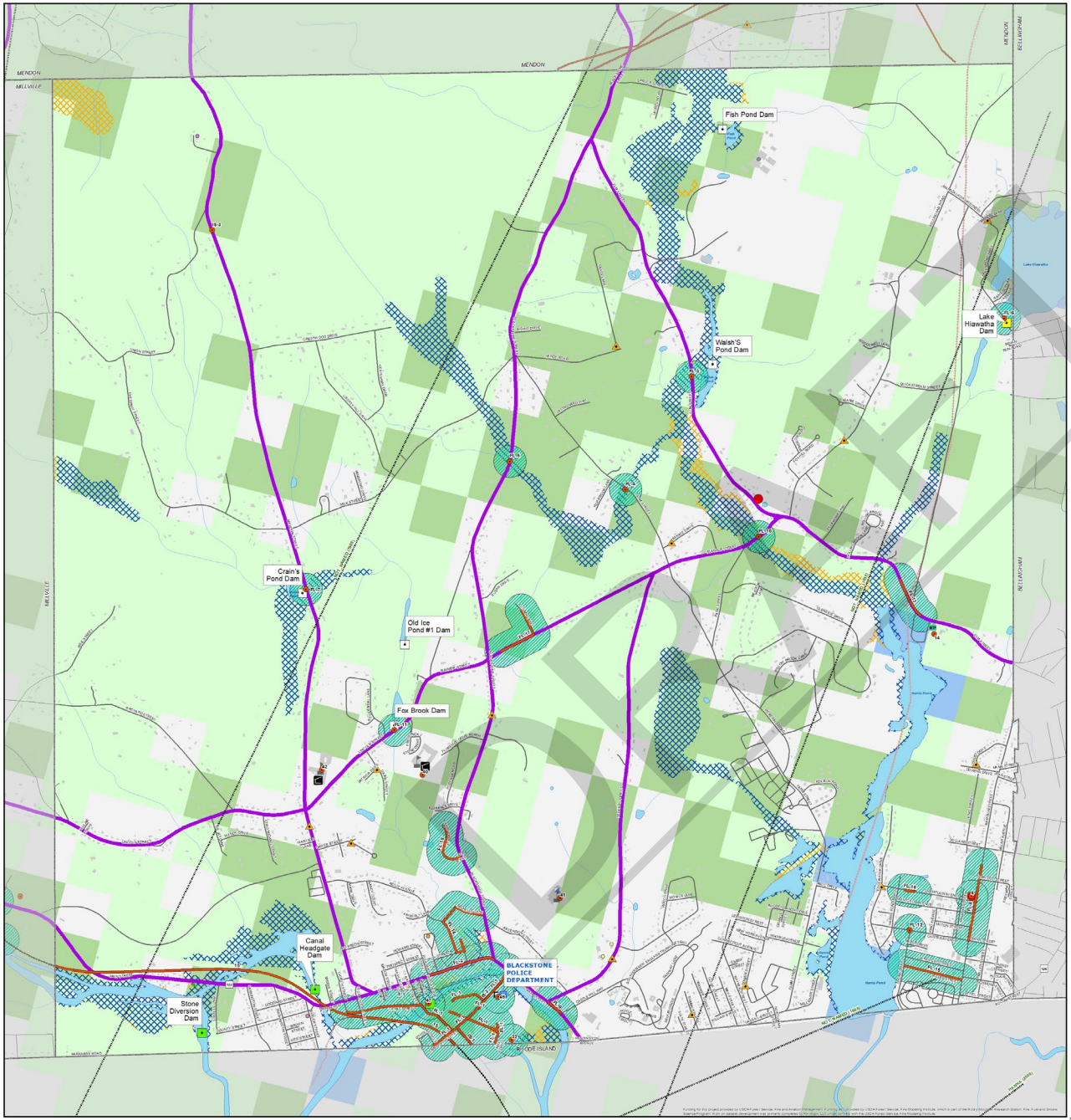
CMRPC
Central Massachusetts Regional Planning Commission



Hazard Mitigation Plan

Map 2
Hazards
Town of Blackstone, Massachusetts

June 2024

Legend

- Assisted Living
- Elderly Housing
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Power Plant
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Water Treatment Plant
- Town Halls
- Local Police
- Fire Station
- Schools (Pre-K through High School)
- Active Rail Line
- Out of Service/Abandoned Rail Line
- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Hazards

Dams (2/2012)
- High Hazard
- N/A

FEMA DFIRM Flood Zones
- 100-year Flood Area*
- 500-year Flood Area
- Repetitive Loss Property Areas
- NOAA Historic Hurricane Tracks (1842-2022)

USDA Wildfire Hazard Potential, Version 2020 Classified
- Very Low
- Low
- Moderate
- High
- Very High
- Non-burnable
- Water

Locally Defined Hazards
- Hazard
- Hazard
- Possible Flood Area Hazard

N W E S

0.25 0.125 0 0.25 0.5 Miles

Data provided by participating municipalities, CMRPC, massDOT, MassGIS, FEMA and NOAA.
Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution interpreting positional accuracy.

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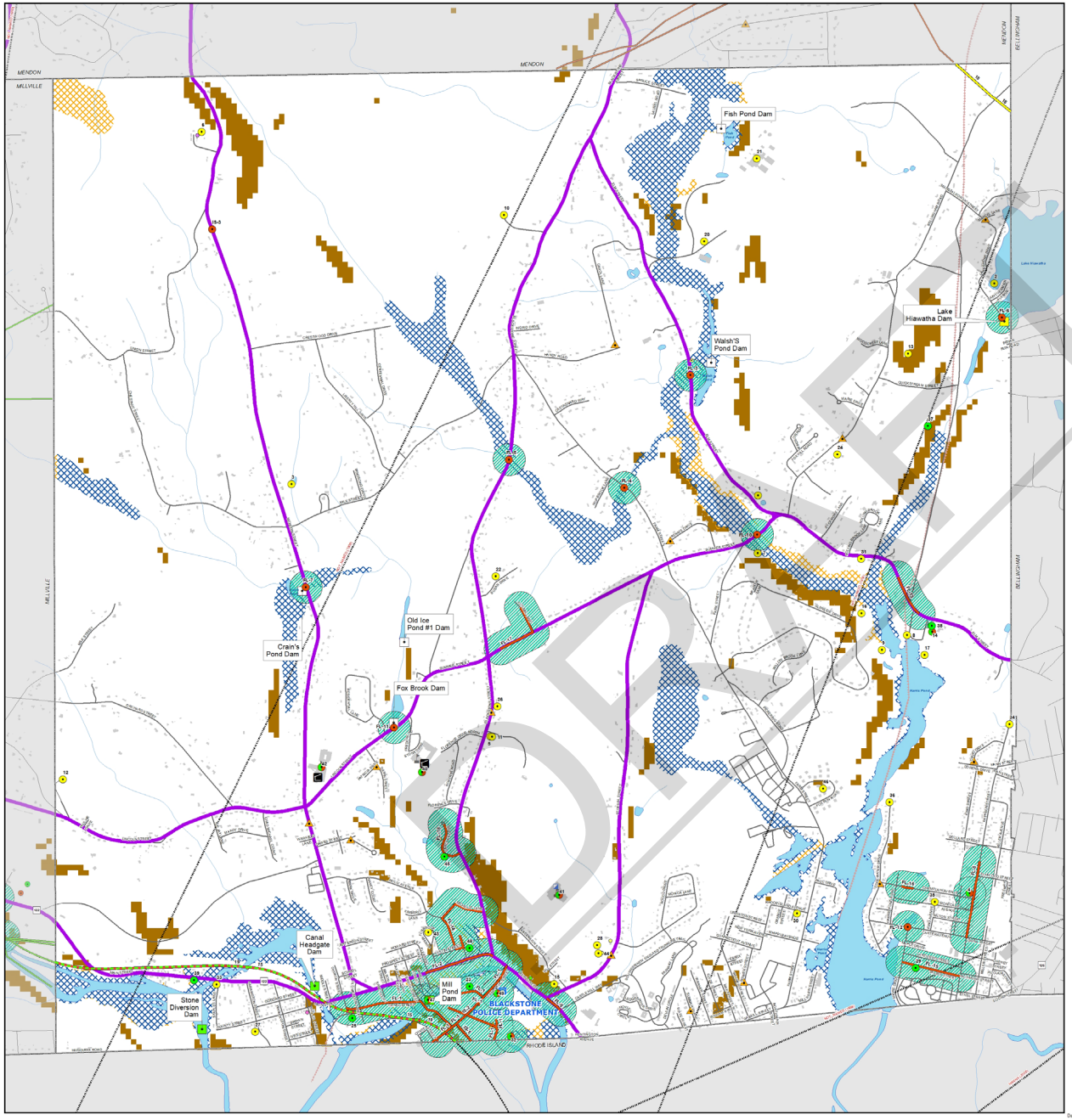


Hazard Mitigation Plan

Map 3
Vulnerable Critical Infrastructure and Facilities
Town of Blackstone, Massachusetts
June 2024

Legend

- Assisted Living
- Elderly Housing
- Emergency Shelters
- End Of Life Facilities
- Misc Data
- Nursing/Rest Homes
- Power Plant
- Daycare
- Electric Distribution
- Electric Substation
- EOC
- Water Treatment Plant
- Town Halls
- Local Police
- Fire Station
- Schools (Pre-K through High School)
- Active Rail Line
- Out of Service/Abandoned Rail Line
- Town Boundaries
- Structures
- Water Bodies
- Streams
- Roads
- Regionwide Evacuation Routes

Hazards

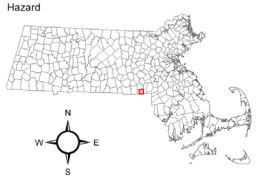
Dams (2/2012)
- Significant Hazard
- Low Hazard
- N/A

FEMA DFIRM Flood Zones
- 1% Annual Chance Flood Hazard or Regulatory Floodway
- 0.2% Annual Chance Flood Hazard

- High Slope (15% and above)
- Repetitive Loss Property Areas
- IBTrACS Historical Hurricane Tracks (1842-2020)

Locally Defined

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



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Date: 6/3/2024 Document Path: H:\Projects\HLS_GIS\subprojects\hmp\HMP_03_Local_Cts_Hazards_36x44.mxd

CMRPC
Central Massachusetts Regional Planning Commission

Meeting Name:
Blackstone Hazard Mitigation Plan Board of Selectmen Meeting Public Presentation

Community: Blackstone

Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

Date: June 25th, 2024

Meeting Time: 6:30 PM

Participant Name	Organization	Title	E-mail
Tanya Polak	Town of Blackstone	Selectman	tpolak@townofblackstone.org
michael J Sweeney	Town of Blackstone Selectmen		mikesweeney@townofblackstone.org
Brian Scanlon	Town of Blackston	Selectman	
Daniel P Keefe	Town of Blackstone	Selectmen	
Mary Bulso	Town of Blackstone	Selectmen	

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Meeting Name:
Blackstone Hazard Mitigation Plan Board of Selectmen Meeting Public Presentation

Community: Blackstone

Location: Blackstone Town Hall, 15 Saint Paul Street, Blackstone, MA

Date: June 25th, 2024

Meeting Time: 6:30 PM

Participant Name	Organization	Title	E-mail
GARY JOLICOEUR			DRAMONDOCKS@COMCAST.NET
Gregory Gilmore	Police Dept	Chief	chief@blackstonepolice.org
Lisa Cheever	Library Dept.	Director	lcheever@cwmars.org
Lori Poirier	Zoning Dept.	Vice Chair	poirierlori83@gmail.com
Andrew Loew	CMRPC		aloew@cmrpc.org
Will Talbot	CMRPC	Assistnt Planner	wtalbot@cmrpc.org

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APPENDIX E
Community
Outreach Materials

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HAZARD MITIGATION PLANNING

What is a Hazard Mitigation Plan?

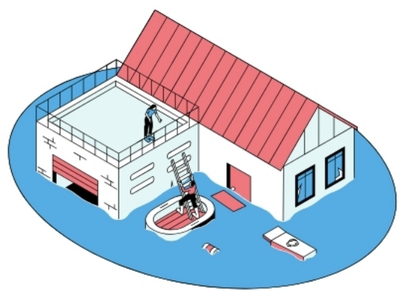
- A Hazard Mitigation Plan (HMP) is a document describing how a jurisdiction will prepare for and mitigate against natural and related hazards.
- It is a 5-year planning document which is approved by the Town, State, and Federal Government.
- It is a key to unlocking federal grant funding for resiliency and infrastructure projects.

How Does Hazard Mitigation Planning Affect Me?

- You can have a direct impact on your town's hazard mitigation plan by letting us know what concerns you have for your Town's future.
- This plan will determine what course of action your town will take to mitigate the effects of natural disasters and climate change.

What Disasters are Addressed in the Plan?

Hazard mitigation plans address a wide variety of natural disasters. For example, this plan being worked on for your town covers:



- Flooding
- Winter Storms
- Invasive Species
- Wildfires
- Tornados
- Earthquakes
- Thunderstorms
- High Wind Events
- Dam Failures
- Drought
- Landslides
- Other Natural Hazard Events

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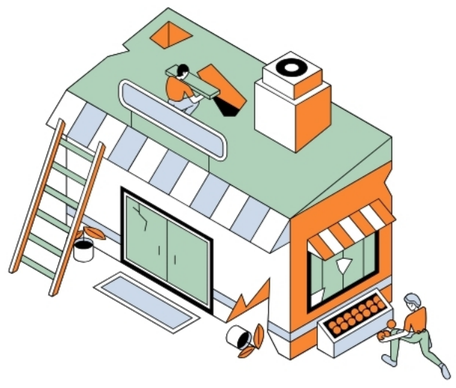
How Can I Help Plan for Hazards?

- You can help by providing a comment in the drop box below about your town's plan:
  - Anything from strategies for mitigating these disasters to notable events you have experienced in town are welcome!
- Increase your preparedness for natural hazards by signing up to receive updates from your Town's emergency management services and going to Ready.gov for information on personal preparedness.



CMRPC
Central Massachusetts Regional Planning Commission

Blackstone Hazard Mitigation Plan: Draft Findings

Hazards of Concern in Blackstone

- Flooding
- Thunderstorms
- Invasive Species
- Winter Storms
- Wildfires
- Drought
- Rooftop snow loads
- A lack of backup generators

Critical Infrastructure in Blackstone

- Department of Public Works infrastructure (water and sewer)
- Public safety infrastructure (fire and police), communications infrastructure, and energy infrastructure,
- Public service buildings (libraries, schools, daycares)
- Public and elderly housing

Selected High-Priority Draft Mitigation Strategies

- Conduct a townwide stormwater drainage improvement study.
- Continue drainage and structural resiliency improvements near the town hall / public safety / senior center building.
- Coordinate with hydropower plant in Rhode Island to prevent flooding near the Blackstone Valley Boys and Girls Club.
- Plan and site new wells to supply the town water system.
- Increase education and outreach on all hazards, on social media and through schools and the senior center.

Sample of Survey Results

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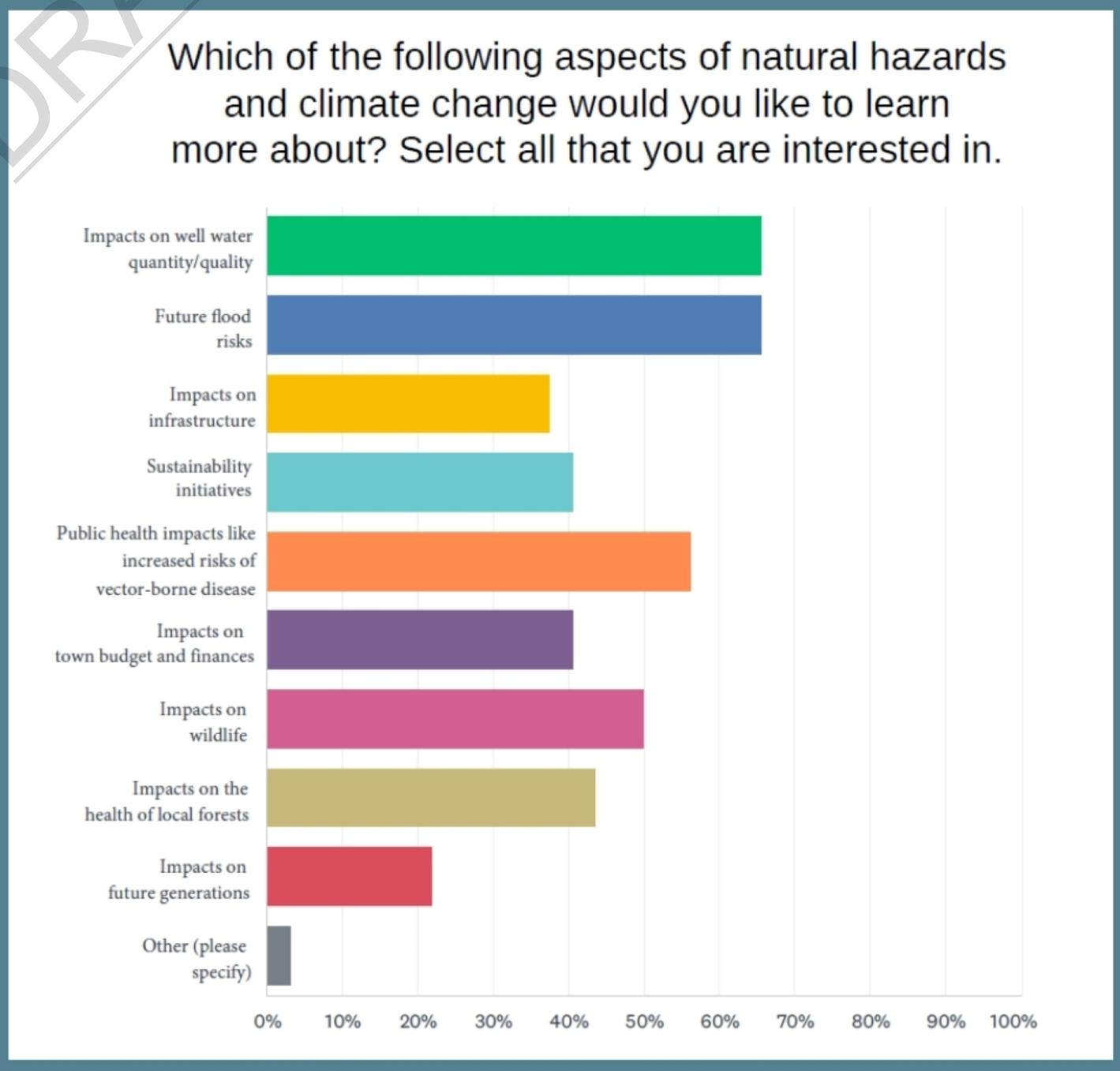

We would like to hear your thoughts on these draft hazard mitigation plan findings! Feel free to leave an anonymous comment in the box below or reach out to us at wtalbot@cmrpc.org or mgranato.cmrpc.org with your comments and suggestions.

CENTRAL MASSACHUSETTS
Regional Planning Commission

APPENDIX F:
Glossary

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APPENDIX F

GLOSSARY OF TERMS

As used in this plan, these terms are defined as follows:

Blizzard – Issued for sustained or frequent gusts to 35 mph or more for an hour or greater and considerable falling and/or blowing snow. These conditions frequently occur alongside reduced to or below one-quarter mile. These conditions must be the predominant condition over a 3-hour period.

Blizzard warning - Sustained winds or frequent gusts of 35 mph or higher, occurring in combination with considerable falling and/or blowing snow. When proclaimed, these conditions are expected to prevail for a period of at least three (3) hours. Visibilities will frequently be reduced to less than one-quarter mile.

Blowing snow - Wind driven snow that reduces visibility to six (6) miles or less causing significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.

Community Lifelines - The most fundamental services in the community that, when stabilized, enable all other aspects of society to function (definition from FEMA)

Conflagration - A large destructive fire; which attains such intensity that it creates and sustains its own wind system. It is most commonly a natural phenomenon, created during some of the largest bushfires, forest fires, and wildfires.

Drifting snow - Uneven distribution of snowfall caused by strong surface winds. Drifting snow is usually associated with blowing snow.

Flurries – Intermittent light snow with no measurable accumulation; a light dusting is all that is expected.

Exposure - The people, property, systems, or functions that could be lost to a hazard. Generally, exposure includes what lies in the area that the hazard could affect.

Freeze - Occurs when the surface air temperature is 32 degrees Fahrenheit or below over a widespread area for a climatologically significant period of time. The term “freeze” is usually restrictive to advective situations or occasions when wind or other conditions prevent frost.

Freezing rain or drizzle – Rain that falls as a liquid but freezes into an icy glaze when it hits the ground or other surfaces such as trees, cars, and roads=.

Frost - The formation of thin ice crystals on the ground or other surfaces in the form of scales, needles, feathers, or fans. Frost develops when the temperature of the earth's surface falls below 32 degrees Fahrenheit, but because frost is primarily an event that occurs as the result of radiation cooling, it frequently occurs with air temperatures in the middle 30s.

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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.

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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.

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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.

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