Appendix A

Core Team Materials

Town of Townsend
Municipal Vulnerability Preparedness Planning Grant

Core Team Meeting, Skype Call Meeting
Tuesday, March 24, 2020, 11:00 AM-12:00 PM

Introductions	2 minutes
Project Overview	10 minutes
Goal Setting and Endorsement	15 minutes
Community Resilience Building Workshop and Review of Materials	15 minutes
Workshop Participants	15 minutes
Wrap Up and Next Steps	3 minutes

Town of Townsend
Municipal Vulnerability Preparedness Planning Grant

Core Team Meeting, Skype Call Meeting
Tuesday, March 24, 2020, 11:00 AM-12:00 PM

Introductions 2 minutes

- Town:
  - Beth Faxon, Planning and Zoning Board Administrator – 978.697.1556
  - Mark Boynton, Townsend Fire Chief
  - Jay Sartell, Townsend Chief of Police
  - David Henkels, Conservation Administrator
  - Jim Smith, DPW Superintendent
  - Lance McNally, Planning Board Chairman
  - Veronica Kell, Planning Board Clerk
  - Susan McNally, Library Trustees
  - Wayne Miller, Board of Selectmen
  - Becky McEnroe, Townsend Interim Water superintendent
  - Brad Morgan, Schools
- Weston & Sampson
  - Amanda Kohn
  - Steve Roy
  - John Frey
- MVP Regional Coordinator
  - Hillary King
    - hillary.king@state.ma.us
    - 617.655.3913

Project Overview 20 minutes

- Interest in keeping the momentum moving forward online. There is some concern about getting folks set up to participate virtually.
- Tuesdays are the best time to meet. Possibly a workshop on April 14th – 3 webinars on the different features

Goal Setting and Endorsement 5 minutes

- Core Team will review after call

Community Resilience Building Workshop and Review of Materials — 15 minutes

- Hazards Questions
    - Top hazards:
        - Extreme Temps
            - Cost of electricity is a concern
        - Drought and brush fire
        - Flooding
        - Snow storms
    - Where does it flood in town?
    - What is your biggest concern when there is a 95-degree day?
    - What is your biggest concern during a large storm event?
    - What did you do during the 2016 drought?

- Critical Facilities List - Confirm:
    - Check list of facilities and addresses
    - closest hospital/urgent care
        - Nashoba Valley Regional Hospital in Ayer
        - Leominster Hospital
        - Emerson Hospital & Urgent Care in Milford, NH
    - there are no hotel/motels
    - low-income/housing authority properties
    - Any planned evacuation routes

Workshop Participants — 15 minutes

- Should other board and committees be included?
    - Board of Health
- What local organizations should be included?
    - Squannacook River Association
    - Nashua River Watershed Association
    - Squannacook Greenway
    - Local media
    - Townsend Conservation Land Trust
- Do you work with any state agencies regularly? Who do you work with?
    - Anne Gagnon, MA Fish and Wildlife
- Do you work with neighboring towns? Who are your contacts?
    - There are some mutual aid agreements between police departments and there is a county wide one.
    - Relationship with North Eastern MA Law Enforcement Council, Boston Area Police Emergency Radio Network
- Need email addresses for contacts

Wrap Up and Next Steps — 3 minutes

From:	Kohn, Amanda
To:	Guest; +1 (978) 727-3645; Guest; +1 (978) 860-6667; Guest; Frey, John; Guest; Guest; Guest; Guest; Guest; +1 (617) 655-3913; Roy, Steven; Guest; +1 (978) 479-9123; Kohn, Amanda; Guest; +1 (978) 597-1700; Guest; +1 (978) 597-6214; Guest; +1 (978) 597-8517
Subject:	Townsend Core Team Meeting
Date:	Tuesday, March 24, 2020 12:10:11 PM

James Sartell 11:01 AM:
I'm on both

Hillary 11:14 AM:
Sorry it took some trying to get onto the call... I'm here for another 15 minutes or so, please let me know if there have been questions for the program so far

Roy, Steven 11:14 AM:
Thanks Hillary.

Beth Faxon 11:14 AM:
all set here thanks!

James Sartell 11:15 AM:
I can hear just fine

Lance & Susan 11:15 AM:
No issues on our end

James Sartell 11:15 AM:
No issues with screen either

Beth Faxon 11:27 AM:
thank you Hillary

Hillary 11:30 AM:
I've got to head onto another meeting now, I'm sorry I missed the introductions this morning. Beth et. al., please reach out if there is anything I can help you with re: MVP, I'm here for technical assistance and your direct link to the EEA. 617-655-3913

Veronica 11:31 AM:
Extreme Temps and the cost of electricity in town

Lance & Susan 11:31 AM:
brush fires

Lance & Susan 11:31 AM:
flooding

Beth Faxon 11:32 AM:
extreme temps and drought

Veronica 11:32 AM:
snow storms and loss of electricity

Mark Boynton 11:34 AM:
Nashoba Valley Regional Hospital in Ayer. Leominster Hospital.

Veronica 11:35 AM:
Also, Emerson Hospital & Urgent Care in Milford, NH

Mark Boynton 11:35 AM:
Two elderly housing projects on Dudley rd.

Mark Boynton 11:36 AM:
Two power substations in town

Beth Faxon 11:36 AM:
are cell towers included as critical facilities?

Roy, Steven 11:37 AM:
yes, Beth. cell towers are critical facilities

Beth Faxon 11:41 AM:
squannacook river association

Veronica 11:41 AM:

Nashua River Watershed Association

Veronica 11:41 AM:

Squannacook Greenway

Lance & Susan 11:41 AM:

nashoba board of health

Veronica 11:41 AM:

Townsend Conservation Land Trust

Beth Faxon 11:42 AM:

local media?

Veronica 11:43 AM:

Anne Gagnon, MA Fish and Wildlife

James Sartell 11:44 AM:

Mutual aid agreements between police departments. There is a county wide one as well.

James Sartell 11:45 AM:

Also have relationship with North Eastern Massachusetts Law Enforcement Council, Boston Area Police Emergency Radio Network

James Sartell 11:48 AM:

Any information as to moving out these dates?

James Sartell 11:48 AM:

due to public health issue going on?

Beth Faxon 11:52 AM:

I'd prefer to work online

Veronica 11:52 AM:

If it is online, it is good to be able to see people who are participating as opposed to phone only.

Mark Boynton 11:52 AM:

Online vote for Fire

James Sartell 11:52 AM:

Online

Veronica 11:52 AM:

If the public health issues subside, I prefer face to face.

Dave Henkels 11:52 AM:

On line.

Lance & Susan 11:53 AM:

We support on line.

James Sartell 11:53 AM:

we may be limited due to technology (microphones/cameras etc.)

James Sartell 11:53 AM:

I agree with Veronica. Better face to face and if not possible cameras/mics

Beth Faxon 11:54 AM:

if we do the 3 one-hour webinars, what are the dates you want to pencil in?

Mark Boynton 11:54 AM:

My apologies for going late and somewhat disengaged this morning. We are swamped with COVID19 challenges. This plan and process is very important to Fire-EMS. I would prefer we stay on tract and not extend the timeline.

Beth Faxon 11:55 AM:

yes

Dave Henkels 11:55 AM:

yes

Veronica 11:55 AM:

Tuesdays are good for me

Lance & Susan 11:55 AM:

yes

James Sartell 11:56 AM:

Good for me too.

Mark Boynton 11:56 AM:

Yes Tuesday work for Fire-EMS

Beth Faxon 11:56 AM:

thank you

Lance & Susan 11:56 AM:

Thank You as well

Mark Boynton 11:57 AM:

Thank you

Veronica 11:57 AM:

Just to confirm, everything we need to respond to is in today's email? Thank you!

James Sartell 11:57 AM:

Thank you.

Roy, Steven 11:57 AM:

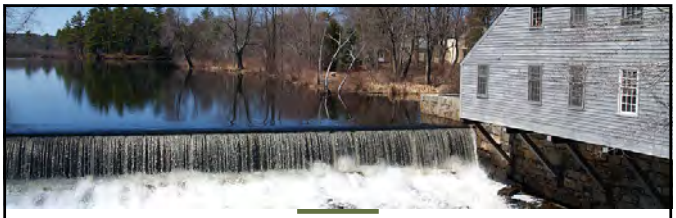
yes, everything is in the email as attachments

James Sartell 11:58 AM:

I was on the phone as well. Last four digits were 6214

Beth Faxon 12:08 PM:

9786971556



TOWN OF TOWNSEND

Core Team Meeting

Tuesday, March 24th, 2020

Photo: Townsend Harbor Dam, Wikimedia Commons

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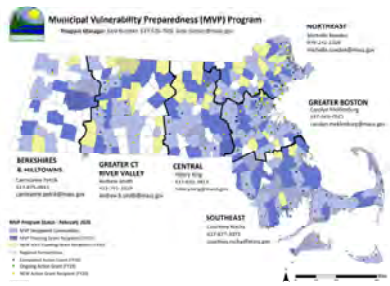
MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM (MVP)



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MVP PROVIDES OPPORTUNITIES

- Improved **resilience and preparedness** of natural and climate-driven hazards
- **Collaboration with stakeholders** about climate change, natural hazards and impacts
- **Increased education, planning, and implementation** of priority actions
- **Funding** for resilience actions as well as efforts that are not exclusively resilience-based (i.e. improved parks, infrastructure)

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MVP COMPONENTS

PHASE 1 - PLANNING

- Receive Planning Grant
- Prioritize Action Items
- Complete MVP Program
- Submit Final Report for Approval
- Become Certified

PHASE 2 - ACTION

- Select an Action Item from Planning Phase
- Apply for Action Grant Funding
- Up to $2 million for planning, design, permitting, construction
- 25% grant match in cash or in-kind
- $10-15 million available

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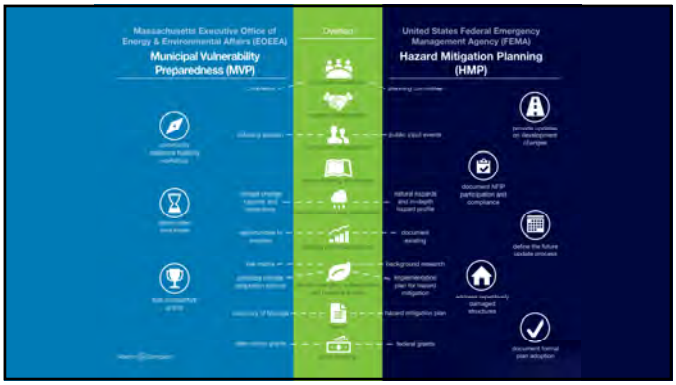

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SCOPE OF WORK

1. Review Plans
2. Convene the Core Team → Thanks for coming!
3. Critical Facilities List → Seeking input
4. Hazards Map
5. Community Resilience Building Workshop → March/April, discuss options for virtual formats
6. Finalize Priorities
7. Public Listening Session → March, discuss options for virtual formats
8. Report → Due June 2020

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ONLINE OPTIONS

- Webinars
- Videos
- Surveys
- Podcasts
- Social Media Campaigns

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CLIMATE DATA

- Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan (2018)
- Massachusetts Climate Change Projections (NECSC, 2018 on resilientma.org)
- Massachusetts Climate Change Adaptation Report (MA EEA, 2011)

APPLICABLE PLANS

- Montachusett Region Natural Hazard Mitigation Plan, 2015 Update
- Townsend Open Space & Recreation Plan, 2013-2020
- Master Plan (2019/in progress)

What other ongoing initiatives, plans, or operations should we review or document?

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ELIGIBLE MVP ACTION GRANT PROJECTS

- Detailed Vulnerability and Risk Assessment
- Public Education and Communication
- Local Bylaws, Ordinances, Plans, and Other Management Measures
- Redesigns and Retrofits
- Energy Resilience Strategies
- Chemical Safety
- Nature-Based Storm-Damage Protection, Drought Prevention, Water Quality, and Water Infiltration Techniques
- Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality
- Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts
- Acquisition of Land to Achieve a Resiliency Objective
- Ecological Restoration and Habitat Management to Increase Resiliency

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Climate mitigation ensures there is less to adapt to and is a key component of our community's resilience

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CORE TEAM

ROLE

- Confirm framework for process
- Provide data and local expertise
- Participate in the stakeholder workshop
- Finalize priority actions for the final report

TODAY'S OBJECTIVES

- Review Process
- Set Goals
- Prepare for Stakeholder Meeting

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EXTREME TEMPERATURES

WARMER ANNUAL AIR TEMPERATURES
UP 0.5°F PER DECADE SINCE 1970, ON AVERAGE

WARMER WINTERS
UP 1.3°F PER DECADE SINCE 1970, ON AVERAGE

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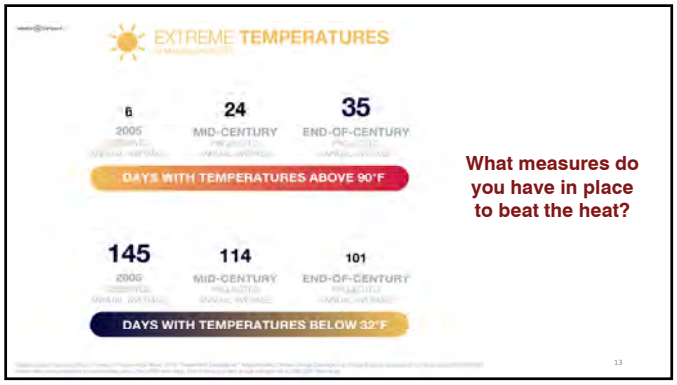

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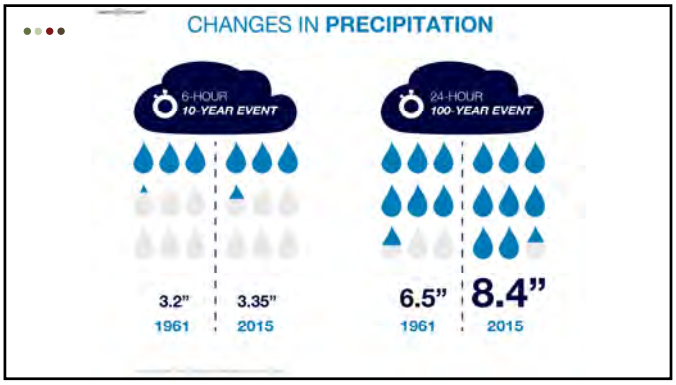

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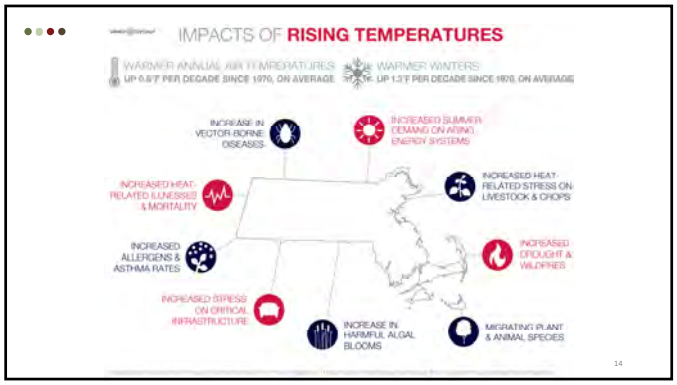

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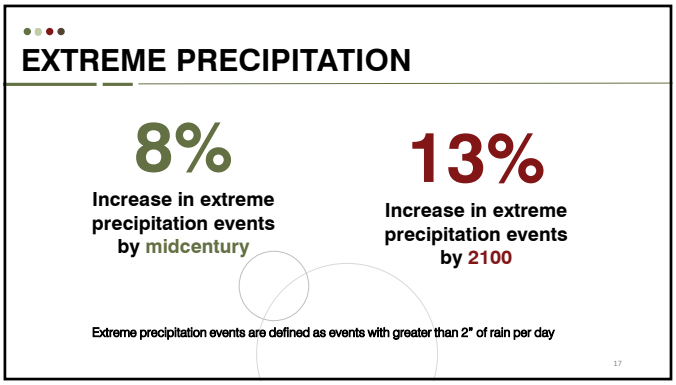

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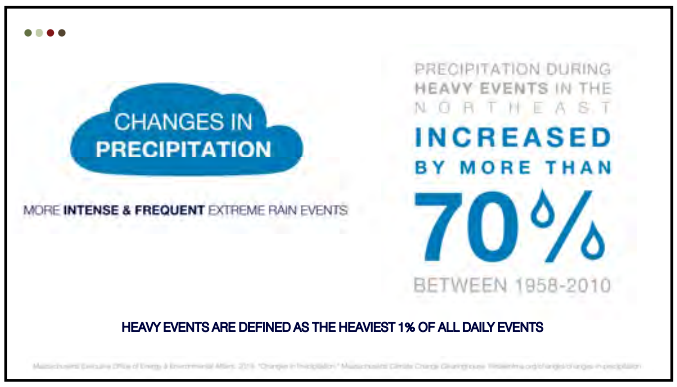

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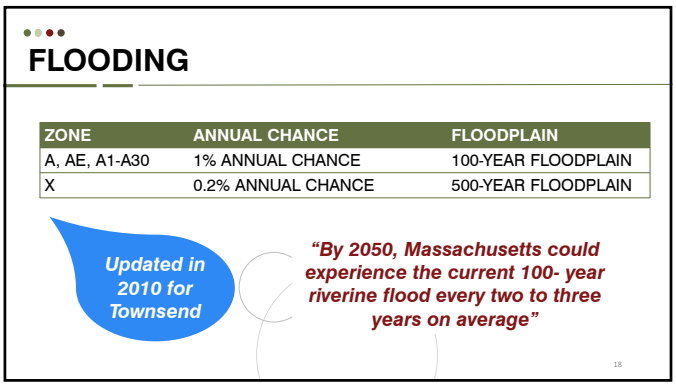

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STORMWATER FLOODING

Areas with:

- Poor drainage
- High amounts of impervious surface
- Undersized culverts
- More events with saturated soil

Are there areas that experience stormwater or riverine flooding outside of the FEMA flood zones?

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HURRICANES AND EARTHQUAKES

Upward trend in North Atlantic hurricane activity since 1970

Nor'easters along the Atlantic coast are increasing in frequency and intensity

Source: Climate Science Special Report, Fourth National Climate Assessment (NCA4). Volume prepared by the U.S. Global Change Research Program (USGCRP)Northern Middlesex Council of Governments. 2015. "Hazard Mitigation Plan for the Northern Middlesex Region," 159-160.

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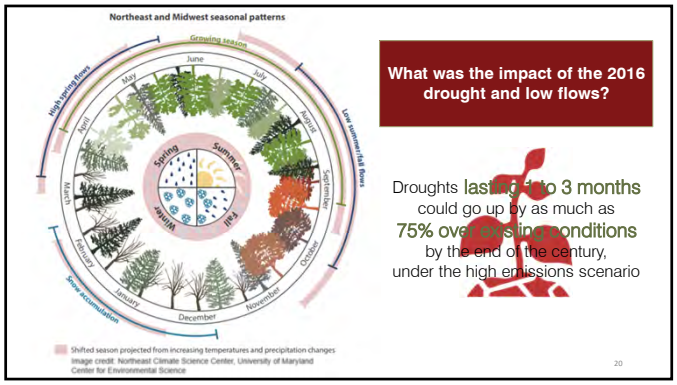

What was the impact of the 2016 drought and low flows?

Droughts lasting 1 to 3 months could go up by as much as 75% over existing conditions by the end of the century, under the high emissions scenario

20

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IMPACTS OF CHANGING PRECIPITATION

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SEVERE STORMS

"Heavy blizzards are among the **most costly and disruptive** weather events for Massachusetts communities."

The blizzard of 2013 left nearly **400,000 Massachusetts residents without power**

Northeast digs out from monster storm: Over 2 feet of snow buries towns in New York, Massachusetts, Vermont

By Dan Peck, Max Golenbo and Emily Shapiro

December 3, 2018, 3:16 PM • 5 min read

https://abcnews.go.com/US/noreaster-moves-storms-move-california/story?id=67458654

Townsend, Massachusetts is buried under 25.2 inches of snow.

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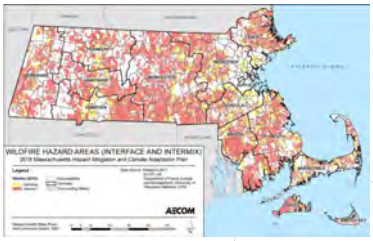
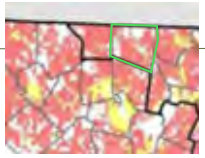
WILDFIRE





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wildfires were reported in the Town of Townsend over a 6-year period.

Source: Montachusett Regional Planning Commission (MRPC). Montachusett Region Hazard Mitigation Plan. 2015. 44.

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IMPACTS OF EXTREME WEATHER

STORMS ARE BECOMING MORE INTENSE AND DAMAGING:

- EROSION OF DUNES, SALT MARSHES & COASTAL HABITAT
- ECONOMIC DAMAGES & BUSINESS DISRUPTION
- RE-SHAPED RIVER COURSES
- INCREASED INJURIES & MORTALITY
- DISPLACEMENT OF RESIDENTS
- PROPERTY DAMAGE
- INCREASED INFRASTRUCTURAL REPAIR COSTS

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INFRASTRUCTURAL FEATURES

Police Department

Photo by the Townsend Police Department

Fire Department

Photo by the Townsend Fire Department

Highway Department

Photo by the Townsend Police Department

Private Sewers

Dams

Harbor Dam Photo: Wikimedia Commons

Roadways

Main Street. Photo: Wikimedia Commons

Bridges/Culverts

Photo provided by Nick Erickson

Town Water and Private Wells

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HAZARDS IN TOWNSEND

- Flooding
- Severe Thunderstorms, Wind, Tornado
- Drought
- Extreme Temperatures
- Nor'easters, Ice Storm, Severe Snow Storm
- Hurricanes
- Wildfires, Brush Fires

Weston & Sampson

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HAZARD POTENTIAL OF DAMS

Dam	Hazard Potential	Ownership
Townsend Pearl Hill Brook Dam	Low Hazard	Public
Townsend Adams Dam	N/A	Public
Townsend Graves Pond Dam	N/A	Private
Townsend Townsend Harbor Dam	Significant Hazard	Private
Townsend Mason Road Dam	Significant Hazard	Private
Townsend VFW Dam	Significant Hazard	Public

Source: Montachusett Regional Planning Commission (MRPC). Montachusett Region Hazard Mitigation Plan. 2015. 210-211.

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CRITICAL FEATURES IN TOWNSEND

Photo: Faluiah Water Treatment Facility. Photo provided Nick Erickson.

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INFRASTRUCTURAL FEATURES

- Unitil Electric and Gas
- Emergency Shelters
  - Hawthorne Brook Middle School
  - North Middlesex Regional High School
  - Spaulding Memorial School
  - Squannacook Elementary School

Source: Montachusett Regional Planning Commission (MRPC). Montachusett Region Hazard Mitigation Plan. 2015. 531-533.

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SOCIETAL FEATURES

Population	Townsend	Massachusetts
2010:	8,926 residents	6,547,790
2017:	9,418 residents	6,902,149
Age		
Under 18 years:	25.3%	20%
65+ years:	12.7%	17%
Education		
Bachelor's degree or higher:	36.1%	42.1%
Additional Information		
Median household income:	$84,630	$74,167
Persons in poverty:	4.0%	10.5%
With a disability:	12.0%	7.9%
Language other than English spoken at home:	3.8%	23.1%

Source: U.S. Census Bureau, 2020

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THANK YOU

Weston & Sampson

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ENVIRONMENTAL FEATURES

Source: Pearl Hill State Park, Townsend, MA Wikimedia Commons

Features in Townsend

- Squanacook River/Harbor Pond
- Townsend Common
- Townsend-Ashby Squannacook Park
- Squannacook Brook State Forest
- Townsend State Forest
- Meetinghouse Park
- Pearl Hill State Park
- Willard Brook State Forest
- Squannacook River State Wildlife Management Area

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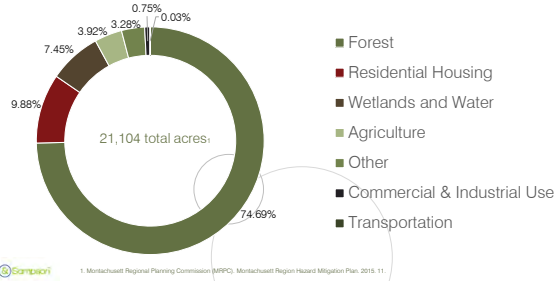
Townsend's Land Use



Weston & Sampson

1. Montachusett Regional Planning Commission (MRPC). Montachusett Region Hazard Mitigation Plan. 2015. 11.

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Town of Townsend
Municipal Vulnerability Preparedness Planning Grant

Core Team Meeting, Skype Call Meeting
DRAFT Townsend Goals Endorsement

Amended and Recommended Hazard Mitigation Goals for Townsend:

1. **Coordination:** Increase coordination between Townsend and Federal, State, regional, and local partners.
2. **Protection:** Develop programs and strategies to protect the following Town features from natural hazards and climate change impacts:
    a. Vulnerable residents, including the elderly, young, homeless, low-income, and those with limited English proficiency
    b. Homes and businesses
    c. Cultural and historic resources
    d. Critical infrastructure, including transportation networks
    e. Public utilities, including electric power, water, and wastewater
    f. Public facilities and services
    g. Future development
    h. Open space, conserved land, and other environmental features
3. **Planning:** Incorporate climate change and natural hazard considerations into Town reports, planning efforts, departments, committees, and boards.
4. **Public Outreach:** Increase awareness and support for climate change and natural hazard mitigation among local organizations, businesses, and residents through outreach and education.
5. **Capacity:** Increase the Town's capacity for responding to climate change impacts and natural hazard events through adequate staff, training, supplies, equipment, and guidance.
6. **Funding:** Identify and pursue funding to support the development and implementation of climate adaptation and hazard mitigation measures.

Expert Interviews

Goal: Conduct interviews with local experts to discuss climate adaptation in more depth, and to update information from the last Hazard Mitigation Plan (HMP). These interviews are typically 45 minutes and conducted over Skype or Microsoft Teams so that we can share a screen. We will share interview materials with attendees in advance, and we will follow up on interviews with a copy of the discussion notes. We propose conducting interviews related to the following topic areas.

Organization	Interviewee
Planning and Town Administrator	James M. Kreidler, Jr. jkreidler@townsend.ma.us Beth Faxon bfaxon@townsend.ma.us Laurie Shifrin Laurie8884@gmail.com Veronica Kell vktownsendplanningboard@gmail.com Bill Cadogan wjc@percep-tech.com
Emergency Management	Shirley Coit mamacoit@aol.com Jay Sartell jsartell@townsendpd.org Mark Boynton mboynton@townsendpd.org Kym Craven kcraven@publicsafetystrategies.com
Highway Department and Utilities (Water and Sewer)	James Smith highway@townsend.ma.us Rebecca McEnroe Becky@mcenroeconsulting.com Todd Melanson tdzilla66@gmail.com Ryan Lepierre
Conservation Department, Cemetery & Parks Department, Tree Warden	Dave Henkels datlee6@msn.com Roger Rapoza cemetery@townsend.ma.us Donald Massucco muzzpam22@gmail.com Leigh Reddin lreddin@townsend.ma.us
The Building Department	Janet Leavitt jleavitt@townsend.ma.us Bentley Herget bherget@townsend.ma.us

Additionally, the following interviews will be conducted via email:

Organization	Interviewee
Public Schools	Brad Morgan bmorgan@nmrsd.org
Townsend Energy Committee	Brent Carney brcarney1015@gmail.com
Housing Authority	Chaz Sexton-Diranian csexton.tha@gmail.com Laura Shifrin laurie@townsendcenterrealty.com
Senior Center and Council on Aging	Jane Jackson jane.lois.jackson@gmail.com Karin Canfield Moore kmoore@townsend.ma.us
Public Health	Carla Walter cjaquilia@yahoo.com Rick Metcalf rmetcalf@nashoba.org Emy Hoff ehtownrec@yahoo.com.
Public Library	Susan McNally scmcnally@comcast.net Stacy Schuttler sschuttler@cwmars.org
Planning and Development	Lance McNally

Organization	Interviewee
Townsend Business Association	Kym Craven
Townsend Recreation	Emy Hoff, Director
Historic District Commission and Cultural Council	Alisa Struthers alisa_55@verizon.net Linda Durette linda.durette@gmail.com

Town of Townsend

Municipal Vulnerability Preparedness Planning Grant

Key Expert Interview Questions

1. How does the goal of improving Townsend's climate resilience overlap with your department's mission or objectives?

2. Which climate hazard is likely to have the greatest impact on your department?
   OR Which climate hazard impacts your department's operations most frequently? What impacts typically occur?

3. What (and where) are your department's critical facilities, infrastructure, or assets? (Review with map and critical facilities list).

4. Does your department have a Standard Operating Procedure or Emergency Plan to respond and recover after hazards occur? (Formal or informal)

5. How has your department taken steps to reduce vulnerabilities to climate change in your operations or to protect the public health and safety in the community?

6. What tools, resources, knowledge, or data would your department need to better mitigate, prepare, respond, recover, or adapt to climate change?

7. How can your department promote resilience within the community or directly with community members?

Weston & Sampson

8. What are some of Townsend's greatest strengths?

9. What are some of Townsend's greatest vulnerabilities?

10. In general, how prepared do you feel Townsend is for climate change? Why?

11. How could Townsend adapt to climate change today? In the next five years? In the next 20 years?

12. How do you think Townsend should prioritize its climate adaptation measures?

13. What climate adaptation measures discussed in question 10, should be a priority?

Appendix B

Additional Hazard Data

MASON

BROOKLINE

ASHBY

GROTON

SHIRLEY

UNENBURG

FI

N

Greenville
Road Conservation Area
Townsend State
Forest
Solar Firm
(1.2MW)
Conservation
Area
Townsend Water
Supply Land
Booster Pumping
Station
Riverside
Cemetery
Riverside
Cemetery
VFW Post #6583
VFW Dam
Main Street
Tubular Well Field #1
Old Brick
Store
First Baptist
Church
West Power
Substation
Townsend Water
Department
Craven Baseball
Field
Pump Station
& Well Fields
DCR Willard
Brook State Forest
Atwood Acres
Townsend Woods
Dudley Road
Townsend Public
Library
Townsend Police
Station
Cell Tower
Howard Park
Howard Park
Hawthorne
Brook Middle School
Cross Street
Gravel Packed Well 2
Townsend Storage
Tank
Main Street
Conservation Area
Town of Ashby/Townsend
Animal Control
Greater Grace
Community Church
Sterlite Corporation
Spaulding
Memorial School
Spaulding
Memorial School
Upper Common
St John the
Evangelist Catholic Church
Old Burial
Ground
Hillside Cemetery
Adams Dam
US Post Office
Headquarters
Townsend Highway
Department
Meetinghouse
Road Conservation Area
Sterlite Corporation
East Power
Substation
Sterlite Coproration
Old Meetinghouse
Park
Maura Price
Wallace Hill
Pearl Hill
Brook Dam
DCR Pearl
Hill State Park
Pheasant Ridge
Conservation Area
Squannacook
Brook State Forest
Co-located
Food Bank and Clothes Closet
Lunenburg
Road Conservation Area
Townsend Storage
Tank
Historical
Society Harbor Church
Harbor Church
Harbor Station
Main Street
Land
Northern Middlesex
Regional High School Athletic Fields
North Middlesex
Regional High School
Deluxe Corp
Walgreens
Hannaford
Supermarket
Repeater Site:
standalone tower with only town equipment
Willard Brook
State Forest
Harbor Trace
Gp Well
Garage facility
for Water Dept.
Lecuyer, Jeanne
Michalczyk,
Elizabeth
Graves Pond
Dam
Crescent Road
Conservation Area
Fitchburg
Road Conservation Area
Bixby Reservoir
Dam
Cell Tower
with associated equipment in an on-site building
Tammy Sontag
Deer Run Conservation
Area
Timberlee
Park Conservation Area
Dussault,
Tracy
Laura Alimayu
Solar Firm
(768KW)

Legend

- Animal Shelter
- City/Town Hall
- Communication Infrastructure
- District Court
- Early Education Childcare Facilities
- Elderly Housing
- Electric Substations
- Emergency Dispensing Sites
- Emergency Operation Centers
- Emergency Shelters
- End of Life Facilities
- Energy Resilience
- Fire
- HazMat Sites
- Historic Properties
- Other Critical Facilities
- Other Government Buildings
- Police
- Public Health Office
- Public Safety Communications
- Pumping Stations
- Religious Center
- Schools
- Supply Store
- Wasterwater Treatment Plant
- Certified Vernal Pools
- Community Groundwater Source
- Non-Community Groundwater Source
- Railroads (Decommissioned)
- Landfill
- Conservation / Protected Land / Open Space

Dams

- Significant Hazard
- Low Hazard
- N/A

Waterways

- Rivers, Streams, and Brooks
- Marsh, Bog, Wooded Marsh
- Lakes, Ponds, Resevoirs

FEMA National Flood Hazard Layer

- 1% Annual Chance of Flooding (Zones A, AE, AH, AO)
- 0.2% Annual Chance of Flooding (Zone X)

Census (2010)

- > 25% of population is < 18
- > 25% of population is 65+

0.5 0 0.5
Miles

FIGURE 1

TOWN OF TOWNSEND, MASSACHUSETTS

MUNICIPAL VULNERABILITY PREPARDNESS HAZARD AND FEATURE MAP

JUNE 2020 SCALE: NOTED

Weston & Sampson

ID	Feature Type	Name	Address	X_LAT	Y_LONG
0	Animal Shelter	Town of Ashby/Townsend Animal Control	352 Main Street	42.67224	-71.723906
1	Animal Shelter	Townsend Veterinary Hospital	354 Main Street	42.67237	-71.724385
	Animal Shelter	Best friends veterinary hospital	Main Street	42.666552	-71.705494
2	City/Town Hall	Townsend Town Hall	272 Main Street	42.667104	-71.706904
3	Clinic	Nashoba Valley Regional Hospital	200 Groton Rd, Ayer, MA	42.577472	-71.574
4	Clinic	Leominster Hospital	60 Hospital Rd, Leominster	42.540444	-71.762611
5	Clinic	Emerson Hospital	133 Old Rd to 9 Acre Corner, Concord, MA	42.45232	-71.375693
6	Clinic	Urgent Care	442 Nashua St, Milford, NH	42.82921	-71.633545
7	Communication Infrastructure	Cell Tower	82 Bayberry Hill Road	42.655048	-71.73611
8	Communication Infrastructure	Cell Tower	12 Dudley Road	42.676071	-71.700918
9	Communication Infrastructure	Cell Tower	Ball Road	42.681516	-71.669008
10	Dam	Townsend Harbor Dam		42.65254	-71.67265
11	Dam	Mason Road Dam		42.678972	-71.7402
12	Dam	Bixby Reservoir Dam		42.6403319	-71.71508357
13	Dam	Adams Dam		42.66591	-71.71019
14	Dam	Graves Pond Dam		42.6431697	-71.70934873
15	Dam	Pearl Hill Brook Dam		42.65777	-71.757136
16	Dam	VFW Dam		42.677727	-71.747611
17	District Court	Townsend Townhall Clerk	272 Main St	42.667104	-71.706904
18	Early Education Childcare Facilities	Lecuyer, Jeanne	173 Lunenburg Road	42.644977	-71.74652
19	Early Education Childcare Facilities	Village Common Children's Center	3 Brookline St	42.666857	-71.704217
20	Early Education Childcare Facilities	Rainbow Preschool & Child Care	27 Main St	42.651324	-71.664048
21	Early Education Childcare Facilities	Dussault, Tracy	271 S. Row Road	42.632783	-71.706075
22	Early Education Childcare Facilities	Maura Price	16 Regan Rd.	42.657593	-71.679325
23	Early Education Childcare Facilities	Michalczyk, Elizabeth	14 Sumac Drive	42.643852	-71.715267
24	Early Education Childcare Facilities	Laura Alimayu	6 Pisces Lane	42.630357	-71.682479
25	Early Education Childcare Facilities	Kidsborough@ Spaulding	1 Whitcomb St.	42.669981	-71.712925
26	Early Education Childcare Facilities	Tammy Sontag	9 Laurel woods Dr.	42.638632	-71.737132
27	Elderly Housing	Townsend Woods	70 Dudley Rd	42.67979	-71.710275
28	Elderly Housing	Atwood Acres	66 Dudley Rd	42.680767	-71.709414
29	Electric Substations	East Power Substation	Main Street	42.661036	-71.696588
30	Electric Substations	West Power Substation	West Main Street	42.675527	-71.759329
31	Emergency Dispensing Sites	North Middlesex Regional High School	19 Main Street	42.651434	-71.66064
32	Emergency Operation Centers	Townsend Memorial Hall	272 Main Street	42.667104	-71.706904
33	Emergency Operation Centers	Townsend Police Station	70 Brookline Street	42.676481	-71.700044
34	Emergency Shelters	Hawthorne Brook School	64 Brookline Road	42.674435	-71.702434
35	Emergency Shelters	North Middlesex Regional High School (Alternate)	19 Main Street	42.651434	-71.66064
36	Emergency Shelters	Squannacook Early Childhood Center (Alternate)	66 Brookline Road	42.675034	-71.705414
37	End of Life Facilities	Hillside Cemetery	Highland St	42.667726	-71.700084
38	End of Life Facilities	Old Burial Ground	Highland Street/Old Meetinghouse Hill Road	42.669961	-71.69385
39	End of Life Facilities	Riverside Cemetery	Dudley Road	42.679659	-71.738375
40	End of Life Facilities	TJ Anderson & Son Funeral Home	250 Main Street	42.666242	-71.705084
41	Energy Resilience	Solar Firm (768KW)	Route13	42.627304	-71.744155
42	Energy Resilience	Solar Firm (1.2MW)	West Meadow Road	42.686111	-71.764511
43	Fire	Harbor Station	47 Main Street	42.65304	-71.66961
44	Fire	Headquarters	13 Elm Street	42.665562	-71.707288
45	Fire	West Townsend Station	460 Main Street	42.677086	-71.743407
46	Fire	Townsend Center Fire Station	8 Elm Street	42.666016	-71.706107
47	Fire	Townsend Center FS- Annex	272 Main Street	42.667056	-71.706987
48	HazMat Sites	Sterlite Coproration	198 Main Street	42.662237	-71.698433
49	HazMat Sites	M&M Auto Supply Inc.	5 Center Street	42.665505	-71.706176
50	HazMat Sites	Apple Meadow True Value Hardware Store	10 Elm Street	42.665733	-71.705912
51	Historic Properties	The Spaulding Cooperage	1 South Street	42.652674	-71.672501
52	Historic Properties	The Spaulding Grist Mill	1 South Street	42.652603	-71.671949
53	Historic Properties	Reed Homestead	72 Main Street	42.653233	-71.673383
54	Historic Properties	Harbor Church	80 Main Street	42.653669	-71.674675
55	Historic Properties	Cooperage	1 South Street	42.652692	-71.672404
56	Open Space	Howard Park	Howard Road	42.674447	-71.707075
57	Other Critical Facilities	Co-located Food Bank and Clothes Closet	82 Bayberry Hill Road	42.655048	-71.73611
58	Other Critical Facilities	Deluxe Corp	12 South Street	42.650768	-71.670756
59	Other Critical Facilities	Sterlite Corporation	198 Main Street	42.662261	-71.698454
60	Other Critical Facilities	Sterlite Corporation	30 Scales Lane	42.669605	-71.7212

61	Other Critical Facilities	Old Brick Store	440 Main Street	42.677059	-71.740863
62	Other Government Buildings	DCR Forest Fire Station	65 Main Street	42.653306	-71.672364
63	Other Government Buildings	Garage facility for Water Dept.	14 Ash Street	42.644863	-71.680945
64	Other Government Buildings	Townsend Capital Meeting Room	14 Dudley Street	42.676239	-71.701427
65	Other Government Buildings	Townsend Highway Department	177 Main Street	42.664172	-71.694589
66	Other Government Buildings	Townsend Historical Society	72 Main Street	42.653241	-71.673475
67	Other Government Buildings	Townsend Police Communication Center	70 Brookline Street	42.67648	-71.700098
68	Other Government Buildings	Townsend Public Library	12 Dudley Road Street	42.676239	-71.701427
69	Other Government Buildings	Townsend Senior Center COA	16 Dudley Road	42.676239	-71.701427
70	Other Government Buildings	Townsend Storage Tank	Highland Street	42.672809	-71.677131
71	Other Government Buildings	Townsend Storage Tank	Fitchburg Road	42.652618	-71.719472
72	Other Government Buildings	Townsend Water Department	540 Main Street	42.674994	-71.760688
73	Other Government Buildings	US Post Office	227 Main Street	42.665676	-71.70269
74	Other Government Buildings	Townsend Recreation Building	274 Main Street	42.667413	-71.707157
75	Police	Townsend Police Station	70 Brookline Road	42.676481	-71.700044
76	Public Health Office	Board of Health	272 Main Street	42.667104	-71.706904
77	Public Safety Communications	Cell Tower with associated equipment in an on-site building	60 Warren Road	42.640233	-71.668337
78	Public Safety Communications	Repeater Site: standalone tower with only town equipment	139 Lunenburg	42.650501	-71.747418
79	Public Water Supply	Cross Street Gravel Packed Well 2	Kimplen Court	42.673312	-71.695095
80	Public Water Supply	DCR Pearl Hill State Park	105 New Fitchburg Rd	42.655688	-71.757418
81	Public Water Supply	DCR Willard Brook State Forest	599 Main Street	42.67337	-71.772623
82	Public Water Supply	Harbor Trace Gp Well	25 Harbor Trace Road	42.646383	-71.669712
83	Public Water Supply	Main Street Tubular Well Field #1	512 Main Street	42.676815	-71.753582
84	Public Water Supply	Witches Brook Well 1	14 Ash Street	42.644863	-71.680945
85	Public Water Supply	Witches Brook Well 2	14 Ash Street	42.644863	-71.680945
86	Pumping Stations	Booster Pumping Station	West Meadow Road	42.679338	-71.758872
87	Religious Center	Townsend Congregational Church, UCC	3 Brookline St	42.666857	-71.704217
88	Religious Center	St John the Evangelist Catholic Church	1 School St	42.668901	-71.703971
89	Religious Center	New Beginnings United Methodist Church	265 Main St	42.667686	-71.705834
90	Religious Center	First Baptist Church	461 Main St	42.677419	-71.743886
91	Religious Center	Historical Society Harbor Church	80 Main Street	42.653669	-71.674675
92	Religious Center	Greater Grace Community Church	354 Main Street	42.672385	-71.724550
93	Schools	North Middlesex Regional High School	19 Main Street	42.651434	-71.66064
94	Schools	Hawthorne Brook School	64 Brookline Road	42.674435	-71.702434
95	Schools	Squannacook Early Childhood Center	66 Brookline Road	42.675034	-71.705414
96	Schools	Spaulding Memorial School	1 Whitcomb Street	42.669981	-71.712925
97	Sports and Cultural	Townsend-Ashby Squannacook Soccer Complex	42 Mason Road	42.680271	-71.744022
98	Sports and Cultural	Craven Baseball Field	15 New Fitchburg Rd	42.675748	-71.745452
99	Sports and Cultural	Spaulding Baseball (Playing) Fields	1 Whitcomb St	42.670722	-71.714338
100	Sports and Cultural	Townsend Senior Center	16 Dudley Rd	42.676239	-71.701427
101	Sports and Cultural	VFW Post #6583	491 Main St	42.678246	-71.74907
102	Supply Store	Hannaford Supermarket	18 Main Street	42.648434	-71.660016
103	Supply Store	McNabb's Pharmacy	233 Main St	42.666152	-71.703871
104	Supply Store	Mr. Mike's Mini Market	Main Street	42.66592	-71.704316
105	Supply Store	Walgreens	18 Main Street	42.648732	-71.661278
106	Supply Store	Apple Meadow Hardware	10 Elm Street	42.665791	-71.706124
107	Wasterwater Treatment Plant	Wastewater Treatment Plan/Septic System	66 Brookline Road	42.675034	-71.705414

Hazus: Hurricane Global Risk Report

Region Name: Townsend

Hurricane Scenario: Probabilistic 100-year Return Period

Print Date: Thursday, May 7, 2020

Disclaimer:
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Totals only reflect data for those census tracts/blocks included in the user's study region.

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There are an estimated 3 thousand buildings in the region with a total building replacement value (excluding contents) of 1,253 million dollars (2014 dollars). Approximately 91% of the buildings (and 85% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 3,269 buildings in the region which have an aggregate total replacement value of 1,253 million (2014 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

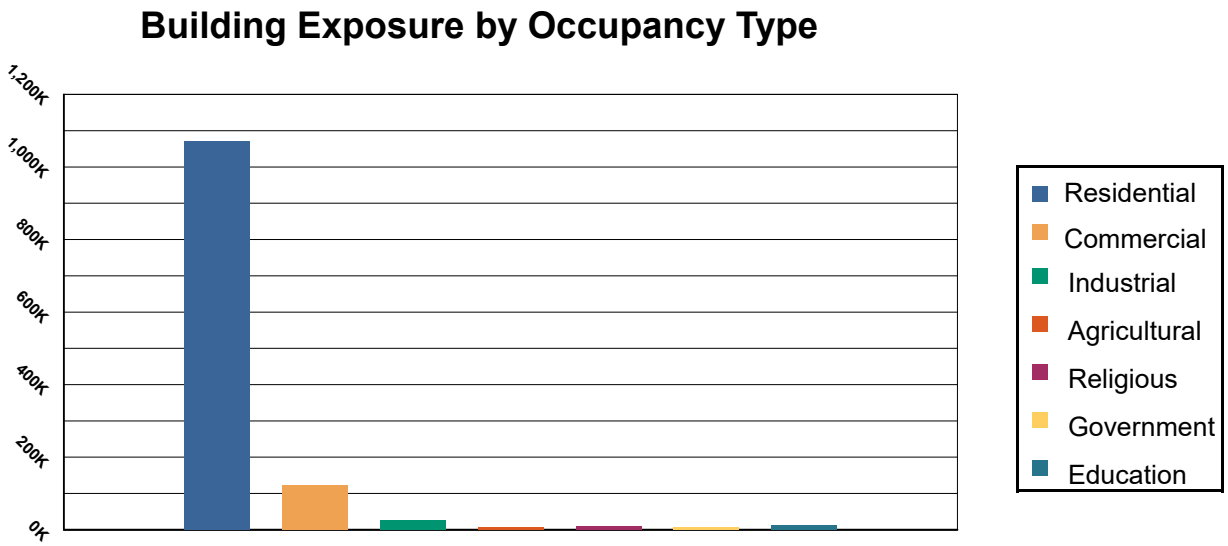


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	1,070,398	85.46 %
Commercial	121,640	9.71%
Industrial	25,784	2.06%
Agricultural	6,730	0.54%
Religious	10,888	0.87%
Government	5,588	0.45%
Education	11,546	0.92%
Total	**1,252,574**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 1 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

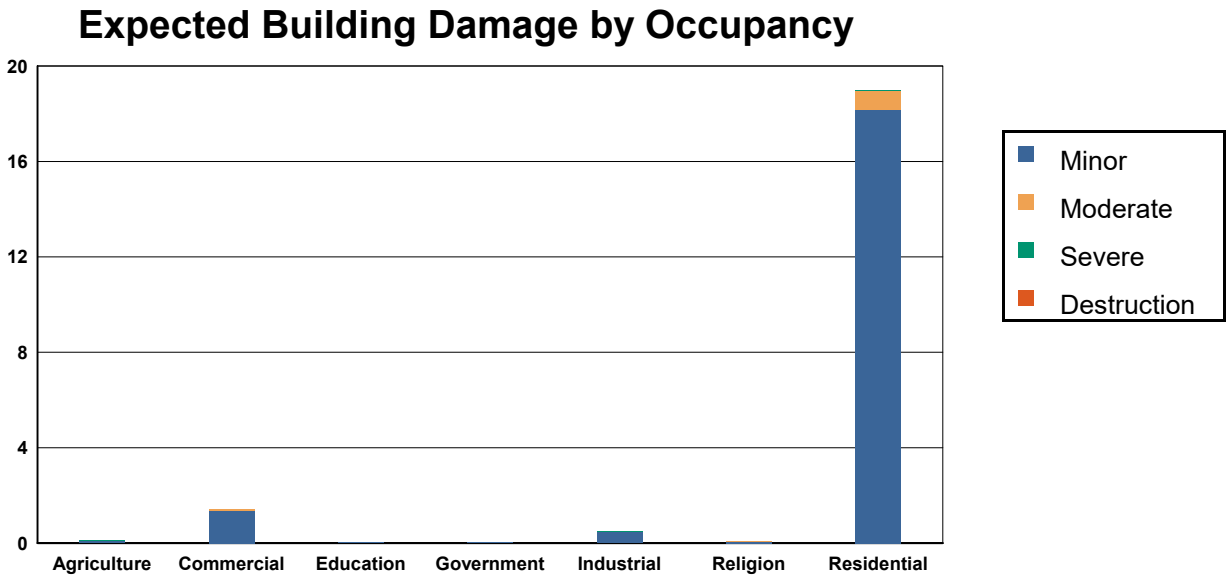


Table 2: Expected Building Damage by Occupancy : 100 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	16.87	99.23	0.12	0.72	0.01	0.04	0.00	0.01	0.00	0.00
Commercial	175.58	99.20	1.35	0.76	0.07	0.04	0.00	0.00	0.00	0.00
Education	4.96	99.28	0.04	0.72	0.00	0.00	0.00	0.00	0.00	0.00
Government	4.96	99.26	0.04	0.74	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	60.50	99.18	0.49	0.81	0.01	0.01	0.00	0.00	0.00	0.00
Religion	12.91	99.31	0.09	0.67	0.00	0.02	0.00	0.00	0.00	0.00
Residential	2,972.00	99.36	18.16	0.61	0.82	0.03	0.02	0.00	0.00	0.00
Total	**3,247.79**		**20.28**		**0.91**		**0.02**		**0.00**	

Table 3: Expected Building Damage by Building Type : 100 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	6	99.19	0	0.81	0	0.00	0	0.00	0	0.00
Masonry	149	98.47	2	1.35	0	0.18	0	0.00	0	0.00
MH	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	128	99.16	1	0.80	0	0.04	0	0.00	0	0.00
Wood	2,865	99.47	15	0.52	0	0.01	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

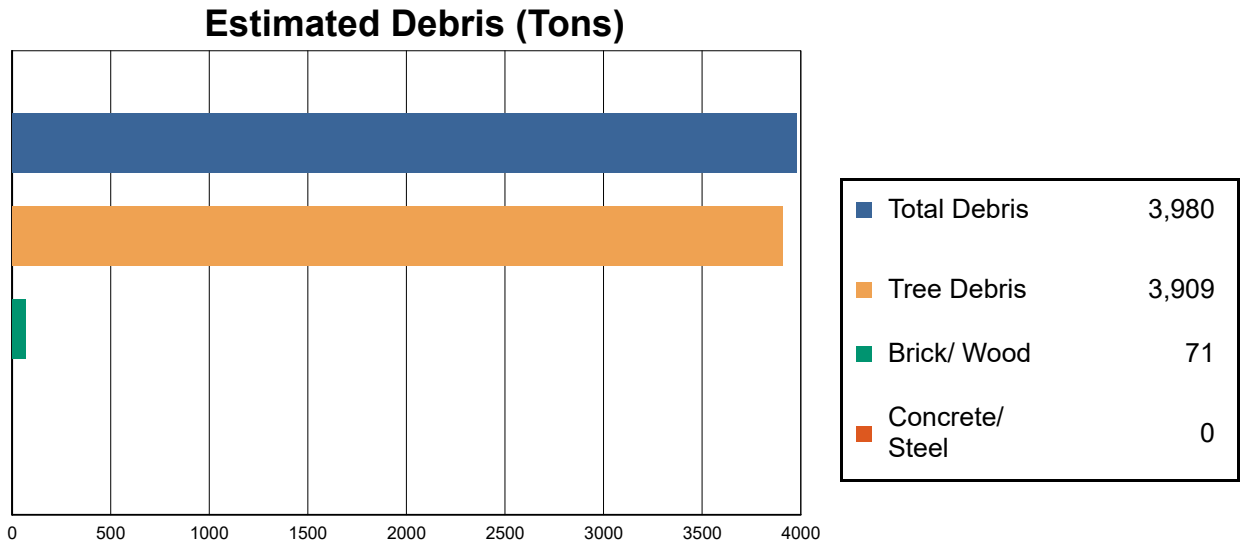
Thematic Map of Essential Facilities with greater than 50% moderate

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
Fire Stations	1	0	0	1
Police Stations	1	0	0	1
Schools	5	0	0	5

Induced Hurricane Damage

Debris Generation

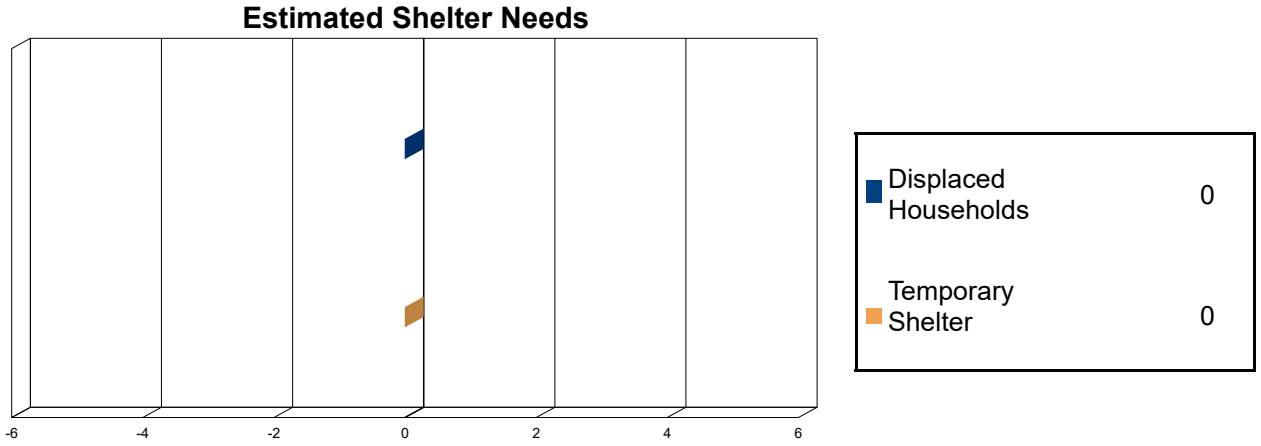


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 3,980 tons of debris will be generated. Of the total amount, 3,460 tons (87%) is Other Tree Debris. Of the remaining 520 tons, Brick/Wood comprises 14% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 3 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 449 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 8,926) will seek temporary shelter in public shelters.

Economic Loss

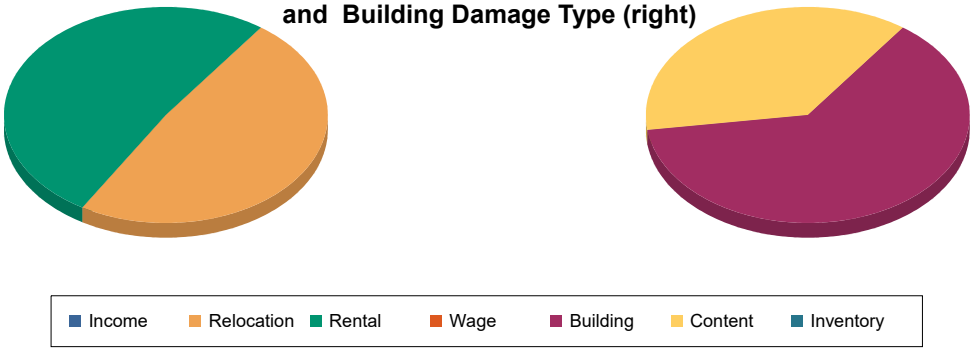
The total economic loss estimated for the hurricane is 4.9 million dollars, which represents 0.39 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 5 million dollars. 0% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 99% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	3,006.45	28.53	4.42	6.42	3,045.82
	Content	1,812.27	0.00	0.00	0.00	1,812.27
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**4,818.73**	**28.53**	**4.42**	**6.42**	**4,858.10**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	4.66	0.40	0.01	0.03	5.10
	Rental	5.41	0.00	0.00	0.00	5.41
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**10.08**	**0.40**	**0.01**	**0.03**	**10.51**

Total

Total	**4,828.80**	**28.93**	**4.43**	**6.45**	**4,868.61**

Appendix A: County Listing for the Region

Massachusetts
- Middlesex

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Massachusetts				
Middlesex	8,926	1,070,398	182,176	1,252,574
Total	**8,926**	**1,070,398**	**182,176**	**1,252,574**
Study Region Total	**8,926**	**1,070,398**	**182,176**	**1,252,574**

Hazus: Hurricane Global Risk Report

Region Name: Townsend

Hurricane Scenario: Probabilistic 500-year Return Period

Print Date: Thursday, May 7, 2020

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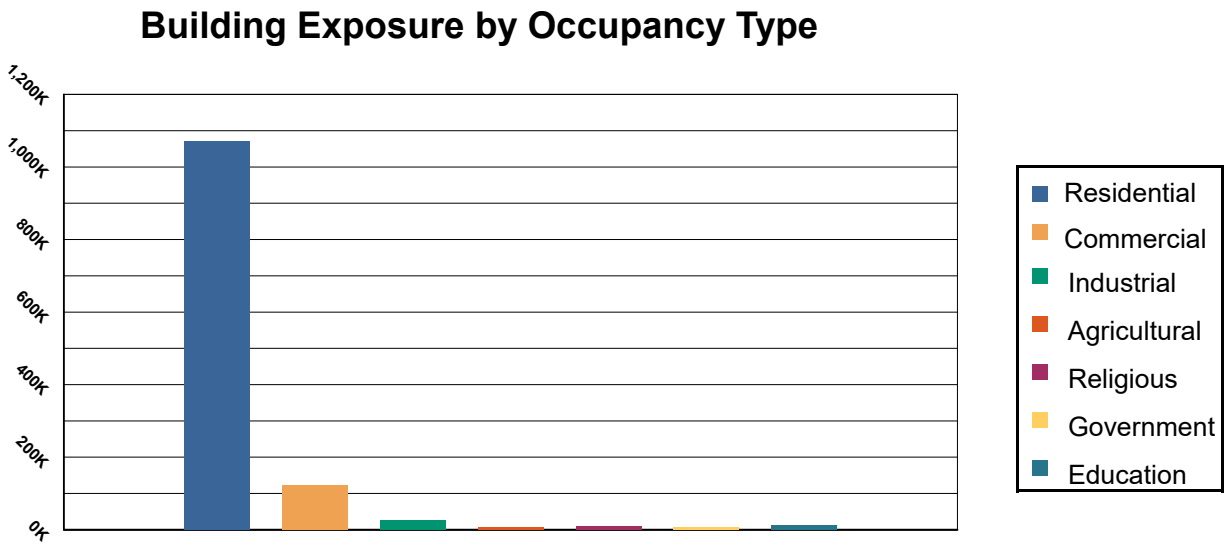

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Agricultural	6,730	0.54%
Religious	10,888	0.87%
Government	5,588	0.45%
Education	11,546	0.92%
Total	**1,252,574**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 23 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

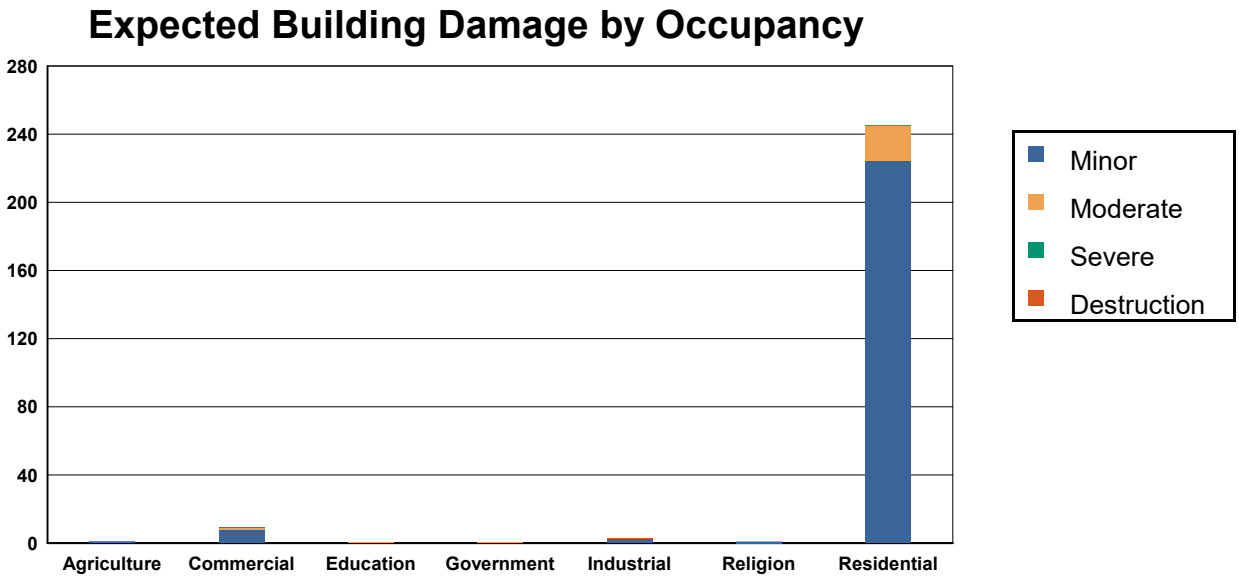


Table 2: Expected Building Damage by Occupancy : 500 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	15.74	92.61	1.00	5.86	0.18	1.05	0.08	0.45	0.00	0.02
Commercial	167.47	94.61	8.14	4.60	1.23	0.69	0.16	0.09	0.00	0.00
Education	4.78	95.64	0.21	4.16	0.01	0.20	0.00	0.00	0.00	0.00
Government	4.79	95.84	0.20	3.99	0.01	0.17	0.00	0.00	0.00	0.00
Industrial	58.00	95.09	2.71	4.45	0.24	0.39	0.05	0.08	0.00	0.00
Religion	12.25	94.23	0.70	5.41	0.05	0.35	0.00	0.02	0.00	0.00
Residential	2,745.67	91.80	224.45	7.50	20.69	0.69	0.16	0.01	0.04	0.00
Total	**3,008.71**		**237.41**		**22.39**		**0.44**		**0.04**	

Table 3: Expected Building Damage by Building Type : 500 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	6	95.66	0	4.14	0	0.20	0	0.00	0	0.00
Masonry	136	90.23	11	7.25	4	2.44	0	0.07	0	0.00
MH	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	123	95.16	5	4.07	1	0.66	0	0.11	0	0.00
Wood	2,656	92.23	211	7.32	13	0.45	0	0.01	0	0.00

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

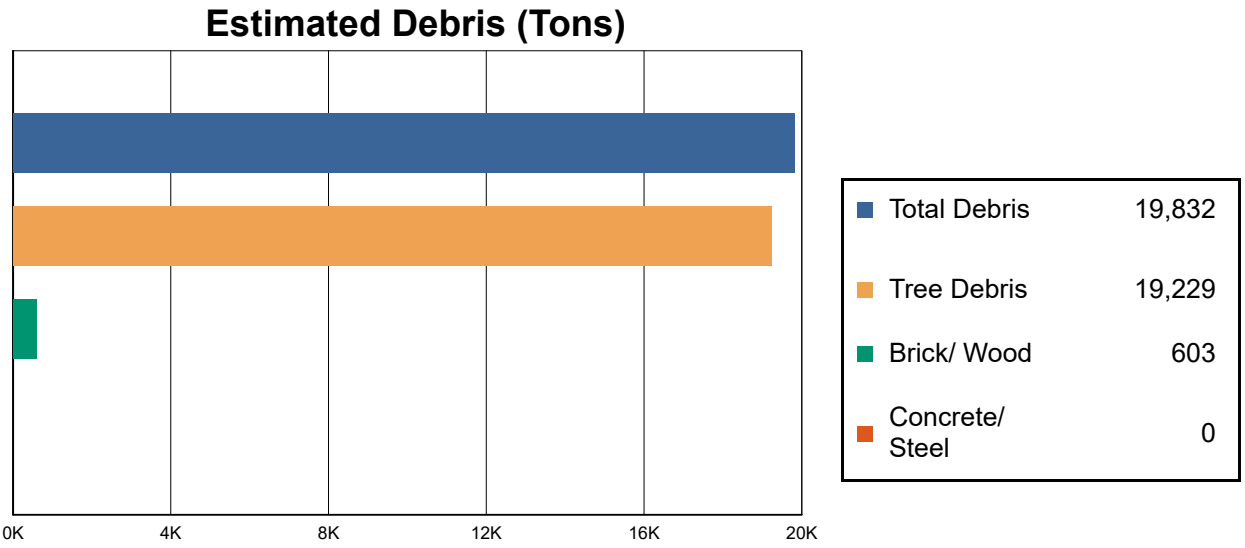
Thematic Map of Essential Facilities with greater than 50% moderate

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
Fire Stations	1	0	0	1
Police Stations	1	0	0	1
Schools	5	0	0	5

Induced Hurricane Damage

Debris Generation

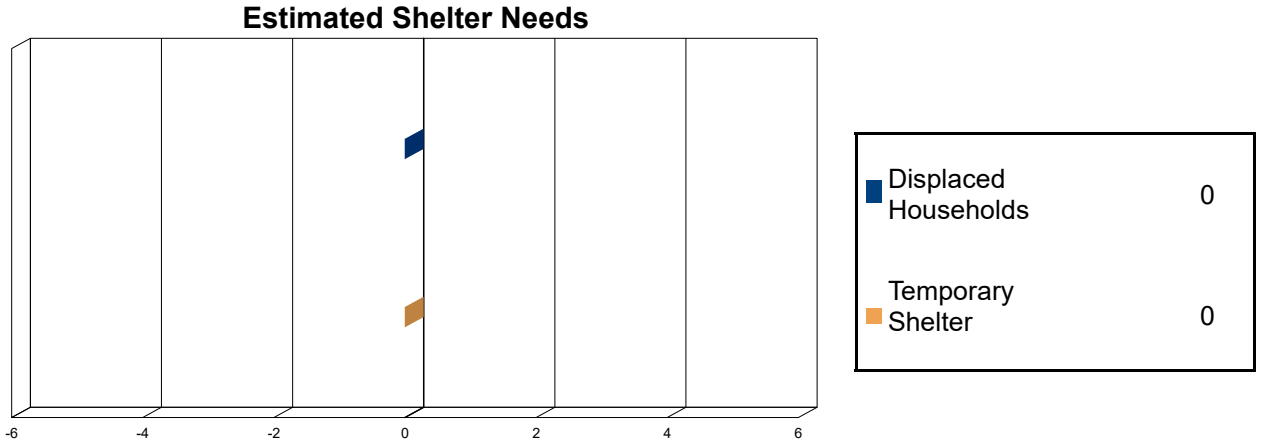


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 19,832 tons of debris will be generated. Of the total amount, 17,042 tons (86%) is Other Tree Debris. Of the remaining 2,790 tons, Brick/Wood comprises 22% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 24 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 2,187 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 8,926) will seek temporary shelter in public shelters.

Economic Loss

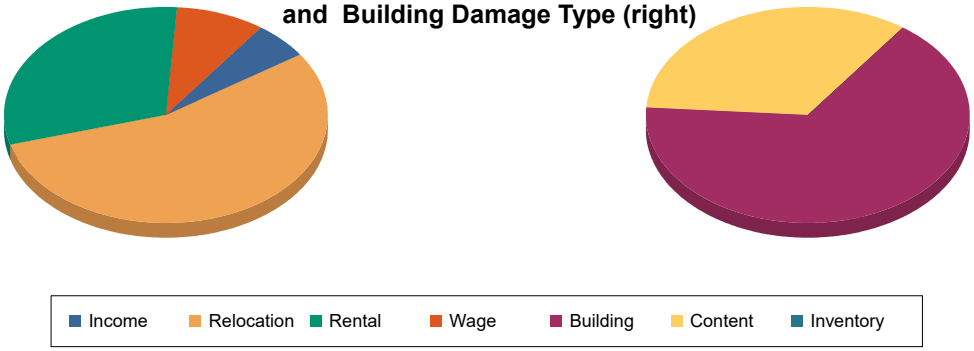
The total economic loss estimated for the hurricane is 19.3 million dollars, which represents 1.54 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 19 million dollars. 2% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 98% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

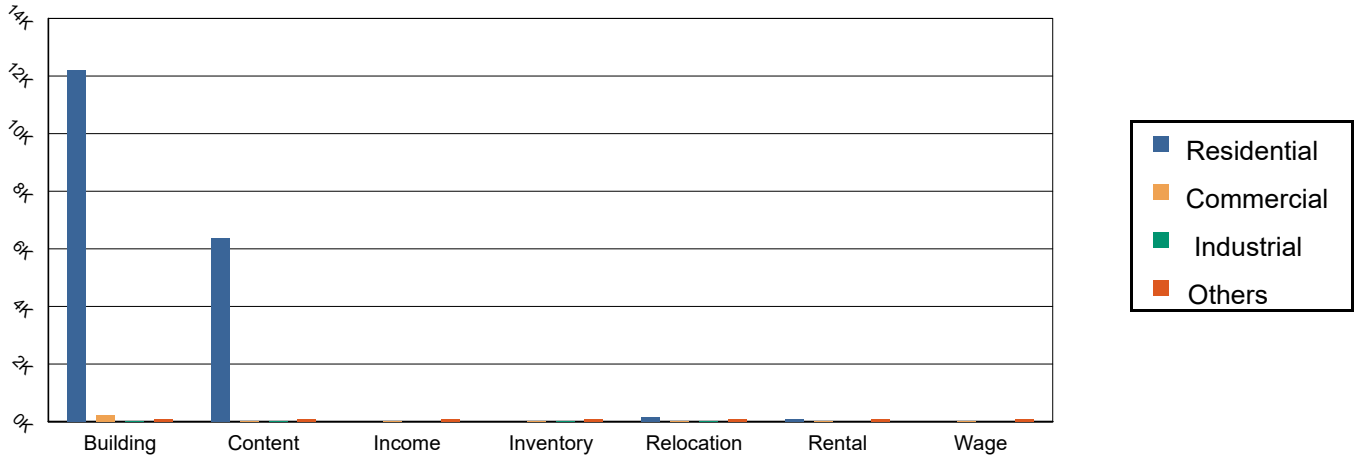


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	12,197.96	214.14	36.00	58.43	12,506.54
	Content	6,378.94	27.60	9.76	9.14	6,425.44
	Inventory	0.00	0.92	1.52	0.51	2.95
	Subtotal	**18,576.91**	**242.67**	**47.28**	**68.08**	**18,934.93**
Business Interruption Loss						
	Income	0.00	14.44	0.13	5.99	20.56
	Relocation	176.44	25.76	0.77	6.23	209.20
	Rental	100.67	14.30	0.11	0.49	115.57
	Wage	0.00	19.12	0.22	14.04	33.38
	Subtotal	**277.11**	**73.62**	**1.23**	**26.75**	**378.71**

Total

Total	**18,854.01**	**316.29**	**48.51**	**94.82**	**19,313.63**

Appendix A: County Listing for the Region

Massachusetts
- Middlesex

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Massachusetts				
Middlesex	8,926	1,070,398	182,176	1,252,574
Total	**8,926**	**1,070,398**	**182,176**	**1,252,574**
Study Region Total	**8,926**	**1,070,398**	**182,176**	**1,252,574**

Hazus: Earthquake Global Risk Report

Region Name	Townsend
Earthquake Scenario:	Townsend Magnitude 5 Earthquake
Print Date:	May 07, 2020

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Massachusetts

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 33.06 square miles and contains 2 census tracts. There are over 3 thousand households in the region which has a total population of 8,926 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 3 thousand buildings in the region with a total building replacement value (excluding contents) of 1,252 (millions of dollars). Approximately 91.00 % of the buildings (and 85.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 221 and 13 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 3 thousand buildings in the region which have an aggregate total replacement value of 1,252 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 89% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 5 schools, 1 fire stations, 1 police stations and 0 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 234.00 (millions of dollars). This inventory includes over 31.69 miles of highways, 13 bridges, 415.70 miles of pipes.

Table 1: Transportation System Lifeline Inventory

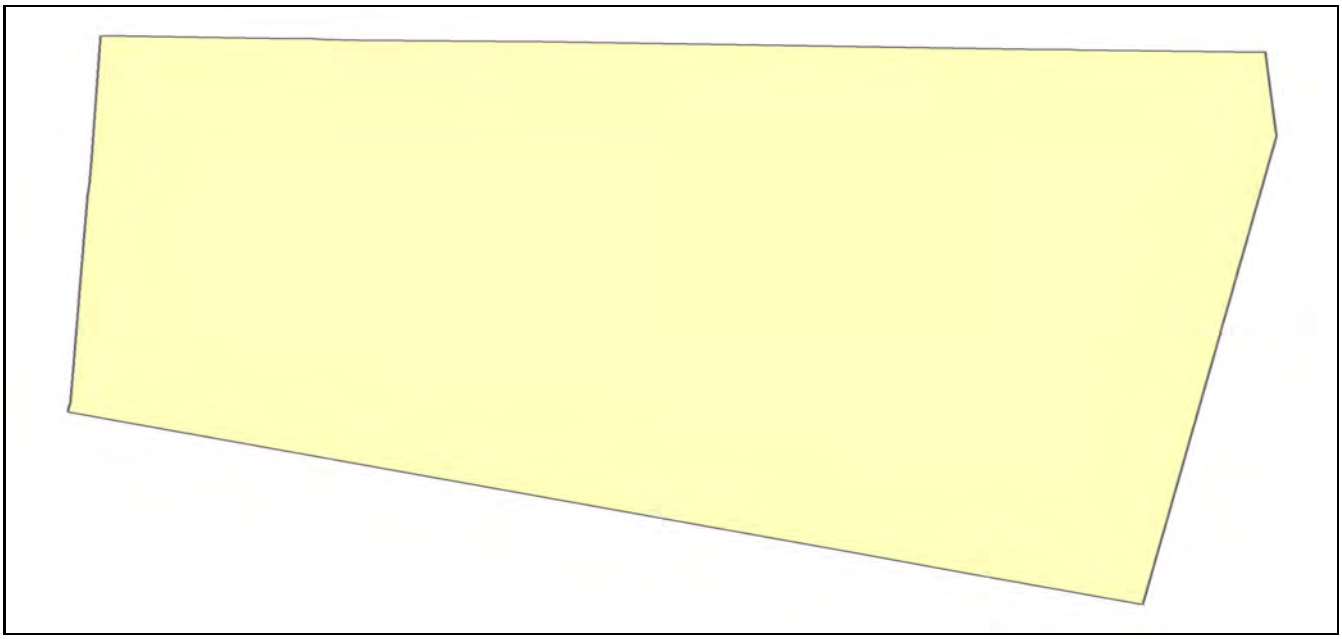
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	13	41.7714
	Segments	12	172.2706
	Tunnels	0	0.0000
		Subtotal	**214.0420**
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	4	7.0260
	Tunnels	0	0.0000
		Subtotal	**7.0260**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	0	0.0000
	Runways	0	0.0000
		Subtotal	**0.0000**
		Total	**221.10**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	6.6944
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**6.6944**
Waste Water	Distribution Lines	NA	4.0166
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**4.0166**
Natural Gas	Distribution Lines	NA	2.6778
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**2.6778**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	0	0.0000
		Subtotal	**0.0000**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**13.40**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Townsend Magnitude 5 Earthquake
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-71.71
Latitude of Epicenter	42.67
Earthquake Magnitude	5.00
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Direct Earthquake Damage

Building Damage

Hazus estimates that about 632 buildings will be at least moderately damaged. This is over 19.00 % of the buildings in the region. There are an estimated 28 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

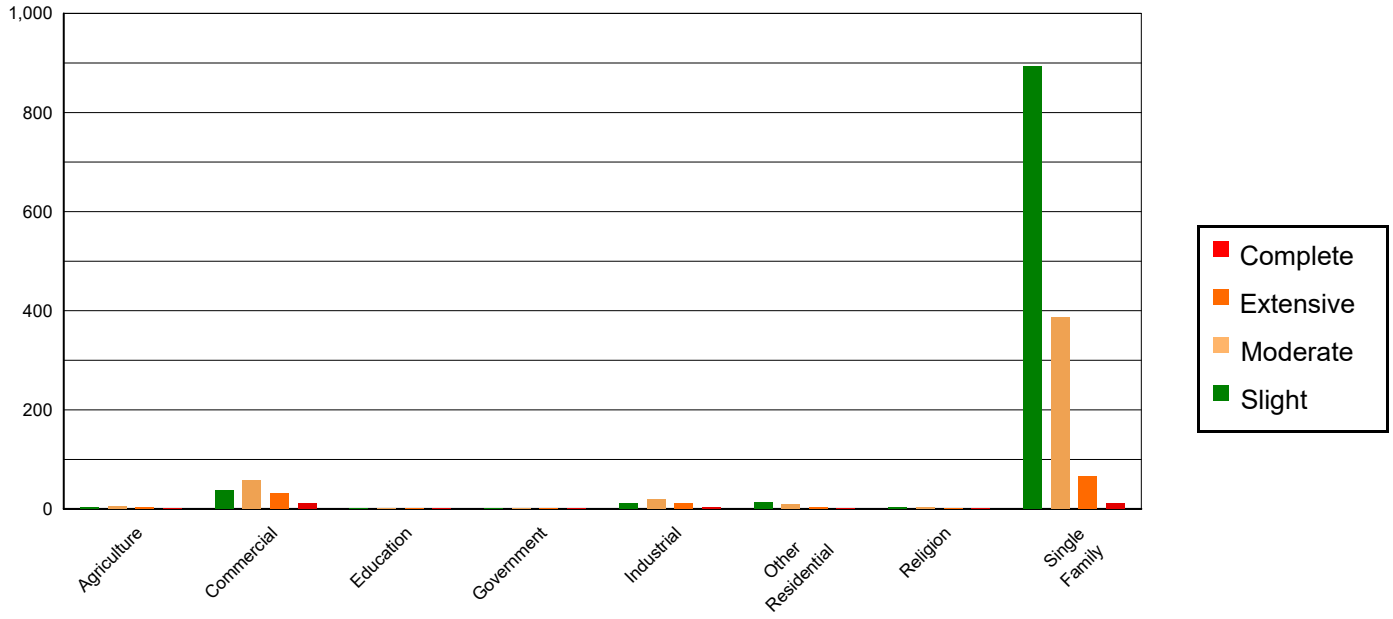


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	3.80	0.23	4.14	0.43	5.62	1.16	2.58	2.16	0.86	3.02
Commercial	40.12	2.40	36.70	3.81	57.59	11.87	31.89	26.72	10.70	37.74
Education	1.19	0.07	1.02	0.11	1.62	0.33	0.88	0.74	0.29	1.02
Government	1.07	0.06	0.93	0.10	1.66	0.34	1.00	0.84	0.34	1.18
Industrial	13.07	0.78	11.44	1.19	20.17	4.16	12.21	10.23	4.11	14.50
Other Residential	20.94	1.25	12.63	1.31	9.33	1.92	3.95	3.31	1.14	4.04
Religion	4.69	0.28	3.07	0.32	3.08	0.63	1.63	1.37	0.52	1.84
Single Family	1588.44	94.93	892.96	92.74	385.99	79.57	65.21	54.64	10.40	36.66
Total	**1,673**		**963**		**485**		**119**		**28**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	1587.17	94.85	891.33	92.57	374.02	77.10	51.15	42.86	3.72	13.10
Steel	25.05	1.50	21.34	2.22	44.37	9.15	28.44	23.83	10.02	35.33
Concrete	3.20	0.19	2.81	0.29	6.63	1.37	4.21	3.53	1.27	4.48
Precast	1.33	0.08	0.96	0.10	2.43	0.50	2.40	2.01	0.71	2.50
RM	7.09	0.42	3.43	0.36	7.25	1.49	5.86	4.91	1.03	3.63
URM	49.48	2.96	43.01	4.47	50.39	10.39	27.28	22.86	11.62	40.96
MH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**1,673**		**963**		**485**		**119**		**28**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	5	4	0	1
EOCs	0	0	0	0
PoliceStations	1	1	0	0
FireStations	1	1	0	0

Transportation Lifeline Damage

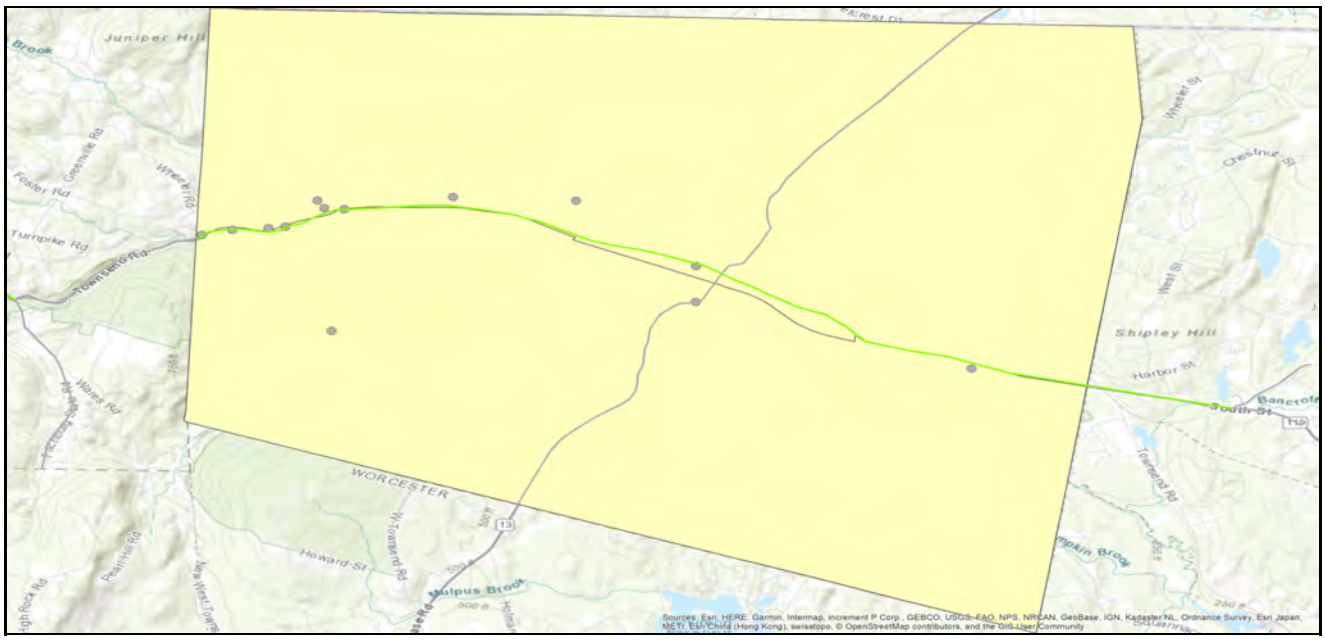


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	12	0	0	12	12
	Bridges	13	1	0	12	13
	Tunnels	0	0	0	0	0
Railways	Segments	4	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	208	54	13
Waste Water	125	27	7
Natural Gas	83	9	2
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,240	0	0	0	0	0
Electric Power		2,701	1,767	721	126	3

Induced Earthquake Damage

Fire Following Earthquake

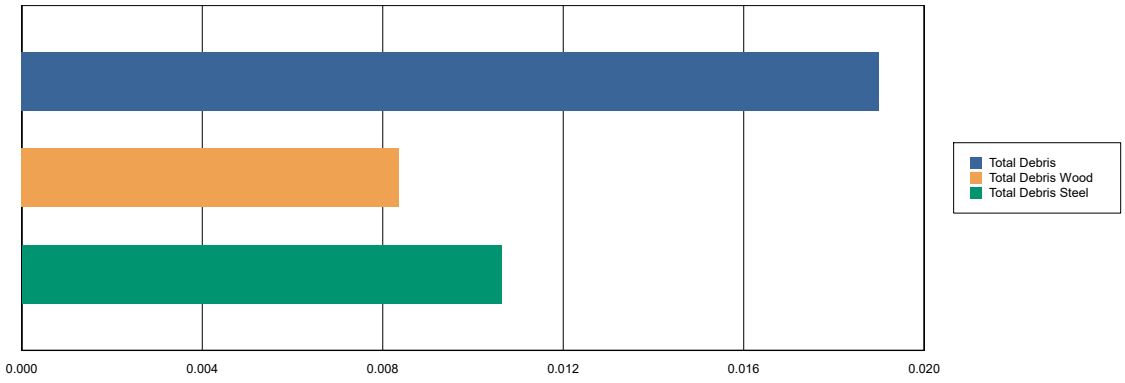
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 19,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 44.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 760 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



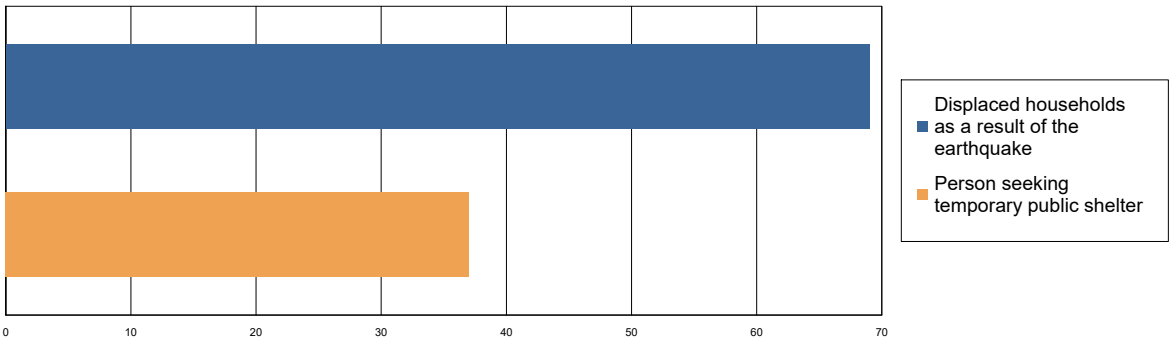
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.01	0.01	0.02	760 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 69 households to be displaced due to the earthquake. Of these, 37 people (out of a total population of 8,926) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
69	37

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.57	0.14	0.02	0.04
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	1.07	0.27	0.04	0.07
	Other-Residential	3.49	0.84	0.12	0.24
	Single Family	9.36	1.59	0.16	0.32
	Total	**14**	**3**	**0**	**1**
2 PM	Commercial	31.83	7.82	1.08	2.10
	Commuting	0.01	0.01	0.02	0.00
	Educational	5.41	1.38	0.20	0.40
	Hotels	0.00	0.00	0.00	0.00
	Industrial	7.88	1.97	0.28	0.54
	Other-Residential	0.58	0.14	0.02	0.04
	Single Family	1.48	0.26	0.03	0.05
	Total	**47**	**12**	**2**	**3**
5 PM	Commercial	23.41	5.77	0.81	1.54
	Commuting	0.14	0.22	0.34	0.07
	Educational	0.27	0.07	0.01	0.02
	Hotels	0.00	0.00	0.00	0.00
	Industrial	4.93	1.23	0.17	0.34
	Other-Residential	1.39	0.34	0.05	0.10
	Single Family	3.68	0.65	0.07	0.13
	Total	**34**	**8**	**1**	**2**

Economic Loss

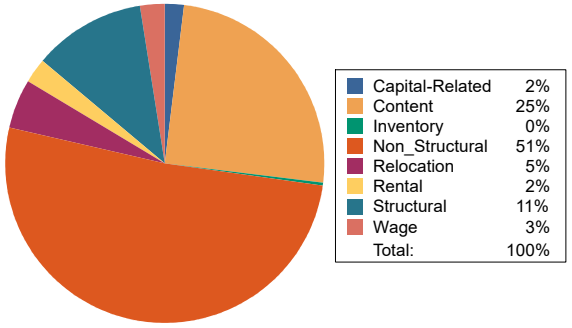
The total economic loss estimated for the earthquake is 142.94 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 141.52 (millions of dollars); 12 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 66 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

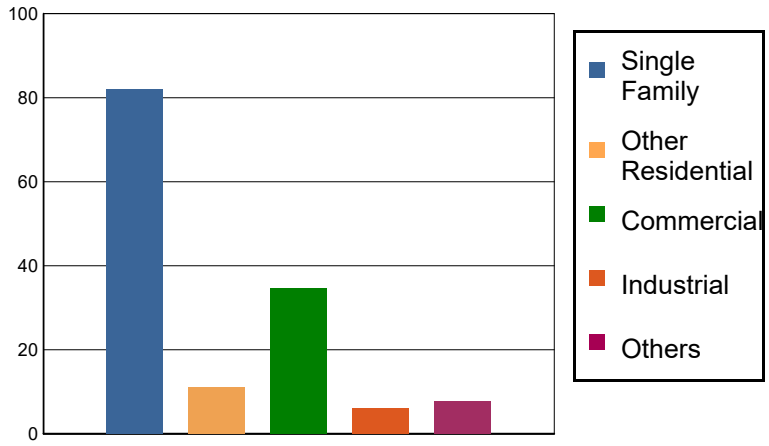


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.1459	3.0168	0.1157	0.2901	3.5685
	Capital-Related	0.0000	0.0621	2.6010	0.0663	0.0472	2.7766
	Rental	0.9380	0.5603	1.7199	0.0311	0.0858	3.3351
	Relocation	3.3597	0.3697	2.6279	0.2134	0.7473	7.3180
	Subtotal	**4.2977**	**1.1380**	**9.9656**	**0.4265**	**1.1704**	**16.9982**
Capital Stock Losses							
	Structural	7.8373	1.0336	5.1547	0.8281	1.3823	16.2360
	Non_Structural	47.1920	6.6850	12.4837	2.8019	3.2902	72.4528
	Content	22.6337	2.1072	6.8098	1.7632	1.9411	35.2550
	Inventory	0.0000	0.0000	0.2341	0.3014	0.0430	0.5785
	Subtotal	**77.6630**	**9.8258**	**24.6823**	**5.6946**	**6.6566**	**124.5223**
	Total	**81.96**	**10.96**	**34.65**	**6.12**	**7.83**	**141.52**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	172.2706	0.0000	0.00
	Bridges	41.7714	1.0143	2.43
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**214.0420**	**1.0143**	
Railways	Segments	7.0260	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**7.0260**	**0.0000**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**221.07**	**1.01**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Line	6.6944	0.2421	3.62
	Subtotal	**6.6944**	**0.2421**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Line	4.0166	0.1216	3.03
	Subtotal	**4.0166**	**0.1216**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Line	2.6778	0.0417	1.56
	Subtotal	**2.6778**	**0.0417**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**13.39**	**0.41**	

Appendix A: County Listing for the Region

Middlesex,MA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Massachusetts					
	Middlesex	8,926	1,070	182	1,252
Total Region		**8,926**	**1,070**	**182**	**1,252**

Hazus: Earthquake Global Risk Report

Region Name	Townsend
Earthquake Scenario:	Townsend Magnitude 7 Earthquake
Print Date:	May 07, 2020

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Massachusetts

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 33.06 square miles and contains 2 census tracts. There are over 3 thousand households in the region which has a total population of 8,926 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 3 thousand buildings in the region with a total building replacement value (excluding contents) of 1,252 (millions of dollars). Approximately 91.00 % of the buildings (and 85.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 221 and 13 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 3 thousand buildings in the region which have an aggregate total replacement value of 1,252 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 89% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 5 schools, 1 fire stations, 1 police stations and 0 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 234.00 (millions of dollars). This inventory includes over 31.69 miles of highways, 13 bridges, 415.70 miles of pipes.

Table 1: Transportation System Lifeline Inventory

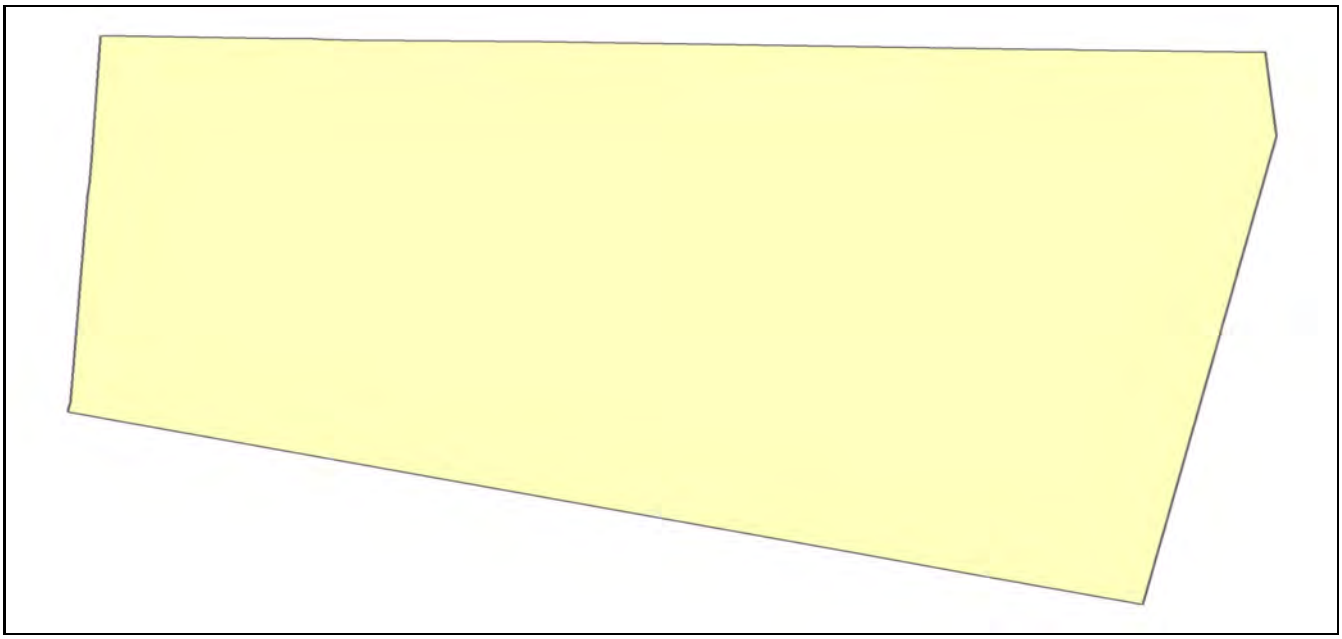
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	13	41.7714
	Segments	12	172.2706
	Tunnels	0	0.0000
		Subtotal	**214.0420**
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	4	7.0260
	Tunnels	0	0.0000
		Subtotal	**7.0260**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	0	0.0000
	Runways	0	0.0000
		Subtotal	**0.0000**
		Total	**221.10**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	6.6944
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**6.6944**
Waste Water	Distribution Lines	NA	4.0166
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**4.0166**
Natural Gas	Distribution Lines	NA	2.6778
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**2.6778**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	0	0.0000
		Subtotal	**0.0000**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**13.40**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Townsend Magnitude 7 Earthquake
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-71.71
Latitude of Epicenter	42.67
Earthquake Magnitude	7.00
Depth (km)	12.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Direct Earthquake Damage

Building Damage

Hazus estimates that about 3,132 buildings will be at least moderately damaged. This is over 96.00 % of the buildings in the region. There are an estimated 1,373 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

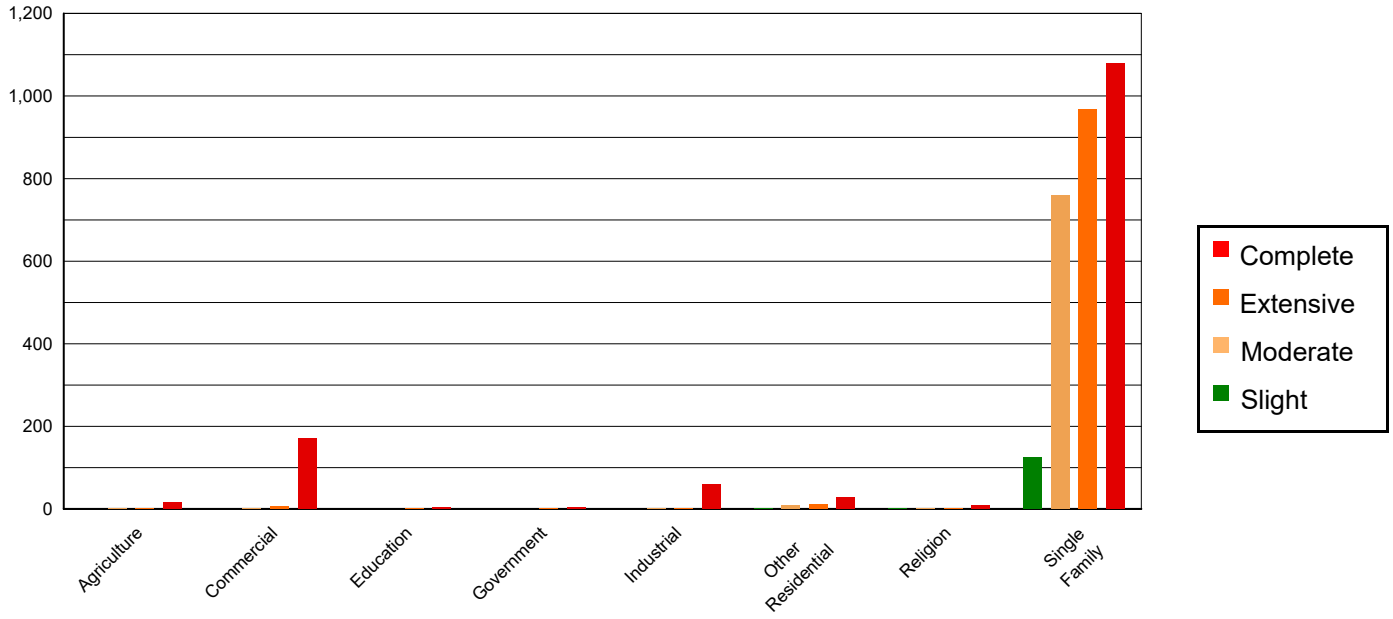


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0.00	0.00	0.00	0.00	0.09	0.01	0.93	0.09	15.98	1.16
Commercial	0.01	0.08	0.04	0.04	0.67	0.09	6.10	0.62	170.18	12.39
Education	0.00	0.00	0.00	0.00	0.02	0.00	0.16	0.02	4.82	0.35
Government	0.00	0.00	0.00	0.00	0.01	0.00	0.12	0.01	4.87	0.35
Industrial	0.00	0.03	0.01	0.01	0.16	0.02	1.61	0.16	59.21	4.31
Other Residential	0.09	0.94	1.23	0.97	7.70	1.00	10.33	1.04	28.66	2.09
Religion	0.02	0.16	0.20	0.16	1.27	0.17	1.79	0.18	9.71	0.71
Single Family	9.55	98.78	125.72	98.82	760.20	98.71	967.77	97.87	1079.76	78.63
Total	**10**		**127**		**770**		**989**		**1,373**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	9.66	99.87	127.08	99.90	768.68	99.81	979.99	99.11	1021.98	74.42
Steel	0.01	0.07	0.01	0.00	0.12	0.02	2.22	0.22	126.87	9.24
Concrete	0.00	0.00	0.00	0.00	0.02	0.00	0.24	0.02	17.86	1.30
Precast	0.00	0.00	0.00	0.00	0.02	0.00	0.05	0.01	7.76	0.56
RM	0.01	0.06	0.01	0.00	0.11	0.01	0.32	0.03	24.22	1.76
URM	0.00	0.00	0.12	0.09	1.18	0.15	5.98	0.60	174.51	12.71
MH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**10**		**127**		**770**		**989**		**1,373**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	5	4	4	1
EOCs	0	0	0	0
PoliceStations	1	1	1	0
FireStations	1	1	1	0

Transportation Lifeline Damage

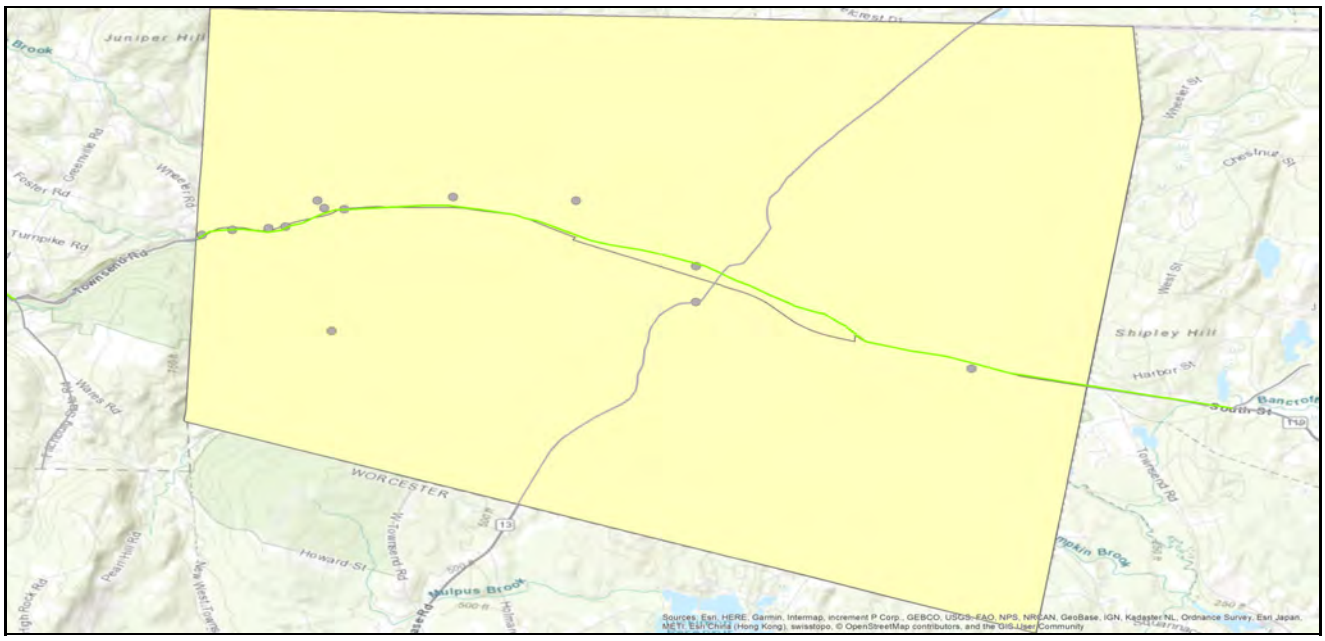


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	12	0	0	12	12
	Bridges	13	12	12	1	1
	Tunnels	0	0	0	0	0
Railways	Segments	4	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	208	1723	431
Waste Water	125	866	216
Natural Gas	83	297	74
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,240	3,234	3,231	3,213	0	0
Electric Power		3,122	2,942	2,421	1,020	3

Induced Earthquake Damage

Fire Following Earthquake

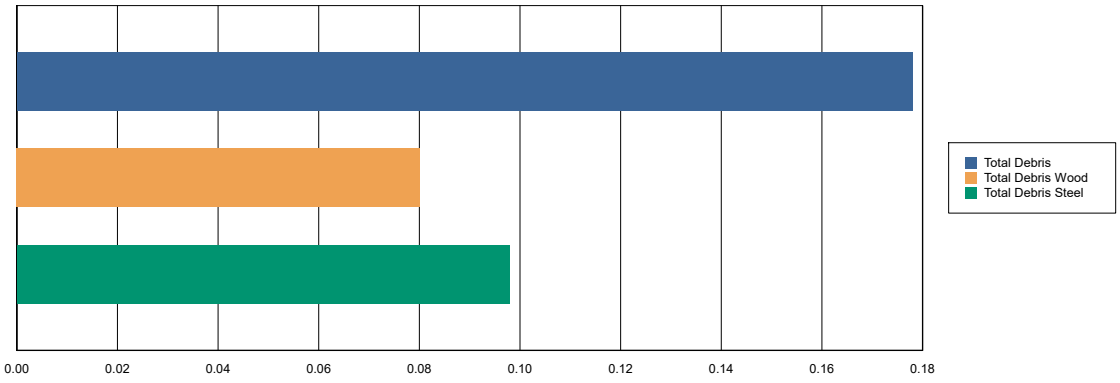
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 178,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 45.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 7,120 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



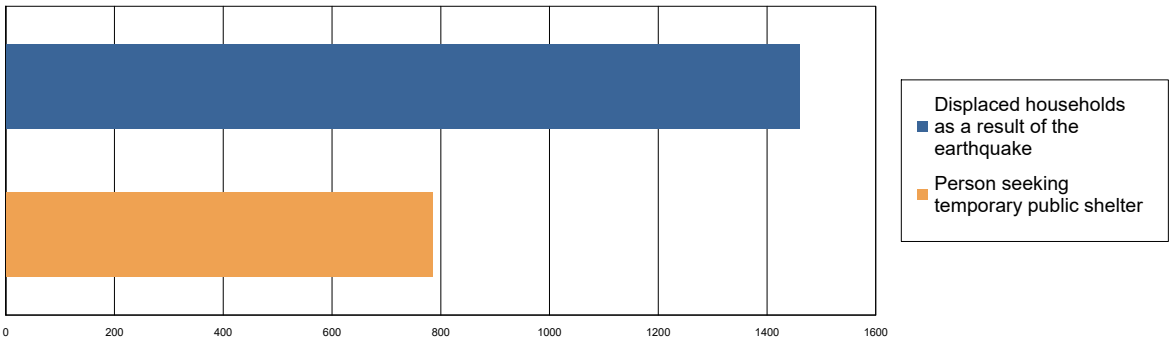
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.08	0.10	0.18	7,120 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 1,460 households to be displaced due to the earthquake. Of these, 785 people (out of a total population of 8,926) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
1,460	785

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	5.91	1.89	0.30	0.59
	Commuting	0.03	0.06	0.07	0.01
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	10.26	3.34	0.54	1.07
	Other-Residential	46.07	14.21	2.12	4.14
	Single Family	228.81	57.34	4.87	8.64
	Total	**291**	**77**	**8**	**14**
2 PM	Commercial	328.88	104.93	16.68	32.68
	Commuting	0.23	0.52	0.62	0.13
	Educational	56.34	18.44	3.08	6.02
	Hotels	0.00	0.00	0.00	0.00
	Industrial	76.20	24.75	4.06	7.92
	Other-Residential	7.69	2.39	0.37	0.68
	Single Family	37.28	9.40	0.93	1.42
	Total	**507**	**160**	**26**	**49**
5 PM	Commercial	243.40	77.71	12.50	24.00
	Commuting	4.75	10.71	12.78	2.74
	Educational	2.82	0.92	0.15	0.30
	Hotels	0.00	0.00	0.00	0.00
	Industrial	47.63	15.47	2.54	4.95
	Other-Residential	18.45	5.73	0.89	1.64
	Single Family	92.28	23.26	2.29	3.52
	Total	**409**	**134**	**31**	**37**

Economic Loss

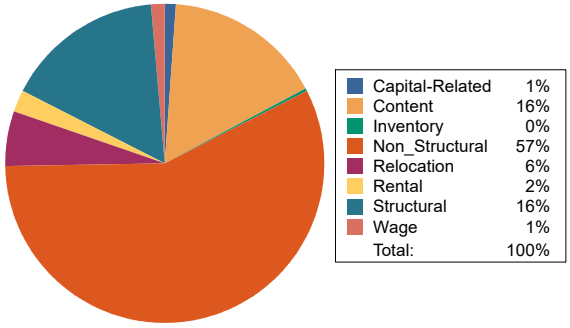
The total economic loss estimated for the earthquake is 1,136.15 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 1,099.82 (millions of dollars); 10 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 75 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

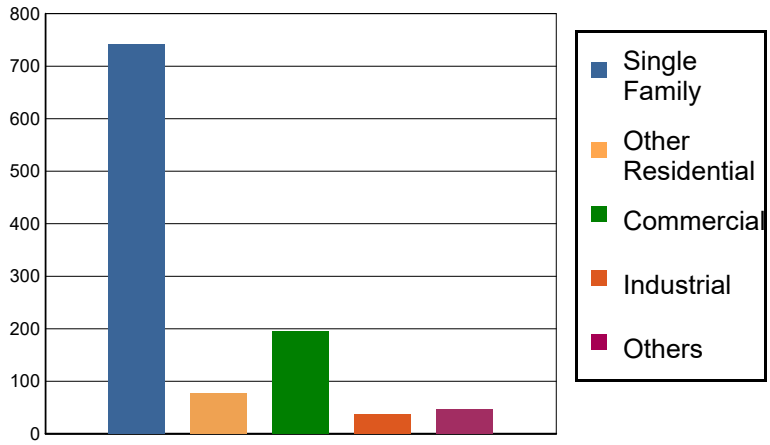


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.8362	13.2451	0.5447	1.1755	15.8015
	Capital-Related	0.0000	0.3561	11.7066	0.3090	0.2621	12.6338
	Rental	13.9719	4.2427	6.2817	0.1151	0.3784	24.9898
	Relocation	46.1475	2.4533	8.9101	0.6257	3.2794	61.4160
	Subtotal	**60.1194**	**7.8883**	**40.1435**	**1.5945**	**5.0954**	**114.8411**
Capital Stock Losses							
	Structural	128.5117	8.3766	26.6661	3.9857	7.8516	175.3917
	Non_Structural	451.4789	50.8950	85.1280	18.9642	22.8131	629.2792
	Content	102.1618	10.7641	41.6231	10.7160	11.5083	176.7733
	Inventory	0.0000	0.0000	1.4311	1.8343	0.2727	3.5381
	Subtotal	**682.1524**	**70.0357**	**154.8483**	**35.5002**	**42.4457**	**984.9823**
	Total	**742.27**	**77.92**	**194.99**	**37.09**	**47.54**	**1099.82**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	172.2706	0.0000	0.00
	Bridges	41.7714	23.3455	55.89
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**214.0420**	**23.3455**	
Railways	Segments	7.0260	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**7.0260**	**0.0000**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**221.07**	**23.35**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Line	6.6944	7.7541	115.83
	Subtotal	**6.6944**	**7.7541**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Line	4.0166	3.8951	96.98
	Subtotal	**4.0166**	**3.8951**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Line	2.6778	1.3344	49.83
	Subtotal	**2.6778**	**1.3344**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**13.39**	**12.98**	

Appendix A: County Listing for the Region

Middlesex,MA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Massachusetts					
	Middlesex	8,926	1,070	182	1,252
Total Region		**8,926**	**1,070**	**182**	**1,252**

Appendix C

CRB Workshop Materials

Town of Townsend
Planning Board
272 Main Street
272 Main Street, Townsend, Massachusetts 01469
978-597-1722
bfaxon@townsend.ma.us

April 7, 2020

Hello,

The Town of Townsend was recently awarded a grant from the Commonwealth's Municipal Vulnerability Preparedness Program to identify priority action items that will improve our community's resilience to climate change and to update our Hazard Mitigation Plan.

As a leader in our community, we hope you or a designee can join the Town at an important, invitation-only, virtual workshop on April 14th. The workshop will include three live webinars discussing climate risks and adaptation related to the following categories:

- 8:30-10:00AM: Townsend's Infrastructure
- 1:00-2:30PM: Townsend's Environment
- 4:00-5:30PM: Townsend's Society

The workshop will follow the Community Resilience Building guidance developed by the Nature Conservancy, which has been successfully used in over 200 communities. The workshop's objectives are to:

- Identify natural hazards that present the greatest threat to the community of Townsend
- Evaluate strengths and vulnerabilities of residents, infrastructure, and natural resources of Townsend
- Identify immediate opportunities to advance actions that reduce the impact of hazards and increase resilience in Townsend

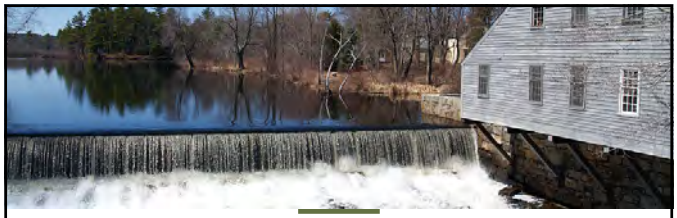
By participating in this effort, Townsend will be designated as an MVP Community and will be eligible for future grants that promote resilience. We will follow up on the workshop with a virtual public engagement strategy to receive broader input on the planning process.

Please RSVP for the workshop by Monday, April 13th by replying to this email (or, by replying to Adria Boynton at boyntona@wseinc.com) or responding to a forthcoming calendar invitation. If you RSVP via email, please specify the webinar that you plan to virtually attend.

We will follow up with more information regarding meeting materials and logistics for joining the webinar. I hope you or a designee can virtually join us at these important workshops. Thank you for your consideration and participation!

Sincerely,

Beth Faxon
Planning Board & Zoning Board of Appeals Administrator, Town of Townsend
Townsend Municipal Vulnerability Preparedness (MVP) planning grant municipal contact
bfaxon@townsend.ma.us
978-597-1722/direct cell: 978-697-1556



TOWN OF TOWNSEND

April 2020

Pre-CRB Workshop Video

Photo: Townsend Harbor Dam, Wikimedia Commons

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Welcome

Image: Pearl Hill State Park, Townsend, MA Wikimedia Commons.

Adria Boynton
Resiliency Specialist, Weston & Sampson
Certified MVP Provider

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LOGISTICS

- Overview in preparation for Townsend's **Community Resilience Building (CRB) Workshop**
- **Online survey** to collect feedback related to climate hazards and preparedness

OUTLINE

- Overview of MVP and HMP
- CRB Workshop
  - Hazards
  - Features
  - Actions
- Next Steps
  - Help us understand your priorities by taking the online survey!
  - Join us for the virtual CRB Workshop on April 14th!

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MVP & HMP OVERVIEW

Image: Townsend Common, Wikimedia Commons.

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MVP Principles

A community-led, accessible process that

- Employs local knowledge and buy-in
- Utilizes partnerships and leverages existing efforts
- Is based in best available climate projections and data
- Incorporates principles of nature-based solutions
- Demonstrates pilot potential and is proactive
- Reaches and responds to risks faced by EJ communities and vulnerable populations

Why nature-based?
Where appropriate, nature-based solutions can be more cost-effective, protect water quality and quantity, sustain lands that provide food and recreation opportunities, reduce erosion, and minimize temperature increases associated with developed areas and climate change.

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MVP Process/ Grant Types

COMMUNITY RESILIENCE BUILDING WORKSHOP(S)

- Define and characterize hazards using latest science and data
- Identify existing and future community vulnerabilities and strengths
- Develop and prioritize community adaptation actions
- Determine overall priority actions
- Receive MVP designation

MVP Planning Grant

MVP Action Grant

Implement priority adaptation actions identified through planning process

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MVP Action Grants: Project Types

- Vulnerability and Risk Assessment
- Community Outreach and Education
- Local Bylaws, Ordinances, Plans, and Other Management Measures
- Redesigns and Retrofits
- Nature-Based Flood Protection, Drought Mitigation, Water Quality, and Water Infiltration Techniques
- Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality
- Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts
- Ecological Restoration and Habitat Management to Increase Resiliency
- Energy Resilience
- Chemical Safety
- Land Acquisition for Resilience
- Subsidized Low-Income Housing Resilience Strategies
- Mosquito Control Districts

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CRB WORKSHOP

Image: Harbor Pond Dam, Wikimedia Commons

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TOWNSEND'S CLIMATE ADAPTATION & HAZARD MITIGATION GOALS

- Protection:
  - Cultural and historic resources
  - Critical infrastructure
  - Public utilities
  - Public facilities and services
  - Homes and businesses
  - Future development
  - Environmental features
  - Vulnerable residents
  - Open Space and Land Conservation
- Planning
- Public Outreach
- Capacity
- Funding
- Coordination

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COMMUNITY RESILIENCE BUILDING WORKSHOP

Focus on Four Hazards

Identify:
- Vulnerabilities
- Strengths
- Priority Action Items

Across Three Categories:
- Infrastructure
- Societal
- Environmental

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PROJECT TIMELINE

Planning Grant	Virtual CRB Workshop	Virtual Listening Session	Draft MVP-HMP Plan
Winter 2020	April 2020	Spring 2020	Spring 2020

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RISK MATRIX

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HAZARDS IN TOWNSEND

Flooding

Drought and brush fire

Snowstorms

Extreme Temperatures

Weston & Sampson

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SOCIETAL FEATURES

Population	Townsend	Massachusetts
2010:	8,926 residents	6,547,790
2017:	9,418 residents	6,902,149
Age		
Under 18 years:	25.3%	20%
65+ years:	12.7%	17%
Additional Information		
Median household income:	$84,630	$74,167
Persons in poverty:	4.0%	10.5%
With a disability:	12.0%	7.9%
Households with limited English proficiency:	3.8%	23.1%

Source: U.S. Census Bureau, 2020

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FEATURES IN TOWNSEND

Image: Main Street in West Townsend, Wikimedia Commons.

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ENVIRONMENTAL FEATURES

Source: Pearl Hill State Park, Townsend, MA Wikimedia Commons.

Features in Townsend

- Squanacook River/Harbor Pond
- Townsend Common
- Townsend-Ashby Squannacook Park
- Squannacook Brook State Forest
- Townsend State Forest
- Meetinghouse Park
- Pearl Hill State Park
- Willard Brook State Forest
- Squannacook River State Wildlife Management Area

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INFRASTRUCTURAL FEATURES

Police Department
Photo by the Townsend Police Department

Fire Department
Photo by the Townsend Fire Department

Highway Department
Photo by the Townsend Police Department

Private Sewers

Dams
Harbor Dam Photo: Wikimedia Commons

Roadways
Main Street, Photo: Wikimedia Commons

Bridges/Culverts
Photo provided by Nick Erickson

Town Water and Private Wells

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Take the **online survey** to tell us more about hazards and preparedness in Townsend

- Help us understand your priorities by taking our survey!
  tinyurl.com/TownsendMVPSurvey1
- The survey will be available online until **April 14th**
- Join us for the **virtual CRB Workshop on April 14th!**

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Pre-CRB Workshop Stakeholder Survey Results (7 Responses)

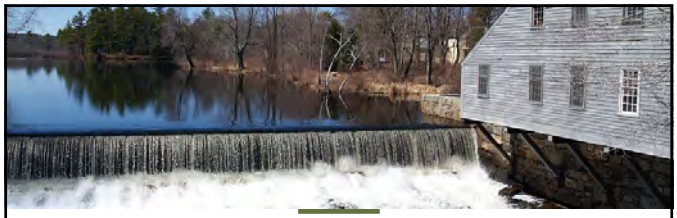
Extreme temperatures	Flooding	Snowstorms	Drought and brush fire	How have these hazards impacted you or your department? Memories of climate hazards could include impacts from: - Frequently flooded local roads - The heatwave during July 2018 or the 2016 drought...	How prepared do you feel Townsend is for future extreme events?	What does Townsend do well to to mitigate hazards or prepare for climate change? Examples could include, but are not limited to: - Town shelters, warming centers, and cooling centers - Regional co...	What are the opportunities to address potential natural or climatic hazards? Examples could include, but are not limited to: - Providing transportation to shelters for vulnerable populations, incl...
Hazard of least concern	Hazard of some concern	Hazard of most concern	Hazard of significant concern	Winter Storms/Flooding impacts our local ballfields - especially late season snow storms	Not prepared	Not sure - I know the senior center does alot with the elderly during emergencies.	Not sure
Hazard of most concern	Hazard of significant concern	Hazard of significant concern	Hazard of most concern	cancellation of public hearings/meetings & occassional temporary office closures.	Somewhat prepared	Towsend has adopted zoning bylaws for sustainable development, solar & wind installations, Wetlands protection, Stormwater managment. Townsend has building codes that ensure safe construction and has a robust inspection program.	Addressing communications accessibility & internet connectivity for all residents of Townsend. Identifying and assessing the ground and surface water supply in Townsend with intent to Protect drinking water. Identifying current impacts to groundwater and, ways to prevent groundwater contamination. Exploring alternate water supplies in the event of drought. Outfitting shelters with off the grid energy supply. Aquiring key land parcels to protect water supply.
Hazard of some concern	Hazard of some concern	Hazard of most concern	Hazard of most concern	Late winter heavy snow delays the start of soccer season and can hamper field condition. Heat waves pose a hazard to player safety, increase water use to maintain fields and can hurt or damage fields	I am not sure on the town as a whole.	We are part of a league incorporating many area towns, so the network we have to share with is a strength. I know Townsend has the TECO to support families in need which is a plus. I am not sure I am familiar enough with the other services in town.	Socialization of benefits available during hazards could improve. Addressing frequently flooded roads as well as any poorly worn roads would be a good investment. Road side tree clearing as well. Mobility could be key to safety during certain hazards.
Hazard of some concern	Hazard of significant concern	Hazard of least concern	Hazard of most concern	Shut down of operations	Not prepared	unknown	Virtual tools to inform pubic
Hazard of least concern	Hazard of significant concern	Hazard of significant concern	Hazard of significant concern	Snow storms and flooding has most impact. The lack of adequate staffing, traffic direction and control equipment, etc. are all factors.	Somewhat prepared	Not sure I'm qualified to answer this. On a hazard mitigation front, we cooperate with adjoining municipalities and regional associations for police service assistance (SWAT, active shooter, large scale events, etc.).	Providing information to the public is a critical shortcoming. The town does not have a civilian alert system such as CodeRed or Nixel. Signage for first responders (police in particular) is lacking as well.
Hazard of significant concern	Hazard of significant concern	Hazard of significant concern	Hazard of some concern	Lack of quick access to shelter space. When the Pine Ridge Fire happened in 2/2019 TEMA did not have access to designated shelter space. A quick plan was put together and use of a church coordinated. While the above did not impact my example, they or other weather events could. When the heatwave hit in 2019 and the cooling center was activated it was difficult to coordinate a town response as databases of volunteers were not available. Prior snow / ice storms had significant impact on the community. When the power is out and there is not any access to TV/Cable an AM Alert system would be an asset. Some in town were out for an extended period (two weeks). Cell phones could not be charged unless folks had a car charger or traveled to a location with power. A hand crank AM radio could be used to receive messages. in the future.	Somewhat prepared	The fire department is part of District 6 Mutual Aid and the police department is part of NEMLEC. Both alliances are good for single incidents, but might not provide as much support for a region wide disruption. Townsend needs to look closely are regionalized public safety services to more intensely share resource. The CEMP exists but is very much in need of updating. The basic services of having shelter space is accounted for but items such as security and vetting need to occur. TEMA has impediments to responding quickly (i.e. not maintaining a active list of keys/codes to access emergency management equipment (not police / fire). There is not a process in place for ensuring all equipment is up and running (i.e. light tower batteries dead when needed by the PD, no one available to move the trailer etc.) Non profit organizations / service based groups are coordinating their efforts.	The Sr. Center / Council on aging does a good job compiling data for their populations/groups. They do a good job with van service. For a larger scale event agreements need to be in place for ambulance transport and transportation for larger groups. Creation of more public/private partnerships for response. For example tree clearing after a storm, while our highway department works really hard, they are a small crew for such a large land area.
Hazard of some concern	Hazard of most concern	Hazard of some concern	Hazard of some concern	No impact on the zoning board. Big fire in apartment building, taking about 36 units offline for almost 2 years now. Not a climate related problem, as far as I know, but easy to imaging similar events related to climate.	Somewhat prepared	Nothing that I know of.	Stop issuing building permits in flood zones. Try to get FEMA to update the maps, as they are way out of date.

What resources does your department need to be more prepared?	How does your department share information with the public?	Are there any additional comments or questions you would like to share with the project team?
N/A - Not a town dept;	Not a town dept - we communicate directly via email/text to our families;	
Funding for climate adaptation projects;Staff and training;Additional guidance related to department operations before, during, and after a hazard event;Data or studies showing the projected impacts of future climate hazards in Townsend;	cable TV channel ;Online, including through the Town website and YouTube page;	
Additional guidance related to department operations before, during, and after a hazard event;	Facebook, and internal mailing lists;	No
Supplies or equipment;	Through printed media; including reports, fact sheets, or brochures;Online, including through the Town website and YouTube page;	
Staff and training;Supplies or equipment;Additional guidance related to department operations before, during, and after a hazard event;	Online, including through the Town website and YouTube page;Strategic outreach to vulnerable populations, such as elderly residents or other groups;	I am taking the opportunity to learn more about the vulnerabilities in town and to use the information gathered to apply to emergency planning which hasn't been a focus for quite some time (last plan 2009?).
Funding for climate adaptation projects;Supplies or equipment;	Through public events, including virtual webinars;Through printed media; including reports, fact sheets, or brochures;Online, including through the Town website and YouTube page;Strategic outreach to vulnerable populations, such as elderly residents or other groups;	It would be great to have this survey more details - for example allow a matrix of responses for preparedness. Allow comments for all questions.
Additional guidance related to department operations before, during, and after a hazard event;Data or studies showing the projected impacts of future climate hazards in Townsend;	Online, including through the Town website and YouTube page;	

Town of Townsend
Municipal Vulnerability Preparedness (MVP) Planning Grant

CRB Workshop Webinars
Tuesday, April 14, 2020

Welcome and Introductions	5 minutes
MVP Program Overview from Hillary King	10 minutes
Overview of Hazards and Climate Change Data	15 minutes
Risk Matrix	15 minutes
Action Items	40 minutes
Wrap Up and Next Steps	5 minutes



TOWN OF TOWNSEND

Community Resilience Building (CRB) Workshop Webinar

Tuesday, April 14, 2020

Photo: Townsend Harbor Dam, Wikimedia Commons

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LOGISTICS

- This webinar is being recorded
- Materials shared for comment:
  - Risk Matrix
  - Hazard Map
    - Comment on our whiteboard!
- Materials shared for reference:
  - Critical facilities list
  - PDF of presentation
  - Agenda

4

WELCOME FROM W&S

ADRIA BOYNTON

STEVE ROY

AMANDA KOHN

JOHN FREY

Photo: Townsend Harbor. Photo by Town of Townsend.

2

2

WEBINAR OUTLINE

PRESENTATION:

- Overview of the MVP and HMP Programs
- Historic and Future Climate Change Impacts in Massachusetts and Townsend

DISCUSSION:

- Pre-Selected Hazards
- Pre-Selected Features
- Identify and Prioritize Action Items

Photo: Townsend Common, Wikimedia Commons

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WELCOME PARTICIPANTS

Photo: Townsend Harbor. Photo by Town of Townsend.

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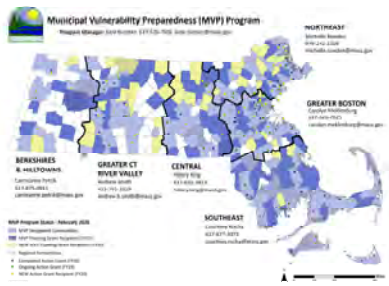
MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM (MVP)

Community Resilience Building Process:
82% participation
287 communities

Action Grant Projects:
FY 18: **37**
FY 19: **36**
FY20: **54**

Total Awards:
$33M+ to date



MVP Website: www.mass.gov/mvp
Central Regional Coordinator: Hillary.King@mass.gov

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MVP Core Principles

- Furthering a community identified priority action to address climate change impacts.
- Utilizing best available climate change data* for a proactive solution. Data from local-level climate change vulnerability studies may also be used.
- Employing nature-based solutions (NBS).
- Involving Environmental Justice Populations in meaningful decision-making, as defined and outlined in the 2017 EEA EJ Policy, and giving special consideration to Climate Vulnerable Populations.
- Achieving broad and multiple community benefits.
- Utilizing regional solutions toward regional benefit.
- Committing to monitoring project success and maintaining the project into the future.
- Pursuing approaches from which other MVP communities and the state can learn.

*MA Climate Change Clearinghouse: http://www.resilientma.org/

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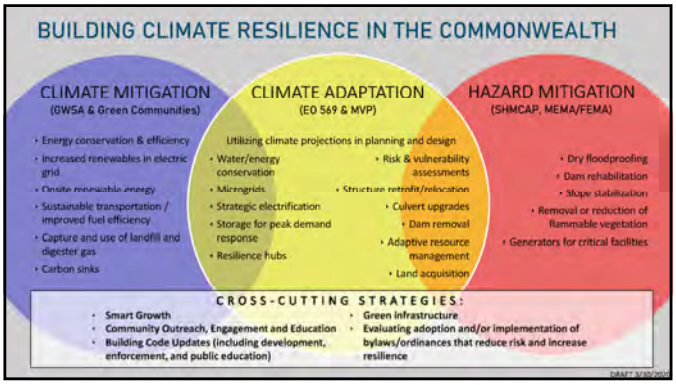

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MVP Grant Types

COMMUNITY RESILIENCE BUILDING WORKSHOP(S)

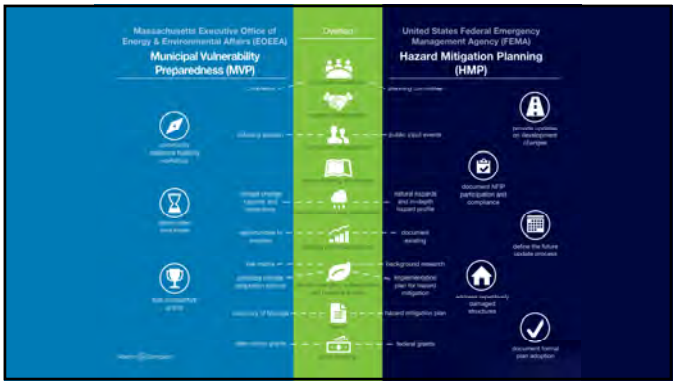
- Define and characterize hazards using latest science and data
- Identify existing and future community vulnerabilities and strengths
- Develop and prioritize community adaption actions
- Determine overall priority actions
- Receive MVP designation

MVP Planning Grant ✓

MVP Action Grant

Implemented priority adaptation actions identified through planning process

8



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Example MVP Project Types

- Vulnerability and Risk Assessments, Adaptation Plans
- Updates to Local Bylaws/Ordinances, Plans, and Other Management Measures
- Nature-based Solutions (NBS) for Ecological and Public Health
- Redesigns and Retrofits for Critical Facilities and Infrastructure

MVP Action Grant Website: https://www.mass.gov/service-details/mvp-action-grant

- MVP Webinar Recording- FY21 Funding Round
- MVP Webinar Slides- FY21 Funding Round
- Learn More About Completed Action Grant Projects

Why nature-based?

Incorporating NBS in local planning and design projects produces long-term solutions that benefit both human and natural systems.

NBS include efforts that restore, protect, and/or manage natural systems and/or mimic natural processes to address hazards like flooding, erosion, drought, and heat islands in ways that are cost-effective, low maintenance, and multi-beneficial for public health, safety, and well-being.

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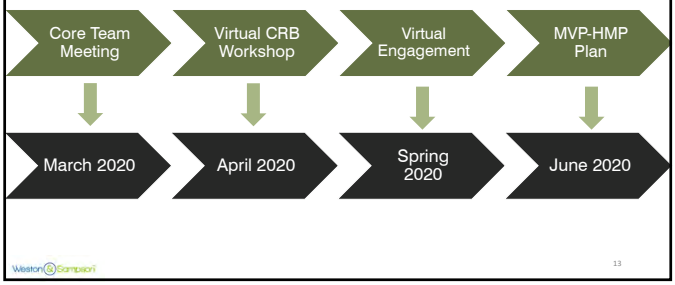
PROJECT TIMELINE



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EXTREME TEMPERATURES

WARMER ANNUAL AIR TEMPERATURES
UP 0.5°F PER DECADE SINCE 1970, ON AVERAGE

WARMER WINTERS
UP 1.3°F PER DECADE SINCE 1970, ON AVERAGE

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CLIMATE DATA

- Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan (2018)
- Massachusetts Climate Change Projections (NECSC, 2018 on resilientma.org)
- Massachusetts Climate Change Adaptation Report (MA EEA, 2011)

APPLICABLE PLANS

- Montachusett Region Natural Hazard Mitigation Plan, 2015 Update
- Townsend Open Space & Recreation Plan, 2013-2020
- Master Plan (2019/in progress)

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EXTREME TEMPERATURES

6	24	35
2005 OBSERVED	MID-CENTURY PROJECTED	END-OF-CENTURY PROJECTED

DAYS WITH TEMPERATURES ABOVE 90°F

145	114	101
2005 OBSERVED	MID-CENTURY PROJECTED	END-OF-CENTURY PROJECTED

DAYS WITH TEMPERATURES BELOW 32°F

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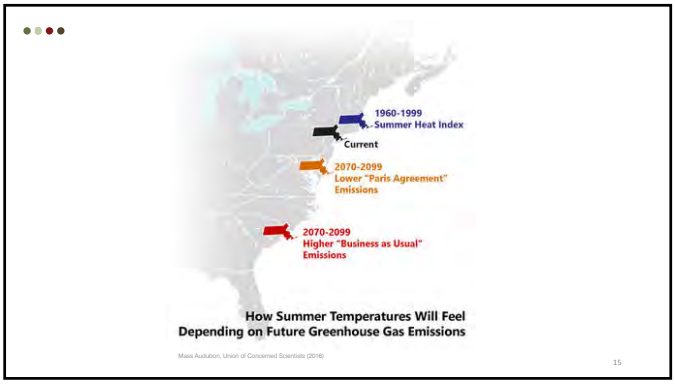

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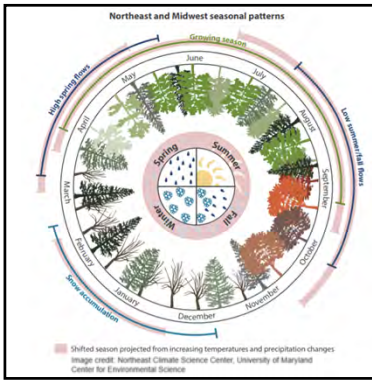

What was the impact of the 2016 drought and low flows?

Droughts lasting 1 to 3 months could go up by as much as 75% over existing conditions by the end of the century, under the high emissions scenario

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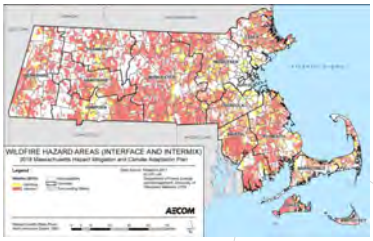
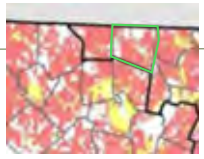
18

WILDFIRE





13
wildfires were reported in the Town of Townsend over a 6-year period.

19

Source: Montachusett Regional Planning Commission (MRPC). Montachusett Region Hazard Mitigation Plan. 2015. 44.

19

EXTREME PRECIPITATION

8%
Increase in extreme precipitation events by midcentury

13%
Increase in extreme precipitation events by 2100

Extreme precipitation events are defined as events with greater than 2" of rain per day

22

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IMPACTS OF RISING TEMPERATURES

WARMER ANNUAL AIR TEMPERATURES: UP 0.5°F PER DECADE SINCE 1970, ON AVERAGE

WARMER WINTERS: UP 1.3°F PER DECADE SINCE 1970, ON AVERAGE

- INCREASE IN VECTOR-BORNE DISEASES
- INCREASED SUMMER DEMAND ON AGING ENERGY SYSTEMS
- INCREASED HEAT-RELATED ILLNESSES & MORTALITY
- INCREASED HEAT-RELATED STRESS ON LIVESTOCK & CROPS
- INCREASED ALLERGENS & ASTHMA RATES
- INCREASED DROUGHT & WILDFIRES
- INCREASED STRESS ON CRITICAL INFRASTRUCTURE
- INCREASE IN HARMFUL ALGAL BLOOMS
- MIGRATING PLANT & ANIMAL SPECIES

20

20

Flood Prone Areas.

Route 13

North End Road, west of Ball Road

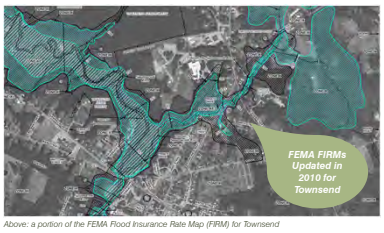
Pearl Hill Brook, south of Old City Road

Intersection of South Row, South Harbor, and Old Meeting House Road

Highland Street by Adams Road

24 Meadow Road

17 Meadow Road



Above: a portion of the FEMA Flood Insurance Rate Map (FIRM) for Townsend

REPETITIVE FLOOD LOSS STRUCTURES

- Defined as an NFIP-insured structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978.[1]
- Townsend has **3** repetitive loss structures.[2]

1. Federal Emergency Management Agency (FEMA). 2019. "Definitions." Accessed August 29, 2019. Fema.gov/national-flood-insurance-program/definitions#R
2. MA Department of Conservation and Recreation (DCR). 2020. "Community Repetitive Loss: Town of Townsend"
3. Montachusett Region Hazard Mitigation Plan. 2015.

23

23

CHANGES IN PRECIPITATION

MORE **INTENSE & FREQUENT** EXTREME RAIN EVENTS

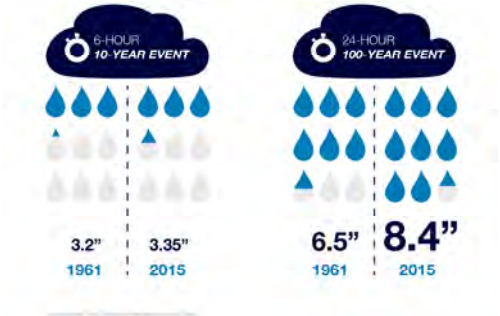
PRECIPITATION DURING HEAVY EVENTS IN THE NORTHEAST INCREASED BY MORE THAN **70%** BETWEEN 1958-2010

HEAVY EVENTS ARE DEFINED AS THE HEAVIEST 1% OF ALL DAILY EVENTS

21

21

CHANGES IN PRECIPITATION



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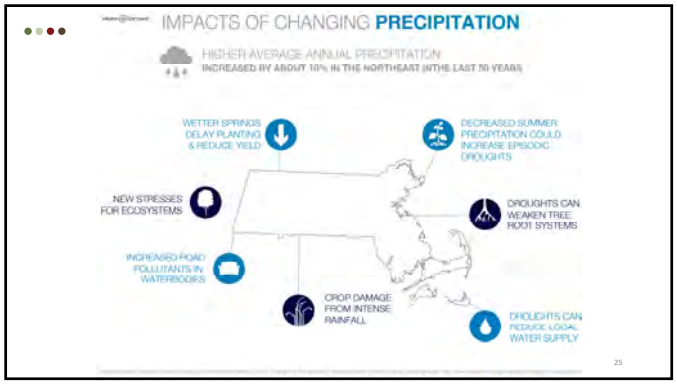

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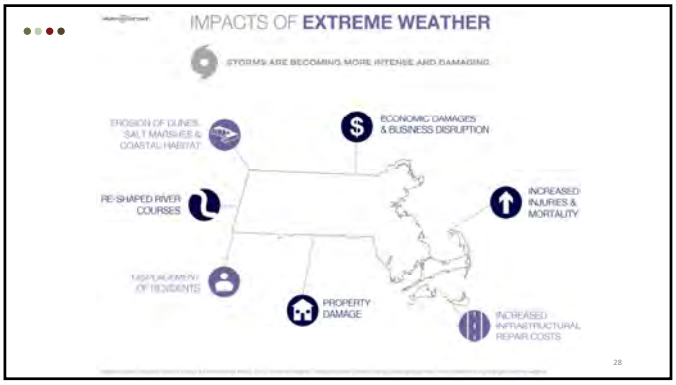

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SEVERE STORMS: BLIZZARDS

"Heavy blizzards are among the **most costly and disruptive** weather events for Massachusetts communities."

The blizzard of 2013 left nearly **400,000 Massachusetts residents without power**

Northeast digs out from monster storm: Over 2 feet of snow buries towns in New York, Massachusetts, Vermont

By Dan Peck, Max Golenbo and Emily Shapiro

Townsend, Massachusetts is buried under 25.2 inches of snow.

26

26

HAZARDS IN TOWNSEND

- Flooding
- Drought and brush fire
- Severe Weather (snowstorms, thunderstorms, tornadoes)
- Extreme Temperatures

Weston & Sampson

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HURRICANES & NOR'EASTERS

Upward trend in North Atlantic hurricane activity since 1970

2012: Hurricane Sandy
2017: Hurricane Jose
2018: Hurricane Florence
2019: Hurricane Dorian

Nor'easters along the Atlantic coast are increasing in frequency and intensity

Jan 3-4, 2018: Winter Storm Grayson
March 2, 2018: Winter Storm Riley
March 8, 2018: Winter Storm Quinn
March 13, 2018: Winter Storm Skylar

Source: Climate Science Special Report, Fourth National Climate Assessment (NCA4), Volume prepared by the U.S. Global Change Research Program (USGCRP)/Northern Middlesex

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FEATURES IN TOWNSEND

Townsend State Forest and private sector solar array. Photos by the Town of Townsend.

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INFRASTRUCTURAL FEATURES

Police Department

Photo by the Townsend Police Department

Fire Department

Photo by the Townsend Fire Department

Highway Department

Photo by the Townsend Police Department

Private Sewers

Dams

Harbor Dam Photo: Wikimedia Commons

Roadways

Main Street. Photo: Wikimedia Commons

Bridges/Culverts

Photo provided by Nick Erickson

Town Water and Private Wells

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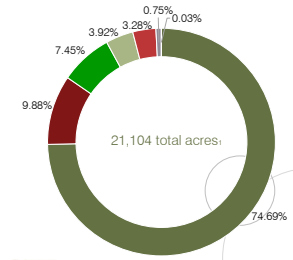
Townsend's Land Use



1. Montachusett Regional Planning Commission (MRPC). Montachusett Region Hazard Mitigation Plan. 2015. 11.

34

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HAZARD POTENTIAL OF DAMS

Dam	Hazard Potential	Ownership
Townsend Harbor Dam	Significant Hazard	Hollingsworth & Vose Company
Mason Road Dam	Low Hazard	John M. and Barbara Delaney
Bixby Reservoir Dam	Low Hazard	David R. Dyer
Adams Dam	N/A	Town of Townsend
Graves Pond Dam	N/A	Unknown
Pearl Hill Brook Dam	Low Hazard	DCR - Dept. of Conservation & Recreation
VFW Dam	N/A	DFG - Dept. of Fish and Game

Source: Office of Dam Safety, 2019

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SOCIETAL FEATURES

Population	Townsend	Massachusetts
2010:	8,926 residents	6,547,790
2017:	9,418 residents	6,902,149
Age		
Under 18 years:	25.3%	20%
65+ years:	12.7%	17%
Additional Information		
Median household income:	$84,630	$74,167
Persons in poverty:	4.0%	10.5%
With a disability:	12.0%	7.9%
Language other than English spoken at home:	3.8%	23.1%

Source: U.S. Census Bureau, 2020

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ENVIRONMENTAL FEATURES

Source: Pearl Hill State Park, Townsend, MA Wikimedia Commons.

Features in Townsend

- Squanacook River/Harbor Pond
- Townsend Common
- Townsend-Ashby Squannacook Park
- Squannacook Brook State Forest
- Townsend State Forest
- Meetinghouse Park
- Pearl Hill State Park
- Willard Brook State Forest
- Squannacook River State Wildlife Management Area

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RISK MATRIX

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ADAPTATION STRATEGIES

Townsend Pond, Dudley Road. Photo by the Town of Townsend.

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RAISED BUILDINGS

40

COMMUNITY ACTIONS

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RETROFITTED FLOODPROOF DOORWAYS

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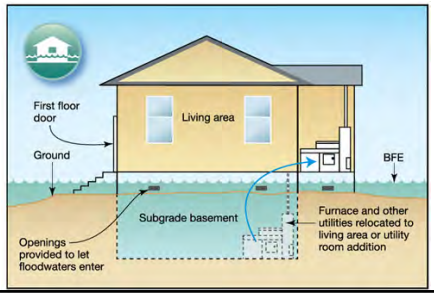
WET FLOODPROOFING



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DEPLOYABLE FLOOD BARRIER

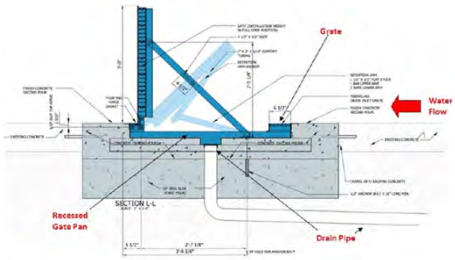

FIGURE 1 | A FloodBreak barrier gate diagram

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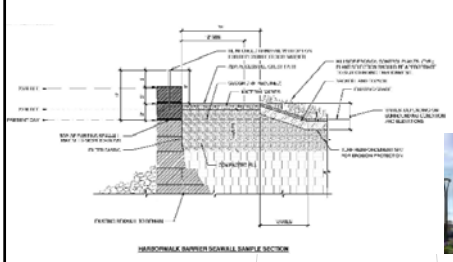
FLOOD WALLS



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LOW IMPACT DEVELOPMENT (LID)

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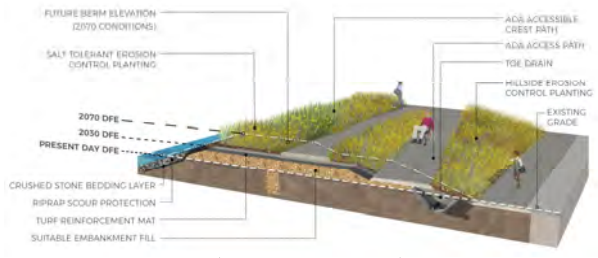
VEGETATED BERM



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Bioretention and Raingardens

Rain Garden in a median strip of a townhouse project. Please note the depressed curb and grate inlet structure

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MULTI-PURPOSE FLOOD STORAGE

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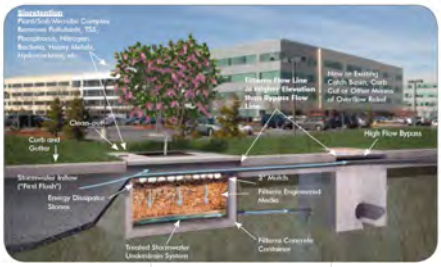
STREET TREES & TREE BOX FILTERS



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STORMWATER DETENTION & RETENTION

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POROUS ASPHALT & PERMEABLE PAVERS

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CULVERT WIDENING TO IMPROVE HABITAT & FLOW

51

51

CLOUDBURST STREETS

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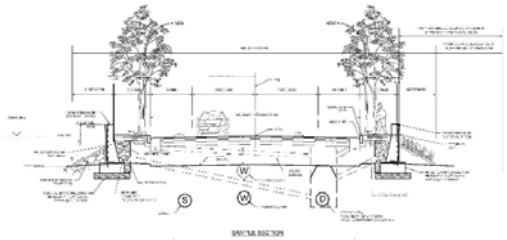
RAISED ROADWAYS



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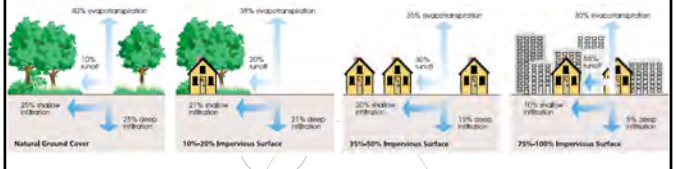
REDUCE IMPERVIOUS AREAS



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GREEN ROOFS

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RENEWABLE ENERGY/MICRO-GRIDS

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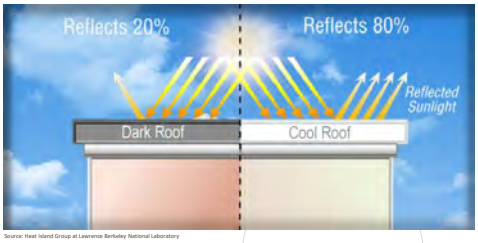
COOL ROOFS



Source: Heat Island Group at Lawrence Berkeley National Laboratory

Source: U.S. Department of Energy Guidelines for Selecting Cool Roofs

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RE-EVALUATE LOCAL REGULATIONS & POLICIES

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COOLING CENTERS

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THANK YOU

Weston & Sampson

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Townsend Webinar: Environment

Attendees – Partial List 18 Total*

Names	Department
Beth Faxon	Planning and Zoning Board, Administrator
James Sartell	Chief of Police
Keith Turgeon	Townsend-Ashby Youth Baseball and Softball Assoc.
Lance McNally	Planning Board, Chair
Susan McNally	Library Trustees
Veronica Kell	Planning Board, Clerk
William Cadogan	Zoning Board of Appeals
Kimberly Roth	MA DEP, Central Regional Office
Hillary King	Regional MVP Coordinator (Central)
Laura Shifrin	Chair, Housing Authority, Planning Board
Leigh Reddin	Highway Department & Conservation Department
Linda Durette	Townsend Cultural Council
Al Futterman	Nashua River Watershed Association, Land Programs and Outreach Director
Ray Jackson	Society for the Protection of NH Forests, Land Steward
+1 (617) 655-3913	*
+1 (978) 597-8813	*
+1 (978) 808-1733	*
Adria Boynton	Weston and Sampson
John Frey	Weston and Sampson

*Potentially duplicates of people calling in for audio

Webinar Notes

Anecdotes:
Squannacook
Forests will always be a strength; Street trees are both a strength and vulnerability. Should be considered seperately.
Parks, Future Development (i.e. undeveloped areas) wetlands are strengths in terms of water storage.
Bylaws of Zoning are in great condition, but also overlay aquifers (often).
Take the time to reeducate communities

Adaptation Strategies mentioned during Discussion :

1. We need to look at ways to capture and collect water, limiting cutting of trees that soak up water.
2. Limit development in the aquifer zone overlays.
3. Forests - Planting species that are suited for warmer, drier conditions
4. Does zoning look into future potential scenarios of density population, climate, hazards?

Forests and Canopy

Forest Health or a Forest Management Plan
Outreach for limited Wetland Forest removal from backyards

Street Trees
Limiting A\C in school
Public Awareness for Street Trees

Parks and Open Space
Park maintenance, i.e. limited mowing, removing grass clippings, and chemicals application, can improve water quality
Maintenance for Craven Field and the Spaulding Ballfields are handled by youth league and not the rec/parks dept

Waterbodies and Wetlands
Land Acquisition near floodplains
Bank restoration and stabilization
Aquifer protection (Overlay district) to limit types of activities

Future Development
Considerate of any building within updated FEMA floodplains

Webinar Chat

[4/14/2020 12:53 PM]
Thanks for joining us for today's webinar!

[4/14/2020 12:54 PM]
Comment on our hazard map by checking out our virtual whiteboard:
https://www.webwhiteboard.com/board/88yeqejb

[4/14/2020 1:03 PM] James Sartell:
I can see the first slide

[4/14/2020 1:07 PM] James Sartell:
James Sartell (Police Department)

[4/14/2020 1:10 PM] Hillary King:
is this meeting video capable if we'd like to 'show ourselves' while speaking to people?

[4/14/2020 1:16 PM] James Sartell:
Would the lack of an updated emergency plan for the town be considered for grant funding?

[4/14/2020 1:22 PM] James Sartell:
So in essence, a creative grant writer.

[4/14/2020 1:22 PM] Veronica Kell:
Same question with respect to sections of the Master Plan

[4/14/2020 1:23 PM] James Sartell:

An overall emergency plan seems completely relevant to those objectives.

[4/14/2020 1:37 PM] Keith Turgeon:
I think that might be the soccer fields, and not Craven field (baseball)

[4/14/2020 1:39 PM] Keith Turgeon:
from that map, Townsend-Ashby Squannacook is the soccer complex

[4/14/2020 1:41 PM] James Sartell:
Wondering if Jim Smith should be consulted.

[4/14/2020 1:41 PM] James Sartell:
He certainly would be aware of these types of issues.

[4/14/2020 1:46 PM] James Sartell:
He is the director of Highway Department

[4/14/2020 1:46 PM] Beth Faxon:
he is on the core team and did attend the team meeting

[4/14/2020 1:47 PM]
Thanks for the reminder Beth and Jay - we will be following up with Jim

[4/14/2020 1:48 PM] Beth Faxon:
thanks!

[4/14/2020 1:58 PM] James Sartell:
I've got another phone conference scheduled for 2.

[4/14/2020 2:06 PM]
Ok - thanks for joining us Jay!

[4/14/2020 2:11 PM] Hillary King:
are you still using the white board?

[4/14/2020 2:12 PM]
Yes! Please feel free to comment on the white board!

[4/14/2020 2:12 PM] Hillary King:
can you please provide the link again?

[4/14/2020 2:12 PM]
Absolutely: https://www.webwhiteboard.com/board/88yeqejb

[4/14/2020 2:14 PM] Laura Shifrin:
Maintain them. By trimming more often

[4/14/2020 2:17 PM] Laura Shifrin:
We probably have more trees then most communities. Over 1/3 of our entire town is State Forest….

[4/14/2020 2:17 PM] Hillary King:
Yes, and NYC has partnered with the USFS and others in an "urban forestry" program, looking at climate change and considering appropriate replacement species as existing trees die out.

[4/14/2020 2:17 PM] Hillary King:
I'm looking for a link...

[4/14/2020 2:18 PM] Laura Shifrin:
Most cities need this help

[4/14/2020 2:23 PM] Frey, John:
Park maintenance, i.e. limited mowing, removing grass clippings, and chemicals application, can improve water quality

[4/14/2020 2:24 PM]
Great, thanks John!

[4/14/2020 2:25 PM] Keith Turgeon:
Maintenance for Craven Field and the Spaulding Ballfields are handled by youth league and not the rec/parks dept

[4/14/2020 2:26 PM] Hillary King:
yes, "green infrastructure" can be a form of maintenance to reduce mowing and improve biodiversity.

[4/14/2020 2:29 PM] Hillary King:
here is a link to the NYC Street Tree map that was developed. https://tree-map.nycgovparks.org/tree-map/learn/about there are headings to see the map, understand the ecological benefits, learn about how the community can participate in stewardship, and see the partnerships that have developed to care for this important living system

[4/14/2020 2:29 PM] Hillary King:
I heard about it on this podcast - it was really interesting! https://www.americaadapts.org/episodes/2019/8/5/resilient-new-york-urban-forestry-shared-stewardship-and-climate-adaptation

[4/14/2020 2:35 PM] Laura Shifrin:
There is currently no development in town. How do you encourage that? There is an economic impact to all of this

[4/14/2020 2:37 PM] Laura Shifrin:
Yes. There is none

[4/14/2020 2:38 PM] Beth Faxon:
https://www.mass.gov/files/documents/2017/11/03/2015-29-sustainable-development-principles-attachment-a.pdf?_ga=2.147608247.1014568919.1586889479-161946517.1586287371

[4/14/2020 2:39 PM] Laura Shifrin:
That might be helpful if we encouraged them

[4/14/2020 2:39 PM] Beth Faxon:

State sustainable development principles

[4/14/2020 2:39 PM] Hillary King:
Something that has come up in several instances is the thought that people on the coast need to considering 'retreat' and could be displaced in a large storm.

[4/14/2020 2:40 PM] Hillary King:
where will these people go? considering long-term masterplanning in light of this may be worth thinking about

[4/14/2020 2:40 PM] Laura Shifrin:
The economics of this town are difficult ….you need more commercial and business to cover the taxes needed to keep some balancwe

[4/14/2020 2:41 PM] Hillary King:
The wild & scenic stewardship plan is here: https://www.wildandscenicnashuarivers.org/uploads/8/9/9/1/89911665/nsn_stewardship_plan_appendices_07-10-18_web.pdf Townsend is reviewed on p30 of the PDF.

[4/14/2020 2:41 PM] Laura Shifrin:
There is a huge housing shortage …there is no where for the coastal community to go

[4/14/2020 2:41 PM] James Sartell:
guinea fowl eat ticks

[4/14/2020 2:41 PM] Laura Shifrin:
Good point Jim

[4/14/2020 2:42 PM] William Cadogan:
Thanks Jim!

[4/14/2020 2:42 PM] Laura Shifrin:
Beth….good idea….we have plenty of land they could use

[4/14/2020 2:43 PM] Laura Shifrin:
It's good exercise :)

[4/14/2020 2:44 PM] Laura Shifrin:
Love that one!

[4/14/2020 2:44 PM] Hillary King:
The NYC parks and rec webpage has a great section on stewardship too.

[4/14/2020 2:44 PM] Hillary King:
https://www.nycgovparks.org/reg/stewardship

[4/14/2020 2:49 PM] Laura Shifrin:
Thank you. See you later

[4/14/2020 2:49 PM] Beth Faxon:
Thank you!!

[4/14/2020 2:49 PM] Veronica Kell:
Thank you!

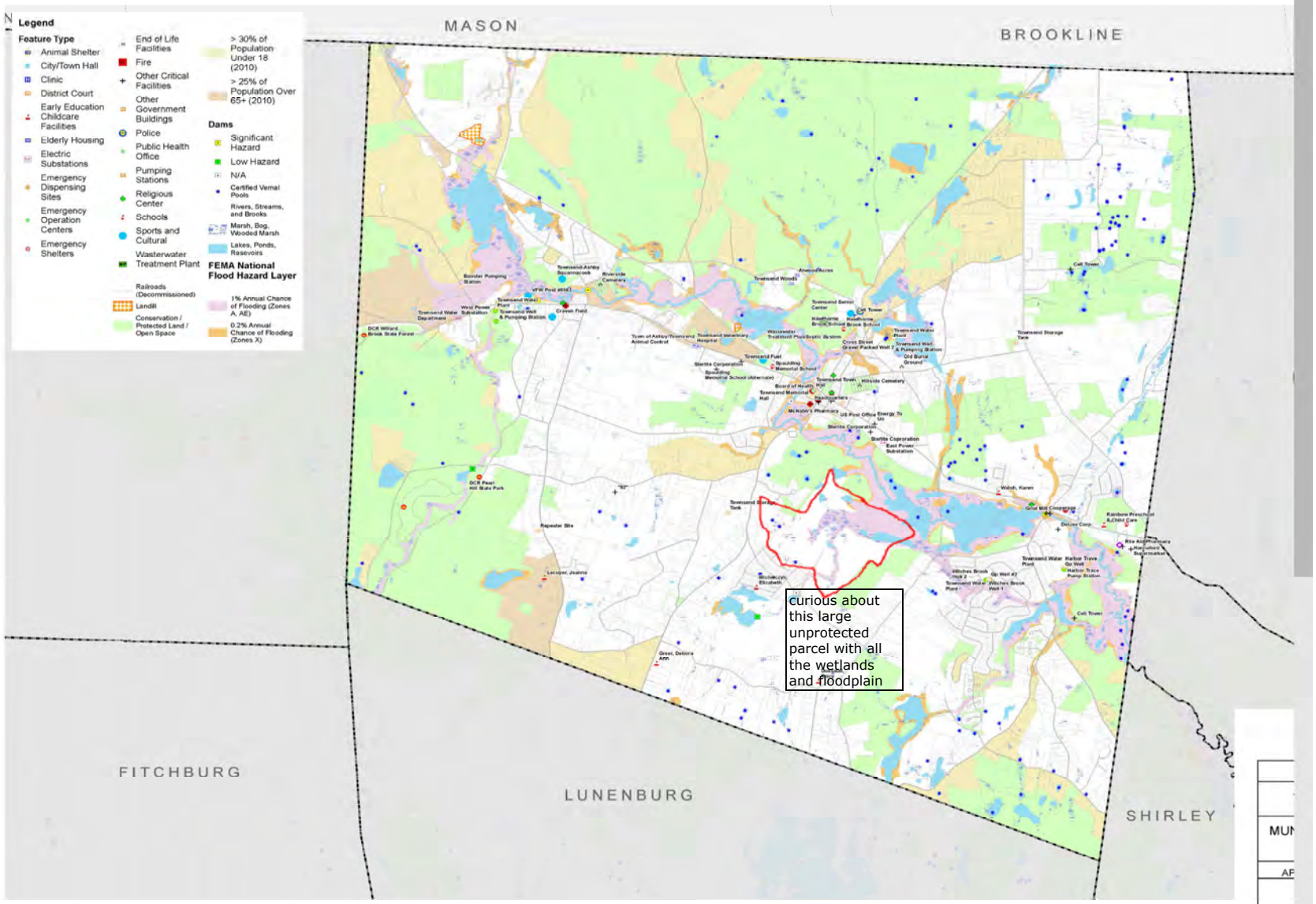
[4/14/2020 2:49 PM] James Sartell:
thank you Adria

[4/14/2020 2:49 PM]
Thank you everyone for participating!

[4/14/2020 2:50 PM]
Please don't hesitate to reach out with any questions!

Environment Webinar - Annotated Hazard Map Shared through a Virtual Whiteboard

New board | Clear board | Visibility | Download | Log in | FAQ



Townsend Webinar: Infrastructure

Attendees: 18

1. Hillary King
2. Lance McNally
3. Susan McNally
4. Beth Faxon
5. Keith Turgeon
6. Steve Roy
7. Kimberly Roth
8. Veronica Kell
9. Rebecca McEnroe
10. Robert Templeton
11. Kym Craven
12. Matt Crean
13. Rick Bailey
14. Leigh Reddin
15. James Sartell
16. Laura Shifrin
17. William Cadogan
18. Adria Boynton

Webinar Notes

Participants agreed with the top 4 hazards previously identified

Veronica suggested adding Public Water Supply to the Critical Infrastructure priorities. Water Department has 5 wells but only two have generators

Bill referenced past issues with Unitil Electric and problems with line maintenance and tree management that lead to power outages

Bill commented that the town does not have a good mapping for culverts and stormwater drainage. Culverts may be found on the BETA map. There is a need to conduct an assessment of culverts, identify areas for stormwater management including green infrastructure and possibly assess existing GI in Town such as Coppersmith Way stormwater and septic systems with advanced nitrogen removal.

Rebecca noted that radio communications between wells and storage tanks needs improvement

West Townsend roads are often flooded

Beth mentioned that there is a need for IT/technology upgrades for municipal staff

Veronica noted that an assessment of Dams in Townsend is necessary. James supported this comment.

Robert mentioned that there are many remote areas in Townsend that lack access to reliable internet.

Veronica stated that she liked the concepts of cloudburst streets and that it could align with the Towns interest of improving mobility and walkability.

Dams require an assessment of existing conditions and could be related to repairs or dam removals and new land acquisition.

Electric and communications – Need better SCADA to increase reliability for water supply, there was a question on how police and fire are currently communicating during emergencies and extreme events. CTOW, cell towers on wheels.

There is potential to add more PV and energy reliability/resilience in the Town

Wells and septic – The Town should investigate BOH regulation to promote septic system pumping and reporting and more private well testing.

Need to assess the location of public wells and threats from flooding.

Drought – investigate additional water supply inter-municipal connection with other communities such as Fitchburg.

Beth suggested conducting an aquifer study and assess the impacts of drought on surface water and groundwater in Town

Veronica suggested exploring more land acquisition associated with future public water supply

Skype Chat

[4/14/2020 8:37 AM] Kohn, Amanda:
Good morning, I've created a whiteboard with the critical facilities list at
https://www.webwhiteboard.com/board/88yeqejb

[4/14/2020 8:40 AM] Kimberly Roth:
Something happened with the connectivity of the screen sharing. Can others see the slides?
Ok, I'll try to refresh
Thanks!

[4/14/2020 8:41 AM] Rick Bailey:
you need to minimize the whiteboard if it is open.

[4/14/2020 9:12 AM] Beth Faxon:
Assessors dept. can help with number of homes. Apt. buildings are on public water. - L. Shifrin via text.

[4/14/2020 9:15 AM] Beth Faxon:
There were short (less than an hour) power outages in Townsend yesterday. - L. Shifrin

[4/14/2020 9:16 AM] Rebecca McEnroe:
the water department has a radio system to allow wells to communicate with the storage tanks. We would like to improve the commiuication system.

[4/14/2020 9:17 AM] Hillary King:

I have to jump off now, as I have a couple of calls to make between now and 1pm. Will be back for the 'Environmental' session then. Great work everyone! I really appreciate everyone's time today.

[4/14/2020 9:17 AM] leigh:
Hi all - I think culverts are on the BETA stormwater map

[4/14/2020 9:19 AM] leigh:
Hi again, its a mix. Some of the bridges/culverts are in bad shape

[4/14/2020 9:20 AM] Beth Faxon:
would like to improve the technology/IT network for town hall municipal staff allow for telework - L. Shifrin

[4/14/2020 9:22 AM] James Sartell:
Dam breaks are always an issue.

[4/14/2020 9:28 AM]
Let me know if you can hear the video audio

[4/14/2020 9:28 AM] Steve:
no

[4/14/2020 9:45 AM] Beth Faxon:
rasing roads in low lying areas. impervious surfaces.

[4/14/2020 9:46 AM] Beth Faxon:
yes, I meant using pervious pavement

[4/14/2020 9:47 AM] Rebecca McEnroe:
if roads are raised need to coordinate with ulilties below grade

[4/14/2020 9:52 AM] Veronica Kell:
Perhaps we should include the ability for the Town to acquire land in flood plains if dams are removed

[4/14/2020 9:52 AM] Beth Faxon:
assess what residents homes are not serviced by internet.

[4/14/2020 9:55 AM] Beth Faxon:
assess any risk to cell tower - any potential interference of emergency communications

[4/14/2020 9:58 AM] Beth Faxon:
assess current zoning and BOH regulations for best practice and sustainable development.

[4/14/2020 10:00 AM] leigh:
Consider cost to track that reporting....

[4/14/2020 10:03 AM] Beth Faxon:
aquifer studies, impact of drought on ground and surface water supply

[4/14/2020 10:03 AM] Laura Shifrin:
Great idea Beth

[4/14/2020 10:05 AM] Veronica Kell:
Again, for public water supply, does it make sense for the town to acquire land surrounding town wells.

[4/14/2020 10:06 AM] Laura Shifrin:
On going

[4/14/2020 10:06 AM] James Sartell:
I have additional feedback on asking cell companies for access

[4/14/2020 10:06 AM] James Sartell:
I will hit you offline.

[4/14/2020 10:07 AM] Laura Shifrin:
yes

[4/14/2020 10:08 AM] Laura Shifrin:
This is Laura Shifrin I see all of these as on going…

[4/14/2020 10:15 AM] Laura Shifrin:
Thank you!

[4/14/2020 10:15 AM] Veronica Kell:
Thanks, Adria and Steve.

[4/14/2020 10:16 AM]
Thank you all for participating!

Townsend Webinar: Society

Attendees: 14

1. Shirley Coit (phone)
2. Keith Turgeon
3. James Gates (phone)
4. Lance McNally
5. Susan McNally
6. Laura Shifrin
7. Kym Craven
8. James Sartell
9. Robert Templeton
10. Veronica Kell
11. Beth Faxon
12. Hillary King
13. Adria Boynton
14. Amanda Kohn

Webinar Notes

Hazards

- No questions or comments

Features

- Veronica – food security
    - TEO is distributing a lot of food during current crisis
    - Agriculture and farming in
- Kim Craven –
    - Social service organization developed after fire last year
    - Business association
    - TEO – 22 seniors for food and now its up to 80 for food delivery
        - Volunteer-run primarily
    - We have lost a lot of farms in Townsend
        - Agriculture and impact of COVID 19

Vulnerability and Strength

- At risk of isolation (V)
    - Can start to think and prepare a little bit differently, making this an opportunity to reduce vulnerability
    - Real difference between young adults and children
    - Learned in fire that there is a whole group that is disconnected
    - Friends of the Seniors and COA are very well connected.

    - Where we aren't connected is folks that are in lower income housing – lacking community network.
    - Add in limited English speakers (V)
        - Lack of awareness on this as a need.
- When we needed Hawthrone Brook as a shelter, it was not available. They made a make shift shelter with the places of worship, but there were no showers.
    - Right now we are using a District Asset as a shelter rather than a municipal building.
- Local businesses
    - Both – each of the priority hazards can wipe out a business, but whether it's the ice storm, sink hole, or a barn blowing over they are there to help.
- Harbor Station is set back, but if the dam was overtopped it could be vulnerable.
- Fire is a strength, well positioned to help with isolation.
    - Locations east, west, central
- PD department should be set.
- Food security
    - Service delivery of food is a strength
    - Vulnerability
    - Secured a larger warehouse
    - Cost and reliance on Boston Food Bank is a vulnerability
    - Local farms have shut down – vulnerability
    - Food bank does not have a generator. Was a worry on 4/13. 3 commercial refrigerator and a walk in freezer.

Actions

- Housing authority is trying to meet statewide guidelines on low income housing.
- We don't have services for vulnerable populations. Seniors are taken care of, but we are constantly providing services to (non-eligible housing). More subsidized housing increases strain on non-profit groups.
- How do we increase capacity?
    - Staff, meeting needs on volunteer basis
    - Ripple effect
    - Veteran housing was coming and then there was going to be an impact on PD and FD.
    - Infrastructure,
    - Grant funding is being pursued with churches
    - Formal organization to provide services, traditional municipal service model may not work because its free to adapt and be nimble.
    - PD have recovery coaches.
    - Food, fuel assistance, transportation, burial assistance, counseling and not having insurance
    - Completed community fundraiser, Lyft gave some credits for use
- Build connectivity. Bringing people to the band concerts. Network of community dinners.
- Need funding to create opportunities for connection. Vouchers for band concerts or other community events, food, experiences.

- Fitchburg and Leomister offer ESL classes. Some clergy offer to help with ESL. Need some more resource. MWCC program ongoing.
- Library program for adult language. MOC is available to Townsend.
- Planner in Ayer used to be in Nashua and Lowell. We could use his vision and success to advance economic development in Townsend.
- Solar farm is already connected to largest apartment complexes.
- There are apartments along the river. Need to consider how to protect those buildings.
- Long-term—commercial refrigerators are good but we need more room. We are using two offsite facilities. Could use generator and walk in refrigerator at TOE.
- @TOE add more victory garden/community gardens.
- Incentivize farms.
- Need to do a deeper dive to see if flooding is an issue and other extreme weather events.
- Widely unpopular, but we should think about regionalization.
- Locally we don't have a lot of ability to ramp up police and fire.
- When Ashby was without a chief, they looked into this a bit but it didn't have much traction.
- Devise a strategy for regional crisis response.
- Fire has a very specific mobilization plan. NMLAC comes for crisis but they don't have a mobilization plan.
- Technology is big—see notes of call.
- Arabic and Spanish translation available.
- In crisis we need it to happen quickly and we could use a direct contact
- Montachusett Regional- translated into Mung. (Veronica)

Priority/Timeframe

- Isolation – seems critical and feasible
- Non-English speakers –
- Unable to adapt -
- Shelters -
- Local businesses – need to start in the short term, but a long term project
- Municipal building -
- Food security –

Many of these are ongoing, but some we could get started right away.

Meeting Chat

[4/14/2020 4:01 PM] James Sartell:
You're welcome.

[4/14/2020 4:09 PM] Hillary King:
since I came on late, I do not have any previous chat entries

[4/14/2020 4:09 PM] Hillary King:
if you might put that white board link up again, I would appreciate it! Apologies again for jumping on late!

[4/14/2020 4:10 PM]
Link to Hazard Map: https://www.webwhiteboard.com/board/88yeqejb
The action couldn't be completed. Please try again later.
[4/14/2020 4:10 PM]
Link to Hazard Map: https://www.webwhiteboard.com/board/88yeqejb

[4/14/2020 4:18 PM] Beth Faxon:
Thank you Hillary

[4/14/2020 4:18 PM] Hillary King:
Any time Beth!

[4/14/2020 4:18 PM] James Sartell:
Beth..can you call me real quick? 978-300-5808 is the direct line to my desk.

[4/14/2020 4:38 PM] Laura Shifrin:
V only

[4/14/2020 4:41 PM] Laura Shifrin:
Great point for opportunity

[4/14/2020 4:41 PM] Laura Shifrin:
Not sure about the strength …will need reaching out and training

[4/14/2020 4:48 PM] James Sartell:
Coming up on 30 years old here...

[4/14/2020 4:49 PM] James Sartell:
Fire are definitely strength. Positioned well in town to deal with isolation

[4/14/2020 4:49 PM] James Sartell:
locations...east, west, central

[4/14/2020 4:50 PM] Hillary King:
This is Hillary, I'm leaving the web chat and transferring to listening via phone. Please reach out with any follow-up questions for the MVP Program. hillary.king@mass.gov - thanks everyone for your efforts today!

[4/14/2020 4:55 PM] James Sartell:
No issues at PD from that perspective.

[4/14/2020 4:56 PM] Laura Shifrin:
Those assessments would be good for our town to know what shortages we have

[4/14/2020 4:57 PM] Beth Faxon:
cooling centers
transportation to shelters for isolated citizens

[4/14/2020 4:57 PM] Laura Shifrin:
Transportation is lacking for sure

Shelters is what I was referring to

[4/14/2020 5:00 PM] James Sartell:
The organization behind transportation alone

[4/14/2020 5:02 PM] Laura Shifrin:
Kym is right in that almost every crisis we have had recently has been community driven and it's not just 1 or 2 people….this is a group that reaches out to others to lend a hand

[4/14/2020 5:04 PM] Laura Shifrin:
They do these things for people without "public assistance". It is informal

[4/14/2020 5:06 PM] Laura Shifrin:
That is also done for the few new businesses that try to start in town

[4/14/2020 5:07 PM] Beth Faxon:
perhaps a library program?

[4/14/2020 5:08 PM] Laura Shifrin:
That's a great idea

[4/14/2020 5:08 PM] Laura Shifrin:
Not everyone may be comfortable going to the church…so the senior center does not have to be just for seniors

[4/14/2020 5:12 PM] Beth Faxon:
in home visitation services?

[4/14/2020 5:12 PM] Beth Faxon:
medical and check ins

[4/14/2020 5:13 PM] Laura Shifrin:
Atwood Acres and Townsend Woods are now senior housing and considered affordable…they have community rooms….we are lacking this and have been working for the last 3-5 years to get another project going

[4/14/2020 5:14 PM] Laura Shifrin:
The next project for affordable housing is to include more services to the community

[4/14/2020 5:18 PM] Beth Faxon:
create Agricultural advisory committee and organize farmers markets & public outreach for the gardening programs Kym is referring to>

[4/14/2020 5:18 PM] Laura Shifrin:
Great idea

[4/14/2020 5:20 PM] James Sartell:
A bit of all those things

[4/14/2020 5:20 PM] James Sartell:
the discussion earlier today about technology is huge

[4/14/2020 5:20 PM] Beth Faxon:
yes

[4/14/2020 5:21 PM] James Sartell:
Remote access, sustained internet access, ability to transfer phones etc.

[4/14/2020 5:25 PM] Laura Shifrin:
Should be addressed now but it would be on going

[4/14/2020 5:29 PM] Beth Faxon:
infographic signage?

[4/14/2020 5:30 PM] Laura Shifrin:
Mung is high in Fitchburg…I really think MRPC got it wrong and I told them.

[4/14/2020 5:31 PM] Laura Shifrin:
We have a lack of housing even regionally…just ask the fire chief it is real

[4/14/2020 5:32 PM] Laura Shifrin:
Good question!

[4/14/2020 5:35 PM] Laura Shifrin:
Medium>we seemed to take care of it in the past with the school…but the future is what needs assessmengt

[4/14/2020 5:36 PM] Laura Shifrin:
Long term?

[4/14/2020 5:37 PM] Laura Shifrin:
High…we need economic

[4/14/2020 5:37 PM] Veronica Kell:
I am getting off the call as I have another webinar at 6 pm. Thank you.

[4/14/2020 5:37 PM]
Thanks for attending Veronica!

[4/14/2020 5:38 PM] Laura Shifrin:
High yes we need a better system for our staff at town hall to be able to work during these times

[4/14/2020 5:38 PM] Laura Shifrin:
yesterday

[4/14/2020 5:39 PM] Laura Shifrin:
Yes

[4/14/2020 5:39 PM] Laura Shifrin:
yes

[4/14/2020 5:39 PM] Hillary King:

if helpful, the state has a list of approved vendors that can help with foreign language interpretation and translatoin services

[4/14/2020 5:39 PM] Hillary King:
https://www.mass.gov/doc/prf63/download

[4/14/2020 5:40 PM] Beth Faxon:
Thank you Hillary! Thank you Adria and Amanda!

[4/14/2020 5:40 PM] Hillary King:
Great work everyone!

[4/14/2020 5:40 PM] Laura Shifrin:
Thank you!

[4/14/2020 5:40 PM]
Thank you all for attending!

[4/14/2020 5:40 PM] James Sartell:
Thanks

[4/14/2020 5:40 PM] Lance and Susan:
Thanks as well

[4/14/2020 5:40 PM] Boynton, Adria:
Thank you everyone for participating!

[4/14/2020 5:41 PM] Hillary King:
be sure to stay involved and share the listening session information with your neighbors!
Thanks!

Town of Townsend Municipal Vulnerability Preparedness Planning Workshop Invitees

Group	Invitee	Title	Organization
Board/Committee/Town Staff	James M. Kreidler, Jr.	Town Administrator	Administration
Board/Committee/Town Staff	Carolyn Smart	Executive Assistant	Administration
Board/Committee/Town Staff	Mark Boynton	Fire Chief	Fire Department
Board/Committee/Town Staff	Jay Sartell	Chief of Police, Interim	Police Department
Board/Committee/Town Staff	Carla Walter	Health Administrator	Board of Health
Board/Committee/Town Staff	Janet Leavitt	Administrator	Building Department
Board/Committee/Town Staff	Bentley Herget	Building Commissioner (Interim)	Building Department
Board/Committee/Town Staff	James Smith	Superintendent	Highway Department
Board/Committee/Town Staff	Dave Henkels	Conservation Administrator	Conservation Department
			^
			^
Board/Committee/Town Staff	Shirley Coit	Director	TEMA
Board/Committee/Town Staff	Tom Whittier	Deputy Director	TEMA
Board/Committee/Town Staff	Beth Faxon	Administrator	Planning Board and Zoning Board of Appeals
Board/Committee/Town Staff	Lance McNally	Chair	Planning Board
Board/Committee/Town Staff	Laurie Shifrin	Vice Chair	Planning Board
Board/Committee/Town Staff	Veronica Kell	Clerk	Planning Board
Board/Committee/Town Staff	Charles Sexton-Diranian	Member	Planning Board
Board/Committee/Town Staff	Jerrilyn Bozicas	Member	Planning Board
Board/Committee/Town Staff	Rebecca (Becky) McEnroe	Water Superintendent, Interim	Water Division
Board/Committee/Town Staff	Carol Hoffses	Associate Member	Planning Board
Board/Committee/Town Staff	Susan McNally	Trustee	Library Trustees
Board/Committee/Town Staff	Robert Templeton	Trustee	Library Trustees
Board/Committee/Town Staff	Brad Morgan	Superintendent	North Middlesex Regional School District
Board/Committee/Town Staff	Donald Massucco	Warden	Tree Warden
Board/Committee/Town Staff	Roger Rapoza	Superintendent	Cemertary & Parks Department
Board/Committee/Town Staff	Wayne Miller	Elected Board Member, Chairman	Board of Selectmen
Board/Committee/Town Staff	Don Klein	Elected Board Member, Vice-Chairman	Board of Selectmen
Board/Committee/Town Staff	Rebecca (Becky) McEnroe	Director, Interim	Water and Sewer
Board/Committee/Town Staff	Jessica Funaiole	Assisstant Town Clerk	Asst. Town Clerk
Board/Committee/Town Staff	Kathleen Spofford	Town Clerk	Town Clerk
Board/Committee/Town Staff	Rick Metcalf	Nashoba Sanitarian	Health Department
Board/Committee/Town Staff	Chaz Sexton-Diranian	Chair, State Representative	Housing Authority
Board/Committee/Town Staff	Laura Shifrin	Vice Chair	Housing Authority
Board/Committee/Town Staff	Jane Jackson	Chair	Council on Aging
Board/Committee/Town Staff	Valerie Adams	Vice Chair	Council on Aging
Board/Committee/Town Staff	Alisa Struthers	Chair	Historic District Commission
Board/Committee/Town Staff	Brent Carney	Chairman	Energy Committee
Board/Committee/Town Staff	Emy Hoff	Director	Recreation Commission
Board/Committee/Town Staff	Lynn Pinkerton	Chair	Finance Committee
Board/Committee/Town Staff	Jerrilyn Bozicas	Vice-Chair	Finance Committee
Board/Committee/Town Staff	Stacy Schuttler	Director	Townsend Public Library
Board/Committee/Town Staff	Joseph Mazzola	Veteran's Agent	Veterans Affairs
Board/Committee/Town Staff	Karin Canfield Moore	Director	Senior Center
Board/Committee/Town Staff	Mark Hussey	Chairman	Capital Planning Committee
Board/Committee/Town Staff	Christopher Nocella	Vice-Chairman	Capital Planning Committee
Board/Committee/Town Staff	Joseph Shank	Chairman	DPW Exploratory Committee
Board/Committee/Town Staff	Mike MacEachern	Chairman	Board of Water Commissioners
Board/Committee/Town Staff	Nathan Mattila	Vice-Chairman	Board of Water Commissioners
Board/Committee/Town Staff	Kym Craven	Chair	Masterplan Committee
Board/Committee/Town Staff	Mike Turgeon	Appointed Board Member, Chair	Conservation Commission
Board/Committee/Town Staff	John Hussey	Appointed Board Member, Clerk	Conservation Commission
Board/Committee/Town Staff	Bill Cadogan	Appointed Board Member, Chair	Zoning Board of Appeals
Board/Committee/Town Staff	Darlene Sodano	Appointed Board Member, Vice Chair	Zoning Board of Appeals
Board/Committee/Town Staff	Vicky Janicki	Appointed Board Member	Zoning Board of Appeals
Board/Committee/Town Staff	Linda Durette		Townsend Cultural Council
Board/Committee/Town Staff	Leigh Reddin	Administrator	Highway Department & Conservation Department
Local Leaders/Organization Reps	Volunteers	teo-ma.org	Townsend Ecumenical Outreach - "82"
Local Leaders/Organization Reps	Kory Eng	President	United Way of North Central MA
			^
Local Leaders/Organization Reps	Veronica Kell	President	Townsend Conservation Land Trust
Local Leaders/Orgs rep.	Gene Rauhala	Member	Townsend Conservation Land Trust
Local Leaders/Organization Reps	John Hume	Planning and Development Director	Montachusett Regional Planning Commission
Local Leaders/Organization Reps	Joan Wotkowicz	Clerk	Squannacook Greenways, Inc.
Local Leaders/Organization Reps	Jennifer Pedit	Citizen Scientist	specialist: Turtles and their Natural habitat
Local Leaders/Organization Reps	Elizabeth Ainsley Campbell	Executive Director	Nashua River Watershed Association
Local Leaders/Organization Reps	Al Futterman	Land Programs and Outreach Director	Nashua River Watershed Association
Local Leaders/Organization Reps	Cynthia	membership	Townsend Business Association
Local Leaders/Organization Reps	Taber Morrell	Site Administrator	Townsend Historical Society
Local Leaders/Organization Reps	Matt Crean	President	Townsend-Ashby Youth Soccer Association
	James Gates		Townsend-Ashby Youth Soccer Association
Local Leaders/Organization Reps	Keith Turgeon	President	Townsend-Ashby Youth Baseball and Softball Assoc.
Local leaders/Organzation Reps	Jason Webster	Principal	Hawthorne Brook Middle School
Local leaders/Organzation Reps	Timothy McMahon	Principal	North Middlesex Regional High School
Local Leaders/Organization Reps	Diane Carson	Nashoba Paddler, LLC	Co-Owner Nashoba Paddler, LLC
Local Leaders/Organization Reps	Raynold Jackson	Land Steward and Trails Maintainer	Society for the Protection of NH Forests
Local Leaders/Organization Reps	Richard Bailey	Former Chief of Police	Townsend Police Department
Local Leaders/Organization Reps	Anne Gagnon	DFG Land Agent	MassWildlife
Local Leaders/Organization Reps	Dr. Denise Pigeon	Superintendent	Nashoba Valley Tecchnical High School
Local Leaders/Org Reps	Sue Lisio	Former Selectboard member	Former Board of Selectmen
Local Leaders/Org. reps	Kate Guziejka	Principal	Spaulding Memorial School
Local Leaders/Org. reps	Stan Dillis	Member	Cable Advisory Committee

Local Leaders/Organization Reps	Joanna Carpentier	representative	Nashoba Valley Technical School District Committee
State and Regional	Dean A. Tran	State Senator, 2nd District	Massachusetts Senate
State and Regional	Hillary King	MVP Regional Coordinator	EEA
State and Regional	Lori Trahan	Congresswoman, 3rd District	US House of Representatives
State and Regional	Sheila Harrington	State Representative, 1st Middlesex District	Massachusetts House of Representatives
State and Regional	Terrence W. Kennedy	Governor's Councilor, 6th District	MA Governor's Council
State and Regional	Melissa Fetterhoff	President & CEO	Nashoba Valley Chamber of Commerce
State and Regional	David Gray	Office of Ecosystem Protection	U.S. Environmental Protection Agency
State and Regional	Melaney Cheeseman	Endangered Species Review Assistant	Natural Heritage Endangered Species Program
State and Regional	Denise Childs	Regional coordinator	MA Department of Environmental Protection
State and Regional	Kimberly Roth	Environmental Analyst	MA DEP, Central Regional Office
State and Regional	Anita Wysocki	Campground coordinator	DCR
State and Regional	Hillary King	MVP Regional Coordinator	EEA
State and Regional	Jeff Zukowski	Hazard Mitigation Planner	MEMA
Adjacent Towns	Lisa Davis	Planning Board Advisor	Pepperell
Adjacent Towns	Takashi Tada	Land Use Director/Town Planner	Groton
Adjacent Towns	Sarah Widing	Planning Board Chair	Shirley
Adjacent Towns	Adam Burney	Land Use Director	Lunenburg
Adjacent Towns	Alan Pease	Planning Board Member	Ashby
Adjacent Towns	Scott MacGarvey	Planning Board Chair	Mason (NH)
Adjacent Towns	Kristen Austin	Conservation Commission	Brookline (NH)
Adjacent Towns	Valerie Rearick	Town Planner	Brookline (NH)

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

H-**M**-**L**priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Features	Location	Ownership	V or S	Extreme Temperatures	Flooding	Drought and Brush Fire	Severe Weather (Snowstorms, Thunderstorms, Tornadoes)	Priority H - M - L	Time S hort L ong O ngoing
Infrastructural									
Culverts and stormwater drainage	Town-wide	Public	V/S	study culverts, compare to new design critieria, identify which might be at risk. Rain gardens to filter storm drainage, with particular attention to Town wells (remove road pollutants from watershed areas. Must also reduce the amount of road salt). Coppersmith Way Development is an example of rain gardens, bioretention cells, water quality swales. Engineering assessment of work at Coppersmith Way. Assess if system is working as it was designed to work. PB - any work that is installed should have a requirement for measuring its efficacy over time. Subdivision regulations require maintenance of private stormwater systems (dention pond, biorention) but there's no requirement for monitoring the effectiveness. That could be an effective regulation. Must periodically check operations and make sure they're operating as designed.				M	O
Roads and bridges	Town-wide	Municipal, State	V/S	Cloudburst streets. PB will hopefully have studies done for walkability/bikability in the center of Town. Could incorporate sidewalks with creative storage for runoff. These strategies would be implemented near the river, in the floodplain. Meadow Road could be raised, where the bridge is that goes over Hawthorne Brook. Raising roads (coordinate with below-grade utilities) in low-lying places, using pervious pavement.			Increase regular tree maintenance to protect roads and electric/communication infrastructure.	M	O
Dams	Town-wide	Municipal, State, and Private	V	Assessment. Gather data on whether dams are a hazard or not. Consider pros and cons of keeping or removing dams/restoring areas. Town could pursue land acquisition in the floodplain if dams are removed.				H	S - assessment O/L - land acquisition
Electricity and communication infrastructure	Town-wide	Unitil	V	Solar farms. Investigate solar panels on Town buildings, parking areas at the high school or behind the library. Add solar that's managed by the Town. Include battery storage. Consider EV charging stations.		Tree maintenance. Add repeaters to communication system to increase reliability. Assess what resident's homes are not serviced by internet. Assess risk to cell tower - any potential interference of emergency communications. AM networks, charging devices, access for public safety (through public safety network or access to cell towers on wheels CTOW).		H	Multi-phased S-assessment, L-implementation
Private wells and septic systems	Town-wide	Private	V/S		Assess current zoning and BOH regulations for best practice and sustainable development. Public education and outreach. Maintaining your septic system. BOH regulation that, when a septic tank is pumped, the report is sent to the BOH. Assess where private wells would be impacted by stormwater drainage. Recharge areas for these private wells. Consider cost to track reporting. Increase public awareness related to testing and arsenic in public wells. Assessment - know where your water supply has issues			M	S - short term, O - other
Public Water Supply	Town-wide (1200 connections)	Municipal	V/S		Do a study to look at where the well floor levels are compared to new floodplain information. See if raising the well stations is in order. Get additional generators.	Ensure water supply during times of drought. Aquifer studies, impact of drought on ground and surface water supply. Townsend has an interconnect with Pepperell, but that's also a groundwater system. Connect with a larger surface water system (Fitchburg is surface water and they have a lot of capacity). Study other feasible connections. Study possibility of the town aquiring land surrounding town wells.		H	S - study, L - generators, design, purchasing
Societal									
At risk of isolation (could include seniors, children, young adults, people who are disabled)	Town-wide	N/A	V	In-home visitation services. Medical visits and check-ins.				H	S/O
Non-english speakers	Town-wide	N/A	V	Language support for adults, classes taught by local clergy. Library program for adult language classes, or host classes at the Senior Center. Access resources available to Townsend in neighboring communities (Fitchburg). Translating documents or emergency communications into other languages (Arabic, Spanish). Access to funding or more time to create a collaboration to make translation efforts ongoing and reduce burden on current translators. Language lines, having translators ready to translate materials in a crisis, developing infographic signage.				H	O
Unable to prepare or adapt (could include low income residents and those in low income housing)	Town-wide	N/A	V		flood protection strategies for housing along the river.	Increase and support volunteers who support residents in subsidized housing. Infrastructure, access grant funding. Assess options for a formal program with Town staff to help. Increase connectivity for new businesses and others: community dinners through local churches, meet other residents and identify local resources. Funding for opportunities, including vouchers for band concerts/Earth Day/Petting Zoo. Support in creating resumes for jobs. Solar energy for apartment complexes. Include more services to the community in future affordable housing projects.		M	O (S- could launch a program quickly to get momentum and show progress)
Shelters	Hawthorne Brook Middle School, St. John's Church	Municipal	V	Cooling centers. Transportation to shelters for isolated residents.			Assess/inventory supplies and storage capacity at shelters to identify shortages.	M	L
Local businesses (including local farms)	Town-wide	Private	V/S	Continue to increase connectivity for new businesses in Town. An economic center to help make business plans. Have a local Planner to focus on supporting economic revitalization.				H	L
Municipal buildings and services (Police, Fire, Highway Department)	Town-wide	Municipal	V/S		Refer to strategies from the infrastrural webinar. Assess risk of flooding at each location and options for adaptation.		Assess risk of extreme storms at each location and options for adaptation. Additional staff, training, memoranda of understand with similar departments in adjacent Towns. Improve use of communication technology during extreme events (remote access, sustained internet access, ability to transfer phones). Consider options for interconnectivity and regional collaboration (for example, regionalized police services with opportunities for training and growth).	H	S
Food security (supply, delivery, and local farmers)	Town-wide	N/A	V/S			Create Agricultural advisory committee and organize farmers markets & public outreach for the gardening programs Kym is referring to	Food bank needs a generator and walk-in fridgerator (in one centralized location). Turn land into victory garden-style space for apartment residents. Develop programs and incentives for local farms and farmstands.	H	S
Environmental									
Forests	Townsend State Forest, and other	Multiple	S	Study existing species as part of a forest health assessment. Study species that could tolerate warmer conditions.	Floodplain forest: trees provide natural resource/solutions benefit. Encroachment of development on these resources is a concern.	Assessment of fire risk. Evaluate response to fire - do we have adequate water resources? Community outreach and education related to fire safety.		M	O
Street trees	Town-wide		V/S	Scenic Road Act: roads (not 119 and 13) are scenic. To remove trees, must come before the PB. Permitting: think about regular tree replacement to provide shade if trees are removed elsewhere. Get families, kids, community groups involved. Start town Committee. Increase public awareness of Scenic Roads Act. Trees can help reduce air temperature. Consider appropriate replacement species. Design new street trees with adequate planters, root space, continuous planting subsoil.			Maintain trees by trimming more often.	M	O
Parks and open space	Town-wide	Multiple	S	Maintain what we have. Maintenance can improve water quality. Work with Recreation Commission. Include parks if they're not currently covered in their plans. Beaver assessment for Howard Park - assess options for beaver deceivers.				M	O
Waterbodies and wetlands	Squannacook River and other	Multiple	S	Protect our wetlands. Look at development upstream. Make sure the development we allow protects the wetlands. Zoning, purchasing, land acquisition. Bank restoration and stabilization to protect waterways.				H	S to begin with (inventory what we have, zoning)
Future development - residential, commercial, resource development (rail trail), Downtown. Town land use and zoning opportunities. Utilize ecosystem services in new development.	Town-wide	Private	S/V	Aquifer Protection protects against commercial uses in the Aquifer Overlay district, but not residential uses. Townsend has an overlay district. How else can we protect the aquifers and the town's water supply? Study options for regulations and waivers. Subdivision, conservation regs, everything can be waived. Where do we allow things to be waived and where do we not? Study options for zoning. LID development, consider transfer of development rights. Flood-prone areas: be considerate of development overlapping with those areas. Limit or do not allow building in the floodplain. How do you encourage development outside of the floodplain? Design guidelines for developers and encouragement. See State Sustainable				H	S
Invasive species and vector-borne diseases	Town-wide	N/A	V	Public education and awareness related to tick exposure and protection. Pursue removal of invasive species with volunteers and local groups. Reduce mosquito habitat through outreach and removing standing water. Catchbasins can also lead to standing water and habitat for mosquitos.				M	O
				Community education, share regular webinars on topics related to open space resources, how to use volunteers, how to collaborate/integrate with staff that maintain these resources, how to use the trails, fire safety, etc.					

Appendix D

Listening Session

MAY 13TH AT 7:00PM

HAZARD MITIGATION & CLIMATE ADAPTATION

COVID-19 FRIENDLY **VIRTUAL GATHERING**

Join us to hear about Townsend's hazard mitigation and climate adaptation planning process.

We'll also be looking to hear your experiences and ideas!

townsend.ma.us

Please register at:

tinyurl.com/TownsendMVPWebinar

Registrations will be accepted until noon on May 12th. Upon registration, you will receive a link to the online meeting.

Please reach out if you have questions or barriers to participating.

Beth Faxon, Planning Board and Zoning Board of Appeals Administrator
bfaxon@townsend.ma.us

Weston & Sampson

This project was funded through the Massachusetts Executive Office of Energy and Environmental Affairs Municipal Vulnerability Preparedness (MVP) Planning Grant

FOR IMMEDIATE RELEASE

Town of Townsend Seeks Public Input for the Municipal Vulnerability Preparedness (MVP) and Hazard Mitigation Plan (HMP) Project

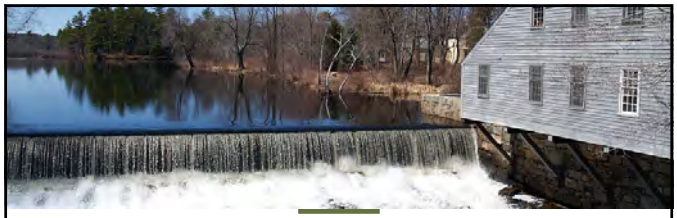
Townsend's responses to previous extreme weather events, as well as the community's current response to the COVID-19 crisis, illustrate the Town's resilience. The Municipal Vulnerability Preparedness (MVP) and Hazard Mitigation Plan (HMP) Project seeks to document historic successes and challenges related to emergency preparedness, to help develop better solutions for tomorrow's risks. The community's input on this process is essential.

The Town of Townsend is identifying projects that could reduce the impacts from flooding, extreme temperatures, and severe weather events. The Town is also considering the likelihood of experiencing more severe natural hazards more frequently due to projected climate change. This planning process explores three topic areas; including infrastructure assets, community resilience, and environmental resources.

Until we can meet in person, we will connect as a community online. The Town is preparing to host a virtual Public Listening Session on May 13th at 7:00PM. For residents without internet connections, wifi will be available at the Townsend Public Library parking lot. A recording of the webinar will be posted on the Town's website, along with a link to an online survey to capture additional public input. Follow the Townsend Public Library Facebook Page for social media updates on this process. You can share, like, and comment on our posts using #TownsendMVP.

This MVP-HMP project is funded through a $22,000 grant award from the Commonwealth's Municipal Vulnerability Preparedness (MVP) Planning Grant program, which provides technical and financial support for cities and towns to plan for climate change and implement the results. As part of this process, Townsend will also fulfill the Federal Emergency Management Agency's (FEMA) requirements to update the Town's regional Hazard Mitigation Plan (HMP) from 2015. This HMP update will maintain the Town's eligibility for federal grant funding from FEMA.

If you would like to receive updates on this project, please email your contact information to Beth Faxon, Planning Board and Zoning Board of Appeals Administrator for the Town of Townsend (bfaxon@townsend.ma.us).



TOWN OF TOWNSEND

Municipal Vulnerability Preparedness (MVP) Listening Session

May 13, 2020

Photo: Townsend Harbor Dam, Wikimedia Commons

1

WELCOME FROM W&S


ADRIA BOYNTON


STEVE ROY


AMANDA KOHN


RUPSA ROY

Photo: Townsend Harbor. Photo by Town of Townsend.

2

2

WELCOME PARTICIPANTS

Photo: Townsend Harbor. Photo by Town of Townsend.

3

3

WEBINAR LOGISTICS

- This webinar is being **recorded**
- Overview of Skype
  - Tell us what your favorite thing is about Townsend **in the chat!**
- The webinar is paired with an **online survey**
  - A link is included at the end of the presentation

4

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WEBINAR OUTLINE

- Overview of MVP and HMP
- Overview of Climate Change
- Strengths and Vulnerabilities
- Priority Action Items
- Next Steps
  - Tell us about your climate adaptation priorities by taking our **online survey!**

Photo: Townsend Common, Wikimedia Commons

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MVP & HMP OVERVIEW

Townsend State Forest. Photo by the Town of Townsend.

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MVP Program Goals

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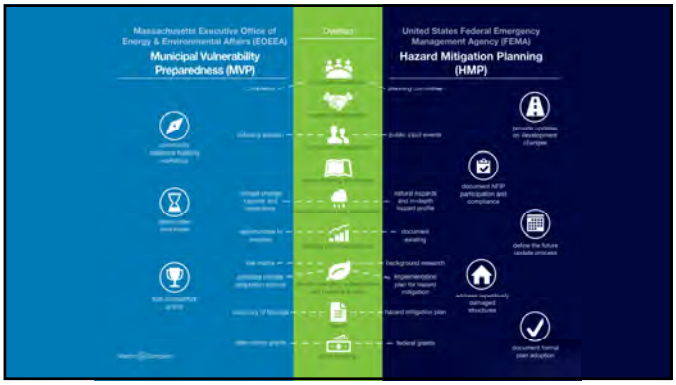

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MVP Process

1. **MVP Planning Grant**
   - Define climate hazards
   - Identify community vulnerabilities and strengths
   - Develop and prioritize adaptation actions
   - Receive MVP designation

   ** We're also updating Townsend's Hazard Mitigation Plan!*

2. **MVP Action Grant**
   1. Implement priority adaptation actions identified during the planning process

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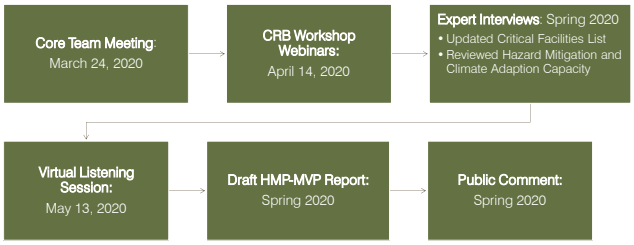
PROJECT TIMELINE



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What Can the MVP Action Grant Fund?

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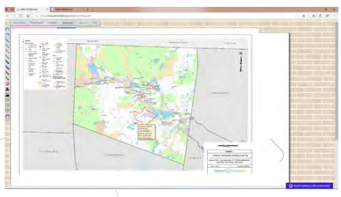
COMMUNITY RESILIENCE BUILDING WORKSHOP

Focused on Four Hazards

Identified:
- Vulnerabilities
- Strengths
- Priority Action Items

Across Three Categories:
- Infrastructure
- Societal
- Environmental



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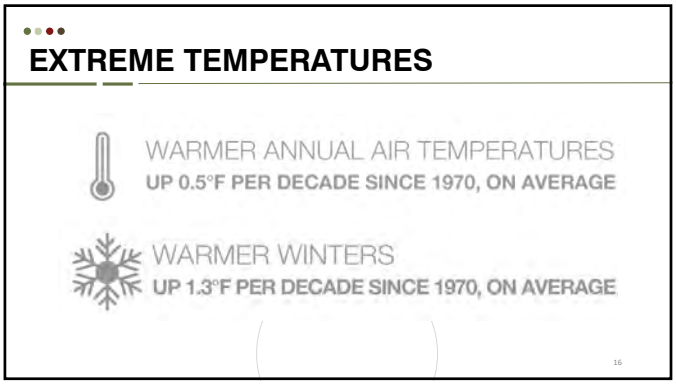

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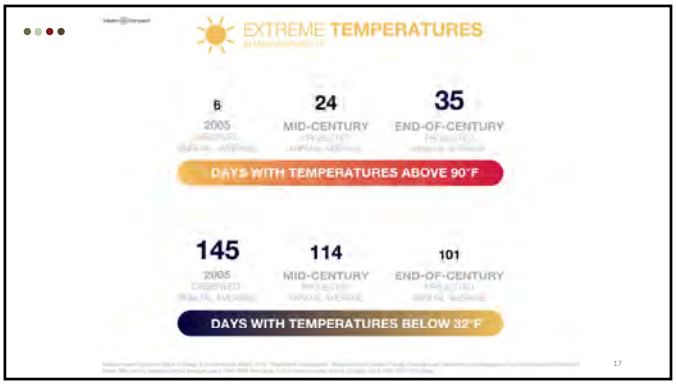

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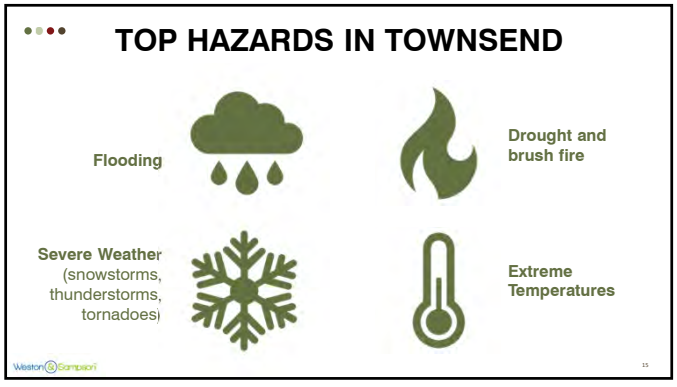

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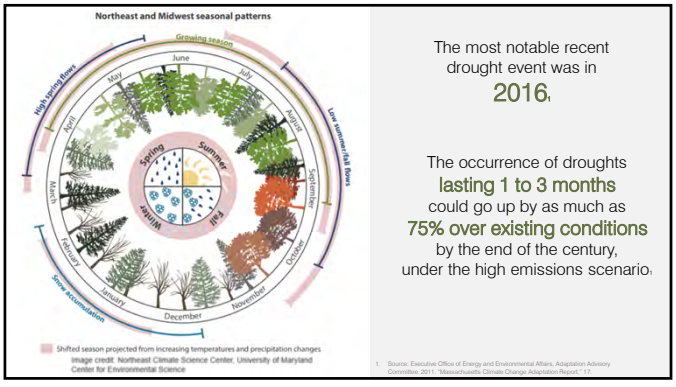

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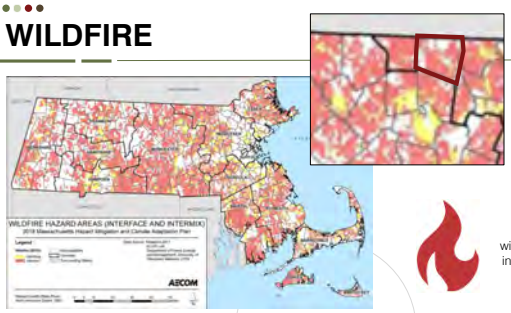
WILDFIRE



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wildfires were reported in Townsend over a 6-year period.

Source: Montachusett Regional Planning Commission (MRPC). Montachusett Region Hazard Mitigation Plan. 2018. 44.

19

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EXTREME PRECIPITATION

8%
Increase in extreme precipitation events by midcentury

13%
Increase in extreme precipitation events by 2100

Extreme precipitation events are defined as events with greater than 2" of rain per day

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IMPACTS OF RISING TEMPERATURES

WARMER ANNUAL AIR TEMPERATURES
UP 0.5°F PER DECADE SINCE 1970, ON AVERAGE

WARMER WINTERS
UP 1.3°F PER DECADE SINCE 1970, ON AVERAGE

- INCREASE IN VECTOR-BORNE DISEASES
- INCREASED SUMMER DEMAND ON AGING ENERGY SYSTEMS
- INCREASED HEAT-RELATED ILLNESSES & MORTALITY
- INCREASED HEAT-RELATED STRESS ON LIVESTOCK & CROPS
- INCREASED ALLERGENS & ASTHMA RATES
- INCREASED DROUGHT & WILDFIRES
- INCREASED STRESS ON CRITICAL INFRASTRUCTURE
- INCREASE IN HARMFUL ALGAL BLOOMS
- MIGRATING PLANT & ANIMAL SPECIES

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Flood Prone Areas.

Route 13

North End Road, west of Ball Road

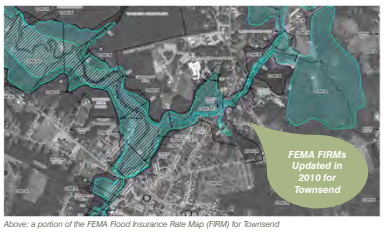
Pearl Hill Brook, south of Old City Road

Intersection of South Row, South Harbor, and Old Meeting House Road

Highland Street by Adams Road

24 Meadow Road

17 Meadow Road



Above: a portion of the FEMA Flood Insurance Rate Map (FIRM) for Townsend

REPETITIVE FLOOD LOSS STRUCTURES

- Defined as an NFIP-insured structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978.
- Townsend has **3** repetitive loss structures.

1. Federal Emergency Management Agency (FEMA). 2019. "Definitions." Accessed August 29, 2019. Fema.gov/national-flood-insurance-program/definitions#R
2. MA Department of Conservation and Recreation (DCR). 2020. "Community Repetitive Loss: Town of Townsend"
3. Montachusett Region Hazard Mitigation Plan, 2013.

23

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CHANGES IN PRECIPITATION

MORE **INTENSE & FREQUENT** EXTREME RAIN EVENTS

PRECIPITATION DURING HEAVY EVENTS IN THE NORTHEAST

INCREASED BY MORE THAN 70%

BETWEEN 1958-2010

Heavy events are defined as the heaviest 1% of all daily events

Source: Massachusetts Executive Office of Energy and Environmental Affairs. 2019. "Changes in Precipitation." Massachusetts Climate Change Clearinghouse. Resilientma.org/changes/changes-in-precipitation

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IMPACTS OF CHANGING PRECIPITATION

HIGHER AVERAGE ANNUAL PRECIPITATION
INCREASED BY ABOUT 10% IN THE NORTHEAST (IN THE LAST 50 YEARS)

- WETTER SPRINGS DELAY PLANTING & REDUCE YIELD
- DECREASED SUMMER PRECIPITATION COULD INCREASE EPISODIC DROUGHTS
- NEW STRESSES FOR ECOSYSTEMS
- DROUGHTS CAN WEAKEN TREE ROOT SYSTEMS
- INCREASED ROAD POLLUTANTS IN WATERBODIES
- CROP DAMAGE FROM INTENSE RAINFALL
- DROUGHTS CAN REDUCE LOCAL WATER SUPPLY

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SEVERE WINTER WEATHER

The blizzard of 2013 left nearly **400,000 Massachusetts residents without power**

Heavy blizzards are among the **most costly and disruptive** weather events for Massachusetts communities

Nor'easters along the Atlantic coast are increasing in frequency and intensity

Jan 3-4, 2018: Winter Storm Grayson
March 2, 2018: Winter Storm Riley
March 8, 2018: Winter Storm Quinn
March 13, 2018: Winter Storm Skylar

Sources: ResilientMA, Climate Science Special Report, Fourth National Climate Assessment (NCA4), Volume prepared by the U.S. Global Change Research Program (USGCRP)/Northern Middlesex

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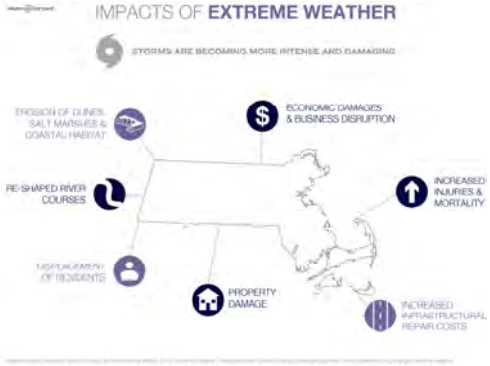
IMPACTS OF EXTREME WEATHER



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What hazard most concerns you?

What memories do you have of climate impacts?

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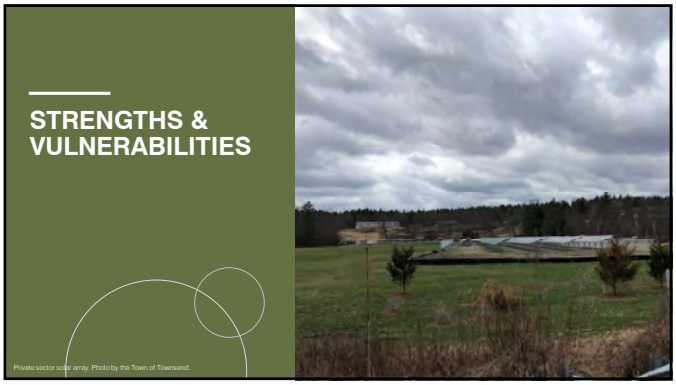

Private sector solar array. Photo by the Town of Townsend.

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INFRASTRUCTURE

Strengths

- Culverts and stormwater drainage
- Subdivision regulations require maintenance of private stormwater systems
- Roads and bridges
- Private wells and septic systems
- Public water supply
- Opportunities for solar
- Complete Streets Program

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INFRASTRUCTURE

Vulnerabilities

- Culverts and stormwater drainage is undersized
- Stormwater pollution from roadways
- Unknown effectiveness of stormwater best management practices and regulations
- Meadow Road bridge floods
- Roadways in West Townsend often flood
- Downed powerlines from tree damage during storms
- Communication infrastructure lacks redundancy
- Unknown conditions of dams
- Private septic systems are not always properly maintained
- Possible surface water or ground water pollution in drinking water wells
- Three out of five of the water supply wells don't have a generator
- Public wells are at risk of flooding
- Wells are at risk of drying up during droughts

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ENVIRONMENTAL

Strengths

- Forests
- Regular tree maintenance
- Street trees
- Parks and open space
- Waterbodies
- Wetlands' ability to provide water storage
- Future development

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ENVIRONMENTAL

Vulnerabilities

- Encroachment of development on natural resources
- Ability of native species to thrive in a hotter environment
- Lack of street trees to provide shade in parts of town
- Invasive species
- Vector-borne diseases
- Beavers causing flooding

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SOCIETY

Strengths

- Local businesses, including local farms
- Municipal buildings and services
  - Elected and appointed municipal boards and committees
  - Townsend Energy Committee
- Food pantry and delivery service for seniors
- Municipal and emergency services
- Community support and volunteers
- New business support
- Seniors are well connected through the Council of Aging and Friends of Seniors
- Complete Streets
- Montachusett Regional Planning Commission

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SOCIETY

Vulnerabilities

- Residents at risk of isolation
- Residents with limited English proficiency when communications are primarily in English
- Vulnerable housing units in the floodplain
- Residents with challenges to prepare or adapt
- Some residents do not have internet
- No cooling centers
- Lack of transit to shelters and essential services
- Critical services need back up power
- Food access and reduction of local food production
- Food bank does not have a generator
- Emergency Management Plan
- Affordable housing shortages
- Increase municipal capacity through additional staff and work with volunteers and non-profits
- Need for more economic development

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What do you think about these vulnerabilities and strengths?

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EXISTING HAZARD PROTECTION

- Senior Center activities
- Community outreach and education
- Shelters
- Emergency generators
- Volunteer programs
- Green infrastructure projects
- Fire safety
- Snow removal
- Green Community Designation
- Regional Emergency Planning Committee
- Massachusetts Municipal Association Best Practice Series
- Massachusetts State Building Code
- Complete Streets Funding Program
  - Committee
  - Current Greenville Road Bridge project
- Townsend Energy Committee
- Project funding support
  - Montachusett Regional Planning Commission
  - District Local Technical Assistance and Unified Planning Work Program
  - Community Development Building Grant Community

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HIGH PRIORITIES: INFRASTRUCTURE

- Assess dams, gather data on hazardous dams, consider benefits of keeping or removing dams, and consider land acquisition
- Investigate options for solar panels and include battery storage
- Consider options for EV charging stations
- Tree maintenance
- Add repeaters to communication system to increase reliability
- Assess what resident's homes are not serviced by internet
- Assess risk to cell tower
- Study well floor levels compared to floodplain information and get additional generators.
- Ensure water supply during drought through aquifer studies and assessing drought impacts on ground and surface water supply. Study options to connect with a larger surface water system and the possibility of land acquisition

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HIGH PRIORITIES: ENVIRONMENT

- Assess options for protecting wetlands, including studying development upstream and assessing options for zoning, purchasing, and land acquisition
- Protect waterways through bank restoration and stabilization
- Study options for protecting aquifers and the town's water supply, including options for regulations, waivers, zoning, low impact development, transfer of development rights
- Limit or do not allow building in the floodplain. Assess options for encouraging development outside of the floodplain, including by producing design guidelines for developers

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HIGH PRIORITIES: SOCIETY

- Services for residents at risk of isolation: in-home visitation services and medical visits
- Language support for adults: classes at a local church, library, or the Senior Center
- Translate documents and emergency communications and develop infographic signage
- Create an economic center to help make business plans. Hire a local Planner to focus on supporting economic revitalization
- Assess risk of extreme storms to municipal buildings and services, and options for adaptation
- Provide additional municipal staff and training. Secure memoranda of understand with similar departments in adjacent Towns. Improve use of communication technology during extreme events. Consider options for interconnectivity and regional collaboration
- Create an agricultural advisory committee and organize farmers markets and public outreach for gardening programs. Turn land into victory garden-style space for apartment residents. Develop programs and incentives for local farms and farm stands
- The Food Bank needs a generator and walk-in refrigerator

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What project idea do you think should be a high priority?

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We want to understand your priorities

Comment on the webinar and tell us more about hazards and preparedness in Townsend by taking our survey!

tinyurl.com/TownsendMVPSurvey2

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Townsend Listening Session Webinar

Hazard Mitigation & Climate Adaptation Virtual Gathering

Attendees (23)

1. Kim Craven (phone)
2. Cindy King
3. Don Klein
4. Beth Faxon
5. Ken
6. Paul Boundy
7. Cindy Boundy
8. Paul Premo
9. Tom Maloney
10. Veronica Kell
11. Laura Shifrin
12. Carol Hoffses
13. Chaz Sexton-Diranian
14. Amanda Kohn (W&S)
15. Adria Boynton (W&S)
16. Tom Maloney
17. Lynn Pinkerton
18. Carolyn Matthews
19. Bill Cadogan
20. Sarah Edrie
21. Linda Vincent
22. Laura Shifrin
23. Audrey Lok

Meeting Notes

Favorite Thing about Townsend

- The People
- The Common
- Neighborhood I live in
- Grandchildren
- Library
- Community
- Weather

Comments –

- Great chart! (comment on MVP-HMP overlap)

Hazards

- Power outage
- Flooding
    - South Street at Rte 119 was extremely vulnerable until the series of concrete culverts were put in around ten years ago
- Water supply – shallow wells and cross street well is out of service
- Would street cracking be due to underwater leakage?
- mothers day storm, 2007 I believe was the worst
- Infrastructure being able to meet needs
    - Water, power, roads

Comments

- Concern about economy and COVID-19, but possibly Townsend could see growth because it's a nice place to live and work from home.
- Wifi bandwidth is not consistent. So even when people have access its not equal across the board. There is only one provider (Comcast).
- Could the town consider having it's own internet service? Like Shrewsbury.
- Could possibly do electric too, but its complicated.
- Outsourcing our Water Department billing hasn't been an improvement.
- Should talk with Chamber of Commerce to get businesses involved and the economic development take on climate resilience

Meeting Chat

Boynton, Adria 6:52 PM:

Welcome to Townsend's Hazard Mitigation and Climate Adaptation Virtual Gathering!

Boynton, Adria 6:53 PM:

Feel free to test the chat function and your audio as you join the call by introducing yourself and telling us what your favorite thing is about Townsend!

Paul & Cindy Boundy 6:58 PM:

Paul & Cindy can hear you very well.

Boynton, Adria 7:00 PM:

Great, thanks for joining us tonight! What's your favorite thing about Townsend?

Paul Premo 7:00 PM:

The neighborhood I live in

Veronica Kell 7:01 PM:

I love the library!

Laura Shifrin 7:02 PM:

Laura Shifrin….community

Kohn, Amanda 7:04 PM:

Hi! My email is kohn.amanda@wseinc.com

Bill Cadogan 7:06 PM:

the weather!

Kohn, Amanda 7:08 PM:

Thanks, Adria!

Ken 7:11 PM:

That's a great chart

CK 7:20 PM:

power outage

Ken 7:20 PM:

Flooding

Ken 7:21 PM:

my audio isn't working but South Street at Rte 119 was extremely vulnerable until the series of concrete culverts were put in around ten years ago

Paul & Cindy Boundy 7:21 PM:

Infrastructure being able to meet needs
Water power roads

Ken 7:22 PM:

mothers day storm, 2007 I believe was the worst

Linda Vincent 7:22 PM:

Would street cracking be due to underwater leakage?

Kohn, Amanda 7:23 PM:

You can also tell us through the survey about your experiences that we'll share a link to at the end of the powerpoint!

Paul Premo 7:29 PM:

Will a copy of the presentation be available after?

Paul Premo 7:29 PM:

THanks

Kohn, Amanda 7:29 PM:

We can also send the powerpoint to the rsvp list!

Kohn, Amanda 7:41 PM:

Please remember there is survey for all board members to provide input. You can also use my email kohn.amanda@wseinc.com

Kohn, Amanda 7:44 PM:

http://tinyurl.com/TownsendMVPSurvey2

Paul Premo 7:45 PM:

Shrewbury does

Paul Premo 7:45 PM:

Shrewsbury sorry for the spelling error

Linda Vincent 7:51 PM:

Thank you for a wonderful presentation!

Audrey Lok 7:51 PM:

Thank you.

Veronica Kell 7:51 PM:

Thank you!

Paul & Cindy Boundy 7:51 PM:

Thank you very informative

Boynton, Adria 7:52 PM:

Thank you everyone for joining!

Paul Premo 7:52 PM:

Outsourcing our Water Department billing hasn't been an improvement.

Ken 7:52 PM:

Thank you, great presentation

Paul Premo 7:52 PM:

Thank you.

CK 7:52 PM:

thanks

Bill Cadogan 7:52 PM:

Thanks!

E. Faxon 7:54 PM:

thank you very much!! :)

Kohn, Amanda 7:54 PM:

Thank you Beth!

Boynton, Adria 7:54 PM:

Thanks so much Beth! We're exciting to see the feedback from the survey!

E. Faxon 7:55 PM:

yes!! we will as well!!

E. Faxon 7:55 PM:

Thank you Amanda!

Chaz 7:56 PM:

Thank you Adria and Beth, as always thank you for everything you do for us! I appreciate you!

Boynton, Adria 7:56 PM:

Thank you for joining the call and participating, Chaz!

E. Faxon 7:57 PM:

yes, it is great to have you here! :)

E. Faxon 7:58 PM:

Have a great evening All excellent presentation!!

Boynton, Adria 7:58 PM:

Thank you Beth! Have a good night and thanks for joining us!

Townsend Hazard Mitigation and Climate Adaptation

The Town of Townsend is seeking your ideas to improve our hazard mitigation and climate adaptation planning process. If you have additional input, questions, or barriers to participating, please contact Beth Faxon, Planning Board and Zoning Board of Appeals Administrator, at bfaxon@townsend.ma.us.

1. Townsend has identified the following hazards as being particularly relevant to the Town. What hazard are you most concerned about?

Concern	Hazard of most concern	Hazard of significant concern	Hazard of some concern	Hazard of least concern
Extreme temperatures	○	○	○	○
Flooding	○	○	○	○
Severe storms (snowstorms and wind)	◉	○	○	○
Drought and brush fire	○	○	○	○

2. How have these hazards impacted you impacted you personally or the broader community? Examples of impacts could include the events listed below: - Frequently flooded local roads - Drought in 2016 - The four Nor'easters in March 2018.

3. How prepared do you feel Townsend is for future extreme events?

- ○ Very prepared
- ○ Somewhat prepared
- ○ Not prepared
- ○ Other

4. What steps have you already taken to prepare for extreme events?

- ☐ I have a kit in case of emergencies (which may include food, water, flashlights, batteries, and other supplies)
- ☐ I receive news, updates, and information about emergency preparedness
- ☐ I know where the nearest emergency shelter is
- ☐ Other

5. What resources do you need to feel more prepared?

6. What would you consider Townsend's greatest vulnerability?

- ○ Flooding of roadways
- ○ Critical services and equipment that need back up power
- ○ Encroachment of development on natural resources
- ○ Drinking water supply (which can be impacted by both droughts and floods)

- Vulnerable residents
- Other

7. What is Townsend's greatest strength considering climate resilience?
   - Municipal and emergency services
   - The existing stormwater system
   - Tree canopy from forests and street trees
   - Wetlands, which can provide water storage
   - Community support and volunteers
   - Other
8. How should Townsend prioritize climate adaptation measures?
   - Based on funding
   - Time frame
   - Asset type (including infrastructure, buildings, or natural systems)
   - Impact on public safety
   - Other
9. Rank the following priorities from highest priority to lowest priority.

- Conduct a vulnerability assessment related to the impact of climate hazards on Townsend's wells and water supply
- Protect wetlands and waterways through restoration and land acquisition
- Translate emergency communications into other languages and develop infographic signage
- Increase communication resilience by adding repeaters to increase redundancy, assessing areas of Town not serviced by the internet, and assessing risks to the cell tower
- Increase energy resilience through EV charging stations and by investigating locations for solar panels
- Amend bylaws and regulations to better protect natural resources and incentivize resilient development

10. What other climate adaptation or hazard mitigation measures should be taken in Townsend in the next five years?

11. Are there any additional comments or questions you would like to share?

12. Thank you for completing the survey. Please enter your email address if you'd like to receive updates on climate adaptation and hazard mitigation projects in Townsend.

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

Townsend MVP Survey

Summary of Survey Results and Public Comments

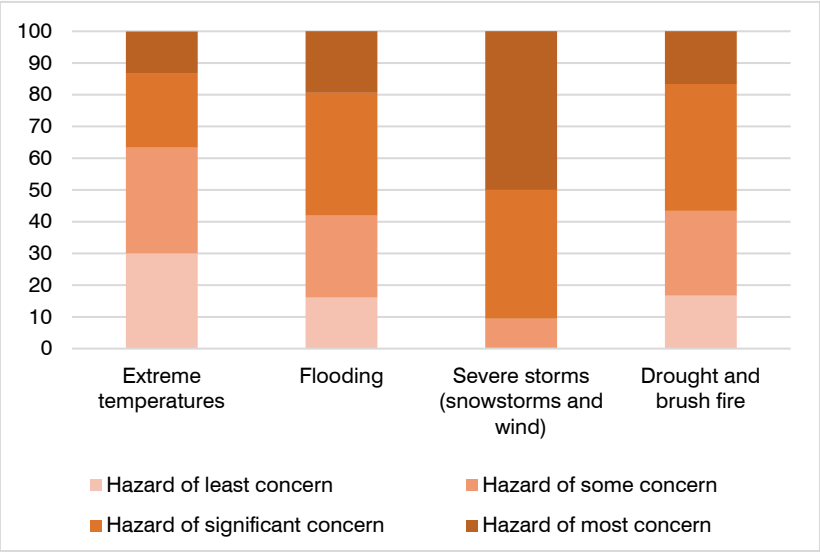
Introduction

The Town of Townsend was awarded a Municipal Vulnerability Preparedness (MVP) Planning Grant to improve the Town's resilience to climate change and to mitigate natural hazards. The MVP Program aims to provide technical and financial support for cities and towns across the Commonwealth to plan for, and mitigate the impacts from, climate change. As part of the virtual Public Listening Session, the project team shared a survey to collect public feedback related to climate hazards, strengths, vulnerabilities, and priority adaptation action items. Key information related to the results of this survey are summarized below:

- The survey was accessible on the Microsoft Forms website from May 13-May 29, 2020.
- A link to the online survey was shared on May 13, 2020 during the virtual Public Listening Session and was also advertised through the following means:
    - Announcement shared on Channel 9, the local cable channel
    - Posted on the Planning Board webpage
    - Posted on the Townsend Business Association webpage
    - Shared in an email blast to the stakeholder list
- The project team received 33 online responses.

The following summary provides an overview of the survey responses, along with key findings and recommendations for using this information. A spreadsheet of short-answer responses from survey participants, along with a copy of the original survey, are included as attachments to this document.

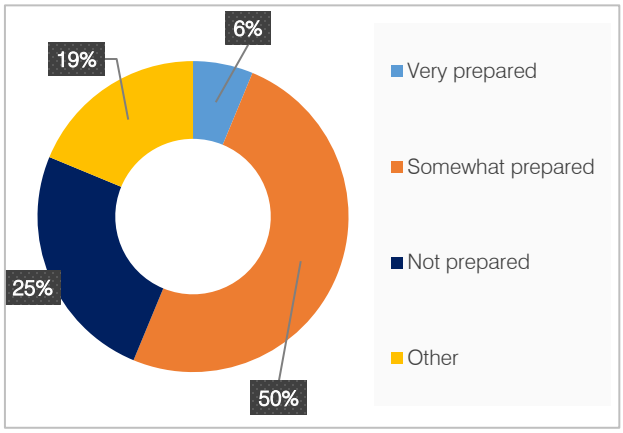
Survey Results



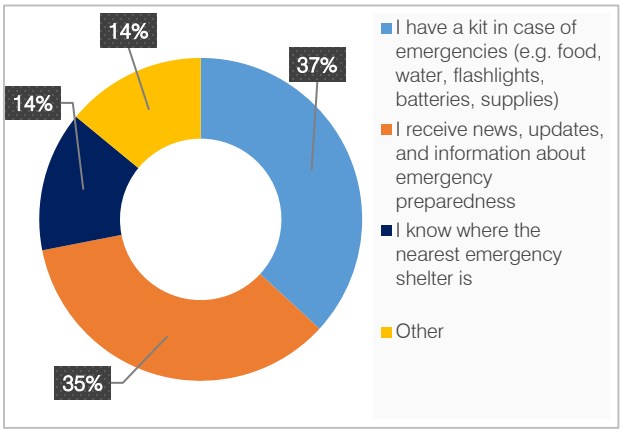
What hazard are you most concerned about?

- Survey results suggest that severe storms (including snowstorms and wind) are hazards of most concern
- Flooding, drought, and brushfires are hazards of secondary concern among residents
- Extreme temperatures are hazards of least concern

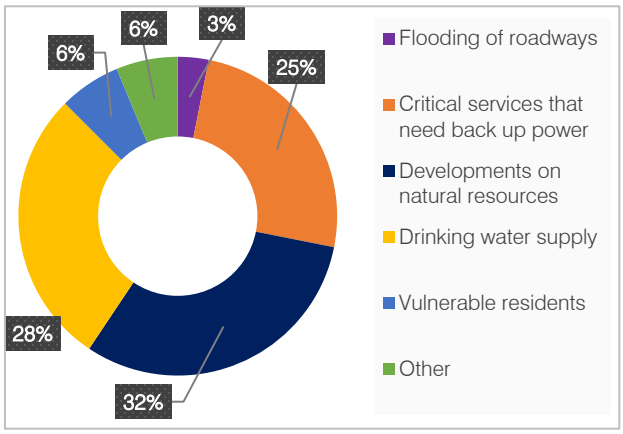
How prepared do you feel Townsend is for future extreme events?



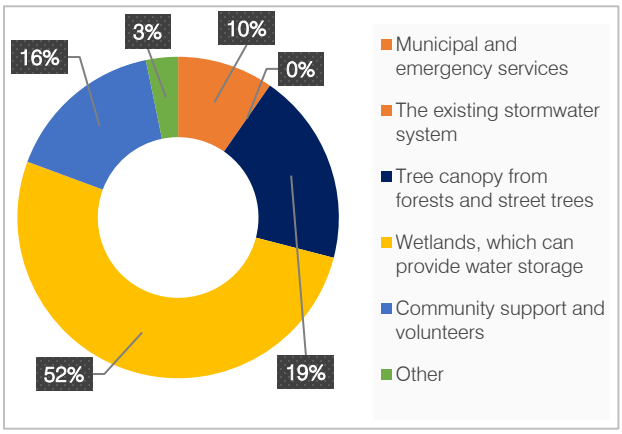
What steps have you already taken to prepare for extreme events?



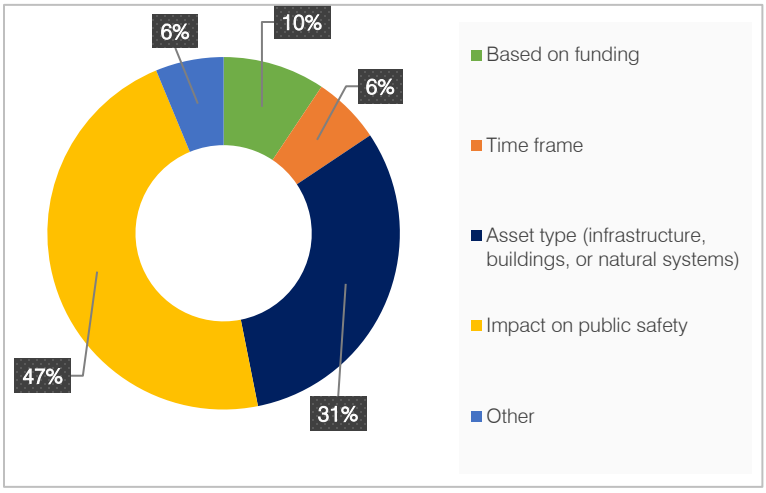
What would you consider Townsend's greatest vulnerability?



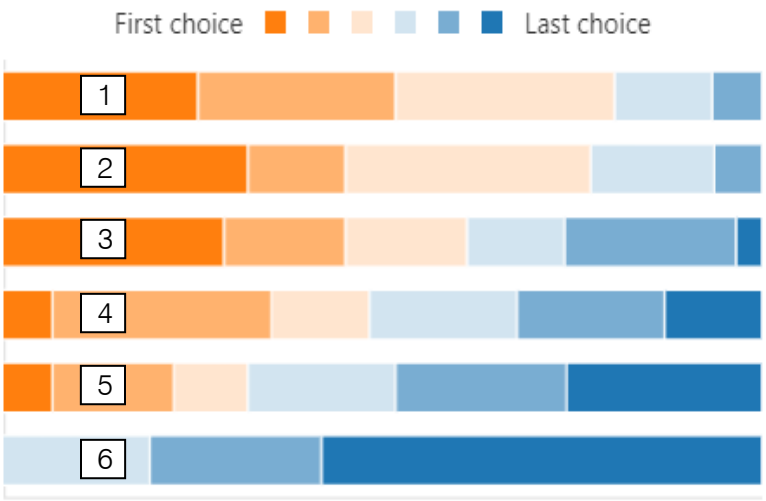
What is Townsend's greatest strength considering climate resilience?



How should Townsend prioritize climate adaptation measures?



Rank the following priorities from highest priority to lowest priority.



1. Conduct a vulnerability assessment related to the impact of climate hazards on Townsend's wells and water supply
2. Protect wetlands and waterways through restoration and land acquisition
3. Translate emergency communications into other languages and develop infographic signage
4. Increase communication resilience by adding repeaters to increase redundancy, assessing areas of Town not serviced by the internet, and assessing risks to the cell tower
5. Increase energy resilience through EV charging stations and by investigating locations for solar panels
6. Amend bylaws and regulations to

The survey results suggest that protecting wetlands and waterways through restoration and land acquisition, translating emergency communications into other languages and developing infographic signage, and conducting a vulnerability assessment on Townsend's wells and water supply are the three top priorities for residents. Amending bylaws and regulations to better protect natural resources and incentivize resilient development were ranked by respondents as the lowest priority.

Summary of short-answer responses:

How have these hazards impacted you impacted you personally or the broader community? Examples of impacts could include frequently flooded local roads, the drought in 2016, and the four Nor'easters in March 2018.

- Winter storms (ice storms, snowstorm, Nor'easters) and associated power outages appear to have the greatest impact on the residents of Townsend. Twenty-one out of thirty responses cite these hazards. The next commonly mentioned hazard was flooding, which has caused both residential and commercial property damage. Additionally, two residents cited the impacts of extreme heat.

What resources do you need to feel more prepared?

- Most of the responses discussed improving town-level organization on climate adaptation and communication from the Town through social media, mail, and email. The participants mentioned that more efficient emergency communication about shelter location, contents of emergency kit, and

emergency preparedness information system is needed in the Town. About 50% of respondents cited uninterrupted power and internet connection as two important resources that residents need to feel prepared for extreme events.

What other climate adaptation or hazard mitigation measures should be taken in Townsend in the next five years?

- The primary measures according to participants should include the following:
    - A more reliable infrastructure for utility services so that there are less frequent power cuts. Two participants suggested a Town-owned utility company. Backup generators for the cooling stations were also suggested.
    - Preservation of natural resources. Acquiring land, increasing tree canopies, improving tree maintenance, and reducing the use of pesticides to protect the environment were among the suggestions.
    - Stormwater and sewer management to mitigate flooding. Replacing culverts, cleaning culverts and storm drains, installing rain gardens were among the suggestions.
    - Dam maintenance and dam removal. Regular inspection and repair/reinforcement of dams or safe precautionary removal of dams was suggested by one participant.

Do you have any other questions or comments? Did you answer "Other" on any of the questions above? If so, please describe below.

- Participants emphasized local vulnerabilities and the need to address challenges including poor power supply and internet connections, lack of a well-informed volunteer base, lack of communication, and excessive tree cutting.

Key Findings & Next Steps

As the pie charts and bar graphs indicate, severe storms are the main concerns for residents as they lead to power outages for days. Lack of backup power in critical resources, developments on natural resources, and quality of drinking water supply are among the Town's vulnerabilities. Conversely, wetlands that provide water storage were identified as the Town's greatest strength. According to participants, climate adaption measures should primarily focus on the impact of extreme events on

public safety. The Town also needs a reliable source of uninterrupted power supply and better internet/cable connections.

The project team should use the findings of this survey to:

- Address climate hazards such as extreme storms, flooding, and drought
- Pursue funding for climate adaptation projects related to:
    - Addressing challenges related to utility and drainage infrastructure, and emergency management.
    - Protecting wetlands and waterways through restoration and land acquisition
    - Translating emergency communications into other languages and developing infographic signage
    - Conducting a vulnerability assessment on Townsend's wells and water supply
- Share more information with the public, especially vulnerable populations, related to emergency preparedness, evacuation routes, and shelters.
- Share more information online, including through the Town's website and social media platforms.
- Use the email addresses collected to start a climate resilience listserv. Additionally, the next public meeting should be advertised via email to respondents who shared their contact information.

Attachments

- Attachment A: Townsend Survey
- Attachment B: Short Answer Responses Spreadsheet
- Attachment C: Email Addresses

Appendix E

Plan Adoption

OFFICE OF THE BOARD OF SELECTMEN
Veronica Kell, *Chairman*
Wayne Miller, *Vice Chairman*
Joseph Shank, *Clerk*

James M. Kreidler, Jr.
Town Administrator

CERTIFICATE OF ADOPTION
BOARD OF SELECTMEN TOWN OF TOWNSEND, MASSACHUSETTS

A RESOLUTION ADOPTING THE *TOWN OF TOWNSEND 2020 HAZARD MITIGATION PLAN AND MUNICIPAL VULNERABILITY PREPAREDNESS PLAN*

WHEREAS, the Town of Townsend established a Committee to prepare the *Town of Townsend 2020 Hazard Mitigation Plan and Municipal Vulnerability Preparedness Plan*; and

WHEREAS, the *Town of Townsend 2020 Hazard Mitigation Plan and Municipal Vulnerability Preparedness Plan* contains several potential future projects to mitigate potential impacts from natural hazards as well as climate change in the Town of Townsend, and

WHEREAS, the public provided input through a duly-noticed listening session and online survey advertised by the local Planning Board on May 13, 2020 and

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

NOW, THEREFORE BE IT RESOLVED that the Town of Townsend Board of Selectmen adopts the *Town of Townsend 2020 Hazard Mitigation Plan and Municipal Vulnerability Preparedness Plan*, in accordance with M.G.L. 40 §4 or the charter and bylaws of the Town of Townsend.

ADOPTED ON FEBRUARY 16, 2021

Veronica Kell, Chairman

Appendix F

FEMA Approval

U.S. Department of Homeland Security
FEMA Region I
99 High Street, Sixth Floor
Boston, MA 02110-2132

FEMA

February 25, 2021

Samantha C. Phillips, Director
Massachusetts Emergency Management Agency
400 Worcester Road
Framingham, Massachusetts 01702-5399

Dear Director Phillips:

The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA) Region I Mitigation Division has approved the Town of Townsend 2020 Hazard Mitigation Plan – Municipal Vulnerability Preparedness Plan effective **February 24, 2021** through **February 23, 2026** in accordance with the planning requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended, the National Flood Insurance Act of 1968, as amended, and Title 44 Code of Federal Regulations (CFR) Part 201.

With this plan approval, the jurisdiction is eligible to apply to the Massachusetts Emergency Management Agency for mitigation grants administered by FEMA. Requests for funding will be evaluated according to the eligibility requirements identified for each of these programs. A specific mitigation activity or project identified in this community's plan may not meet the eligibility requirements for FEMA funding; even eligible mitigation activities or projects are not automatically approved.

The plan must be updated and resubmitted to the FEMA Region I Mitigation Division for approval every five years to remain eligible for FEMA mitigation grant funding.

Thank you for your continued commitment and dedication to risk reduction demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please contact Melissa Surette at (617) 956-7559 or Melissa.Surette@fema.dhs.gov.

Sincerely,

Paul F. Ford
Acting Regional Administrator
DHS, FEMA Region I

PFF:ms

cc: Sarah White, State Hazard Mitigation Officer, MEMA
Jeffrey Zukowski, Hazard Mitigation Planner, MEMA
Beth Dubrawski, Hazard Mitigation Contract Specialist, MEMA