

Community Resilience Building Risk Matrix



TOWN OF NORTH ATTLEBOROUGH

FINAL RISK MATRIX

H-M-L priority for action over the Short or Long term
 V = Vulnerability S = Strength

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

Features	Location	Ownership	V or S	Flooding	Extreme Winter Weather	Nor'easter/ High Wind	Dam Failure	Priority	Time
								H - M - L	Short Long Ongoing
Infrastructural									
Electrical Distribution System	town-wide	NAED	V & S	Ongoing study to bring power to other parts of town	Construct second substation study, currently under funding; ongoing system upgrades; tree trimming	Construct second substation study, currently under funding; ongoing system upgrades; tree trimming		M	L&O
Culverts/Bridges	multiple	town, state & private	V & S	study to reduce flooding, sedimentation & cont. dredge under culverts/bridges	Inspection/ surveying ongoing basis and continued maintenance	Inspection/ surveying ongoing basis and continued maintenance	Inspection/ surveying ongoing basis and continued maintenance	H	S&O
Private Sewer & Water	south part of town	Kings Grant (private)	V	Town take over ownership & maintenance to rebuild to town's standards ; obtain easements to access facilities; explore possibility of bylaw for construction standards and connection				L	L
Fiber Optics	municipal facilities	NAED	S		Ongoing Maintenance & tree trimming; rings for redundancy			L	S&O
Dams	multiple	Town, Federal & Private	V~S				Ongoing maintenance, study potential of removing dams	M	L&O
Interstate Highways	town-wide	State	V&S	Better communication with state; develop evacuation plan, Signage at intersections with flooding	Better communication with state; develop evacuation plan			L	O
Chestnut Street Bridge		Town	V	Widen Bridge			Widen Bridge	H	O
Rt. 1 Culvert @ Elm Street		Private (State)	V	Clean Culvert			Clean Culvert	H	S
Private water - Mendon Rd Area		Private	V	Interconnection (Short term); Obtain System (Long term);		Interconnection (Short term); Obtain System (Long term);		M	L
Arnold Road Culvert		Town	V	Replace with wider culvert				M	L
Private Sewer - Rt. 1		Private	V	Communicate with private owners if issues arise (short)		Town Ownership		L	L
Utility Management		Town	S	Continue to be proactive in maintenance of Infrastructure & Coordination				H	O
Dams	Multiple	Town, Federal & Private	V, S	Maintenance/ Fortifying			Maintenance/ Fortifying; Implement Emergency Action plan	H	O
Waste water treatment Plant	Cedar Rd	Town	V, S	Emergency Shut down; Reduce I/I; Maintenance (Backup) Mitigate Flooding Impacts				L	L
Bridges/ Culverts	Town-wide	Town & State	V	Repair/ Replace (Arnold Rd, Chestnut, Elm); Dredge/ Remove sediment			Properly sizing	H	S/O
Downtown Roads that flood	Downtown	Town & State	V	O & M (catch basins); Upgrade/ add drainage Inspection program; Regrade roads;				H	S/O
Town wells/ Water Treatment Plant	Multiple	Town	V	Inspections Prevent contamination	Improve access to Emergency Power			M	L
EOC/Police Station	Chestnut St	Town	S	Ensure access; Emergency Back-up Communication				L	L

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Features				Priority	Time	
Location	Ownership	V or S	Priority	Time		
Societal				H - M - L	Short Long Ongoing	
Town Communications	town-wide	town	S	Upgrade existing equipment; integrate into town-wide system	H	S&O
Neighborhood Groups	town-wide	private	S	Formalize communication system; include in connectCTY; educate groups on hazard risks	M	L&O
Disadvantaged Populations	Pineapple Inn/East Street	town	V	Determine reach-out groups to communicate with these populations; share information between departments (Board of Health & School Department) to determine who/where these groups are; single point of contact	M/H	O
Sheltering Facility	Middle School	town	S	Continued communication with state and Board of Health; Microgrid; develop alternate resource options develop equipment resource list;	L	O
Emergency Services/ EOC	town-wide	town	S	continued training for emergency management; educating public on correct line of communication in case of emergency	M	O
Senior Housing/ Mobile Homes	multiple	State	V	Resource management for relocation Identify contact personnel for facility; Study to identify relocation location area educate on available services & evacuation	M/H	S&O
Flooding North Washington Street (Park St to Chestnut)		Town & Private	V	Continue Maintenance; 10 mile improvements; emergency evacuation plan for manor & senior housing	H	O
Trailer park below Attleboro Dam		City	V	Continue Maintenance; Obtain Dam Safety efforts (Con Com)		O (S to obtain)
Sewer System Backups Homes		Private	V	Continue to remove I/I		O
Reservoir access to out-lying areas		Town	V	Coordinate Electric & DPW; Continue tree maintenance	H	S
Medium Reserve Corps		Town	S	Continue to Fund with Updating Tech		
Emergency Operation Center (police Station)		Town	S	Continue to Fund with Updating Tech		
Nursing Home	N. Washington	Private	V	Evacuation plan, Emergency backup Access, communication	L	L
Schools (Middle school/shelter)	Multiple	Town	V, S	Access transportation/ communication supplies, inventory	M	S/O
Senior/ Disabled Housing	Multiple	Federal, Private	V	Evacuation Plan; Communication/ transportation access; Emergency Power	M	O
Dams	Multiple	Private	V	Communication; Evacuation Plan; Fortifying dams; Flood Response Plan	H	O
Communication Program	Town-wide	Town	V, S	Expand/ Improve CTY; Siren (warning) System/Evacuation Rt. ; Public Outreach	H	S/O
Sewer System Backup	Town-wide	Town, Private	V	Emergency Power @ Pump Stations; I/I removal; Public Outreach/programs (check valves)	M	L

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

Features	Location	Ownership	V or S	Flooding	Extreme Winter Weather	Nor'easter/ High Wind	Dam Failure	Priority	Time
								H - M - L	Short Long Ongoing
Environmental									
Conservation Land	multiple	town	S	Develop land trust; Conservation bylaw				L	L
Drinking water Supply Protection	multiple	town	V & S	Local bylaw; study expanding drink water supply protection area				H	S
Aquifer Protection	town-wide	town	V & S	Local bylaw; study expanding drink water supply protection area				M	O
Recreation Land/ Ponds	Falls Pond Whiting's Pond Hatchery	town & federal	V & S	Obtain funding to maintain				L	L
Ten Mile River/ Contamination	Center of Town	town	V	Dredging river; identify ownership for potentially widening			Evaluate dam removal; continued maintenance	H	S
Building in Flood Plain	town-wide	town & state	V	Additional zoning restrictions; purchase land in floodplain; transfer development rights; tax incentives to maintain passive recreation				M	O
10 Mile River Storage Capacity		Town	V	Dredging Filled in Wetlands ; Coordinate with State & DOT to limit silting; Remove stone retaining walls; Add "V" slopes with retaining walls				H	L
Downstream impacts from dam Release		Town	V	Reach out to DEP for more flexible drawdown plan, Anticipated increase in price			Reach out to DEP for more flexible drawdown plan, anticipated increase in price	H	S/O
50% Forested & Open Space		Town	S	Continue to Maintain & Protect					
Inundation of Town Water Wells		Town	V	Obtain Inspection Report			Obtain Inspection Report	L	O
Private Wells (west) Drawn dry		Town	V		Extend Water System	N/A		L	L/S
Ground-water Contamination from Historical Industry		Town	V	Continue to Upgrade system; 10 mile River Improvements				L	O
Ten Mile River	Ten Mile/ Downtown	Town, Private	V	Dredging Program - O&M drainage system, preserve trees/ vegetation; Repair or remove walls - Reduce sand, sediment, replace culverts (Chestnut, Rte. 1/Elm); Increase flood storage - wetland restoration along river; prevent development/ bylaw - Maintenance/cleaning of river;				H	S/O
Development in Flood prone Areas	Multiple	Private	V	Regulations/ Bylaw; Purchase land/Restore to natural condition				L	L
Aquifer Protection District	Zoning Districts	Private	V, S	Improve Bylaws; Education/ Outreach; Improve BMP's (Existing Industry Uses)				L	L
Open Space Protection	Town-wide	Town, Private	S	Purchase Land; Bylaws/Protection				M	L
Trees/ Vegetation	Town-wide	Town, Private	V	Education/ Outreach Bylaws	Maintenance Program		Maintenance Program; O&M	L	L
Scott's Brook	Multiple	Town, Private	V	Arnold Rd. Culvert Replacement; Prevent development- Regulations, O&M Drainage systems; Maintenance/ Cleaning				H	S/O

North Attleborough, MA
MVP Community Resilience Building (CRB)
Workshop
Summary of Findings
June 2019



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MVP Community Resilience Building (CRB) Workshop

North Attleborough, MA

Summary of Findings

Prepared by: BETA GROUP, INC.
Prepared for: Town of North Attleborough, MA

June 2019

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1.0 OVERVIEW

Over the past several years there have been an increasing number of impacts due to climate change that have affected the Town of North Attleborough. Storm events in March of 2010 led to severe flooding in the downtown area; tropical storm Irene in 2011 and tropical storm Jose in 2017 resulted in damage to trees and buildings throughout town; major winter storm events in 2013 and 2015 led to extensive power outages from downed trees and wires. In response to the effects of climate change, the Massachusetts Executive Office of Energy and Environmental Affairs began the Municipal Vulnerability Preparedness Program

The Municipal Vulnerabilities Preparedness (MVP) Program is a state program designed to provide support for cities and towns in Massachusetts to begin the process of planning for climate change resiliency and implementing priority projects. Involving the municipalities of Massachusetts to address natural hazards being amplified by climate change allows more targeted solutions to these problems. This program is designed to encourage discussion in order to help municipalities identify the vulnerabilities, strengths, and opportunities to take action to reduce risk and build resilience in their communities.

1.1 COMMUNITY RESILIENCE BUILDING WORKSHOP

As part of the MVP Program, the Town of North Attleborough received a grant to host the Community Resilience Building (CRB) Workshop. This report documents the results from the CRB Workshop which BETA Group facilitated, following the CRB framework. The CRB framework is a system of discussions and note taking developed by The Nature Conservancy and prescribed by the MVP Program. The goal of this workshop was to further investigate the Town's prior planning efforts and resiliency measures as well as to develop a list of strengths, as well as priority actions to focus on in the immediate future.

1.1.1 PARTICIPANTS & PLANNING

The participants were selected based on the CRB Workshop Participant Worksheet as well as any other influential and knowledgeable community members recommended by the Town. Members from a broad range of town departments as well as community members were invited, and in attendance. There were 27 invited participants from 16 departments or boards. The 19 participants who attended the CRB Workshops represented 10 departments. The list of participants is attached in Appendix A.

The participants were assigned to one of 3 teams, distinguished by the colors yellow, green and blue as noted on Maps and Matrices. These teams were intentionally made up of people from different departments in order to enhance different perspectives and identify resiliency opportunities that solved multiple vulnerabilities across sectors. The core team for the CRB Workshop consisted of Mark Hollowell, DPW Director; Shannon Palmer, Conservation Commission Agent; and Nancy Runkle, Town Planner.

It was decided that the workshop should be divided into two, four-hour sessions, held on Tuesday May 7 and Thursday May 9, 2019. Both workshops were held from 10 am to 2 pm at the North Attleborough Department of Public Works. BETA led this workshop with multiple CRB-trained individuals. They provided an overview of climate change in the area as well as climate observations and projections from the Northeast Climate Science Center research, and implications that these changes will have on North Attleborough's infrastructure, society, and environment so participants could have a more informed discussion throughout the rest of the workshop. The presentations are attached in Appendix B.



BETA representatives welcoming stakeholders to the MVP Workshop

1.1.2 WORKSHOP PROCESS

1.1.2.1 DAY 1

The first four hour session was held on May 7, 2019 and began with an overview of the CRB Workshop and the goals of this session and climate change predictions for the Ten Mile River Basin by BETA MVP-Certified facilitators Andrew Dennehy, P.E. and Kendra Martin, P.E. Some of the research and projects presented were that precipitation is projected to increase 22%, there will be 36% fewer days below freezing, and up to 6 times as many days over 90° F by 2050. A summary of this information, which was given to participants as a handout, is attached in Appendix C. A map of the town overlaid with FEMA flood zones was provided to each small group and a map depicting critical facilities in town was also displayed for reference. These maps can be found in Appendix D.

The participants then broke out into their designated small groups for further discussion. Small group discussions began by discussing hazards affecting North Attleborough and developing a list of the top four hazards of concern each group felt North Attleborough was most impacted by. Groups were made up of a facilitator (a member of the BETA Group team), a scribe/spokesperson, and approximately five other workshop participants.

The participants then returned to the larger group to discuss and come to a consensus on the top four hazards moving forward. These were identified as, Flooding, Extreme Winter Weather, Nor'easters/High Wind and Dam Failure. After a brief recess for lunch, groups annotated maps to highlight vulnerable infrastructure, flood zones, and community resources in order to fill in the "Features" column in the Ranking Matrix. Participants also identified who owned that feature and categorized it as vulnerability or strength. These matrices can be found in Appendix D.



Participants worked in small groups to identify areas in town impacted by hazards

1.1.2.2 DAY 2

The second four-hour session began with a brief presentation and overview of day one, before groups moved on to fill in the Ranking matrix by discussing action items that address the vulnerability and the feature by either posing a solution to a hazard/feature or enhancing the strengths of a feature against a specific hazard identified in the previous session. Some common action items included improving Town communication, especially emergency communication and alert systems, developing a plan for vulnerable/elderly population (evacuation plans, emergency generators, etc.), dredging the Ten Mile River, Town ownership of private water and sewer systems and backup power for water/sewer pump stations and shelters. Throughout the small group discussions, the BETA facilitators stayed with groups to ask questions and provide guidance.

After actions had been identified, the small groups decided whether each action was a high, medium, or low priority and if the time frame was short term, long term, or ongoing action. Using this information each small group determined their top five priority actions to present to the large group.

After all groups had completed the above tasks individually, participants reconvened to discuss, rank and prioritize together in order to come to a consensus on the highest priority actions to be taken across North Attleborough. Each group stated the features they focused on in all three categories as well as their top five actions. These sheets where each group contributed their ideas during large group discussion can be found in Appendix E. A discussion followed in which the group at large deliberated why some items should or shouldn't be included in the priority actions. The results and any other notable information throughout the process of the workshop is described in the following sections of this report.

2.0 SUMMARY OF FINDINGS

2.1 CURRENT CONCERNS & CHALLENGES

2.1.1 TOP HAZARDS OF CONCERN

During the individual group discussion the following hazards were identified as being most prevalent and/or impactful in the Town of North Attleborough, and were brought up for discussion in the larger group.

- Flooding
- Nor'easters
- Dam Failure
- Snow & Blizzards
- High Winds
- Ice Storms
- Hurricanes



Participants discuss priority hazards

Several of these hazards could be grouped together into one category and through the discussion there was largely group consensus on what the top four hazards should be with some discussion of the wording. The group decided on the following hazards as the top four.

- Flooding
- Extreme Winter Weather
- Nor'easters/High Wind
- Dam Failure

2.1.2 IMPORTANT FEATURES RELATED TO IDENTIFIED HAZARDS

North Attleborough has experienced a number of weather related events in recent years, and these events are expected to increase due to climate change. Flooding along the Ten Mile River and downtown is a major concern for North Attleborough, particularly since Route 1, a major roadway has flooded in the past. Major flooding in March of 2010 caused the banks of the Ten Mile River to overflow and flood residents yards and basements. Numerous streets were closed, including North Washington Street, Whiting Street, and Route 1 at Chestnut Street. Extreme winter weather events have increased in frequency and severity. The high winds and snowfall associated with this weather leads to fallen trees and downed power lines.

Based on the frequency and severity of the four identified hazards, the groups discussed which areas, communities and systems would be most affected by the occurrence of these hazards. Three categories of town features were discussed: infrastructural, societal and environmental. Below is a list of all of the community features the groups identified:

- Infrastructural
 - Electric distribution system
 - Culverts & bridges
 - Private sewer and water
 - Fiber optics
 - Dams
 - Interstate highways
 - WWTP
 - Down town flooding of roads
 - Town wells/ WTP
 - EOC / Police Station
 - Chestnut St bridge
 - Route 1/ Elm St culvert
 - Utility Management
- Societal
 - Town communication
 - Neighborhood groups
 - Disadvantaged populations
 - Sheltering facility
 - Emergency services
 - Senior & Disabled housing/
mobile homes
 - Dam inundation areas
 - Down town flooding
 - Sewer system backups
 - Residential access to outlying areas
 - Medical reserve corporation
- Environmental
 - Building in floodplain
 - 10 Mile River
 - Recreation land
 - Aquifer protection
 - Drinking water supply protection
 - Conservation land
 - Open space
 - Loss of trees & vegetation
 - Scott's Brook
 - Downstream impacts of dam
release
 - Water wells inundation
 - Drying up of private wells
 - Groundwater contamination from industry



Participants discuss town features

It is important to note that not all of these features were considered vulnerabilities. Some of these features are already strong and as the small groups began to think about ranking, the largest vulnerabilities were identified and prioritized.

2.1.3 PRIORITIZING HAZARDS

Some of the common action items that related to the biggest concerns came up repeatedly in small groups and are described below.

- **Downtown flooding:** Much of downtown floods due to the capacity of the Ten Mile River as well as the culverts and bridges being in need of cleaning or dredging. This also impacts the risk in the event of dam failure. Considering the extensive flooding already occurring in much of town, especially the commercial center of North Attleborough, the flooding effects of dam failure would be catastrophic. Looking into ways to prevent dam failure, and mitigate flooding through cleaning and maintaining of physical assets, dredging the Ten Mile River, or potentially restoring the natural water boundaries by deconstructing the dam are all actions that were highly discussed in relation to this serious hazard.
- **Town communication:** An especially important part of emergency preparation is the ability to communicate to the entire population of Town during an extreme weather event or other emergency. One area of concern was that the public emergency communication system is not utilized to its full extent. Many residents don't know what the system is and therefore even if the system works properly, the result is ineffective. This puts an emphasis on public outreach and education before a potential emergency event to ensure that response to the event would go smoothly. Some participants suggested incorporating a Town warning siren and posted evacuation route.
- **Protection of the population of North Attleborough:** This is a category that came up in every group and ultimately is one of the most important goals in any Town improvement. There are several populations that were addressed specifically, such as the elderly, the disabled, those who live in mobile homes, and other disadvantaged populations. One way to address the protection of these groups is to ensure safe evacuation routes and clear plans in case of emergency. Another action/concern brought up when discussing the especially vulnerable populations is the need for backup power and generators in the event that a flood or major storm event cuts off power. These generators should be placed in emergency shelters, and in locations that provide a critical service to the Town, like pump stations.

Some of these items became incorporated into the top five priority action items, while the rest of that list came from more general concerns addressed in the top four hazard categories facing North Attleborough.

2.2 STRENGTHS AND ASSETS

Many participants thought that while the communication techniques could be improved through more targeted and intentional public outreach, the system itself was in good working order and the Town should continue surveying to maintain the assets it currently owns. This is particularly important because if there are potential improvements to be made in the use of the system, it is helpful that system itself is functioning well. Another strength identified in the Town of North Attleborough is that although there are several infrastructural concerns regarding dams and culverts etc. the town regularly inspects and maintains those physical features. This makes it much easier to avoid larger disasters in the future and will help increase the lifespan of those assets and avoid damage to the Town. The town also has implemented inspections and redundancies in several other key areas that provide an extra layer of protection in order to reduce likelihood that a hazard will affect the Town.

Some of the societal strengths included are already involved and well established neighborhood groups. These local leaders are influential and can be a critical point of contact for citizens and town officials for

information. By educating these under-utilized neighborhood groups, these citizens can be a better resource to the local community and will help with public outreach on key points of importance. An additional strength is that North Attleborough has a regional sheltering facility at the Middle School. Appendix D has a more detailed description for reference.

2.3 FUTURE ACTIONS AND RESOLUTIONS TO IMPROVE COMMUNITY RESILIENCE

2.3.1 HIGHEST PRIORITY ACTIONS

The top actions determined by each small group are listed below. As in other categories there was overlap in the findings and opinions of the groups.

- Dredging/widening of Ten Mile River, bridges and culverts
- Increase flood storage
- Evaluate/study dam removal in certain areas
- Upgrade existing communication equipment of town-wide system
- Upgrading culverts at multiple locations
- Review evacuation plan
- Increased catch basin cleaning downtown
- Expand/improve communication CTY
- Improve public outreach
- Maintain and fortify Emergency Action Plans
- Develop land trust and local by-law to protect drinking water
- Investigate in relocation of housing for vulnerable populations in floodplains in event of flood
- Widen Chestnut Street bridge
- Maintain and fortify dams
- Investigate and prepare for downstream impacts from dam release



Participants discuss potential actions

After each group presented their proposed top action items there was a large group discussion about the merits of each and process of serious discussion in order to ensure that the top overall actions that the participants prioritized for the Town were not only important, but also feasible and would have maximum impact on the priority hazards listed earlier. After a robust conversation, the group came to a consensus on the top actions to be taken and prioritized as a result of the Municipal Vulnerability Preparedness Workshop. The results are as follows:

- Dredge and widen the Ten Mile River to increase flood storage and capacity
- Widen and lower the bridge on Chestnut Street
- Clean culverts at Elm St at Rte. 1 and Route 1 at Orne Street
- Review and improve the operation and maintenance plans for dams to address climate impacts
- Maintain and clean drainage pipes downtown
- Review and revise evacuation plan in the event of downtown flooding
- Review and revise the town communication system as necessary
- Educate residents on existing town communication systems

While this document describes much of the discussion that ensued during the CRB workshop there is additional detail in the Appendices. See Appendix D: Summary of all Actions by Priority, Category and Small Group for full results of all prioritized actions, strengths and vulnerabilities.

3.0 CONCLUSION AND NEXT STEPS

3.1 CONTINUING WITH THE MVP PROGRAM

North Attleborough presented the CRB process and summary of findings at a public listening session at the Department of Public Works on May 22, 2019. This provided an opportunity for any member of the interested public to learn, ask questions, and provide feedback about the workshop and the results that emerged.

Priority actions identified during the workshop will be integrated into the Hazard Mitigation Plan currently underway by BETA. North Attleborough will also continue to pursue funding in order to reduce the effects of climate change, and improve the town's resiliency.

APPENDIX A: List of Invitees & Participants

Appendix A: List of Invitees Participants

5/7/2019	5/9/2019	First	Last	Town Department/ Role
	x	Michele	Bernier	Solid Waste Department
x	x	Julie	Boyce	Planning Board
		Michael	Brousseau	Fire Department
		Steven	Carvalho	Parks and Recreation
x	x	Deb	Cato	Conservation Commission
x	x	Marie	Clarner	Planning Board
		Joe	Collins	Asst. to Town Administrator
		Michelle	DiRenzo	Planning Board
x		Erin	Eagan	Board of Health
x	x	Mark	Fisher	Buisness Leader
x	x	Anne Marie	Flemming	Board of Health
		Michael	Gallagher	Town Administrator
		Scott	Holcomb	Superintendent of Schools
x	x	Mark	Hollowell	Department of Public Works
x	x	Kyle	Kummer	Public Schools
		Ann Marie	Letourneau	Concil on Aging
x		Joan	Maschetto	Board of Public Works
x	x	Chris	Mitchell	Electric Department
x	x	Joe	Nihill	Department of Public Works
x	x	Glenn	Ofcarcik	Conservation Commission
x	x	Shannon	Palmer	Conservation Commission
	x	Lyle	Pirnie	Economic development
x	x	Nancy	Runkle	Planning Board
x	x	Patricia	Wash	Conservation Commission
x		Bill	Wanberg	Department of Public Works
		Russell	Wheeler	Building Department

5/7/2019	5/9/2019	Name	BETA Group Title
x	x	Andrew Dennehy, PE	Project Manager
x	x	Dan Hammerberg, EIT	Engineering Designer
	x	Kendra Martin, PE	Engineer
x	x	Mary Beth Irwin	Engineering Designer
x		Melissa Recos, PE	Project Manager



APPENDIX B: North Attleborough CRB Workshop Presentation

- Day 1 Presentation
- Day 2 Presentation

Municipal Vulnerability Program (MVP)

North Attleborough, MA

May 7th, 2019



Welcome and Introductions

- Andy Dennehy, Associate, BETA Group, Inc.
- Kendra Martin, Engineer, BETA Group, Inc.
- Dan Hammerberg, Engineering Designer
- Mary Beth Irwin, Engineering Designer, BETA Group, Inc.
- Workshop Participants

Municipal Vulnerability Program Agenda

- Program Overview
- Workshop Overview
- Science and Resources Information
- Introduction to Small Team Exercise
- Reporting Small Team Findings
- Summary Discussion
- Wrap-up and Introduce Workshop #2 (Thursday)

Program Overview

EXECUTIVE ORDER 569: AN INTEGRATED CLIMATE CHANGE STRATEGY FOR THE COMMONWEALTH 9.16.16



- Reducing greenhouse gas emissions to combat climate change
- Preparing for the impacts of climate change
 - State Adaptation Plan
 - Agency Vulnerability Assessments
 - Municipal Support
 - Climate Coordinators

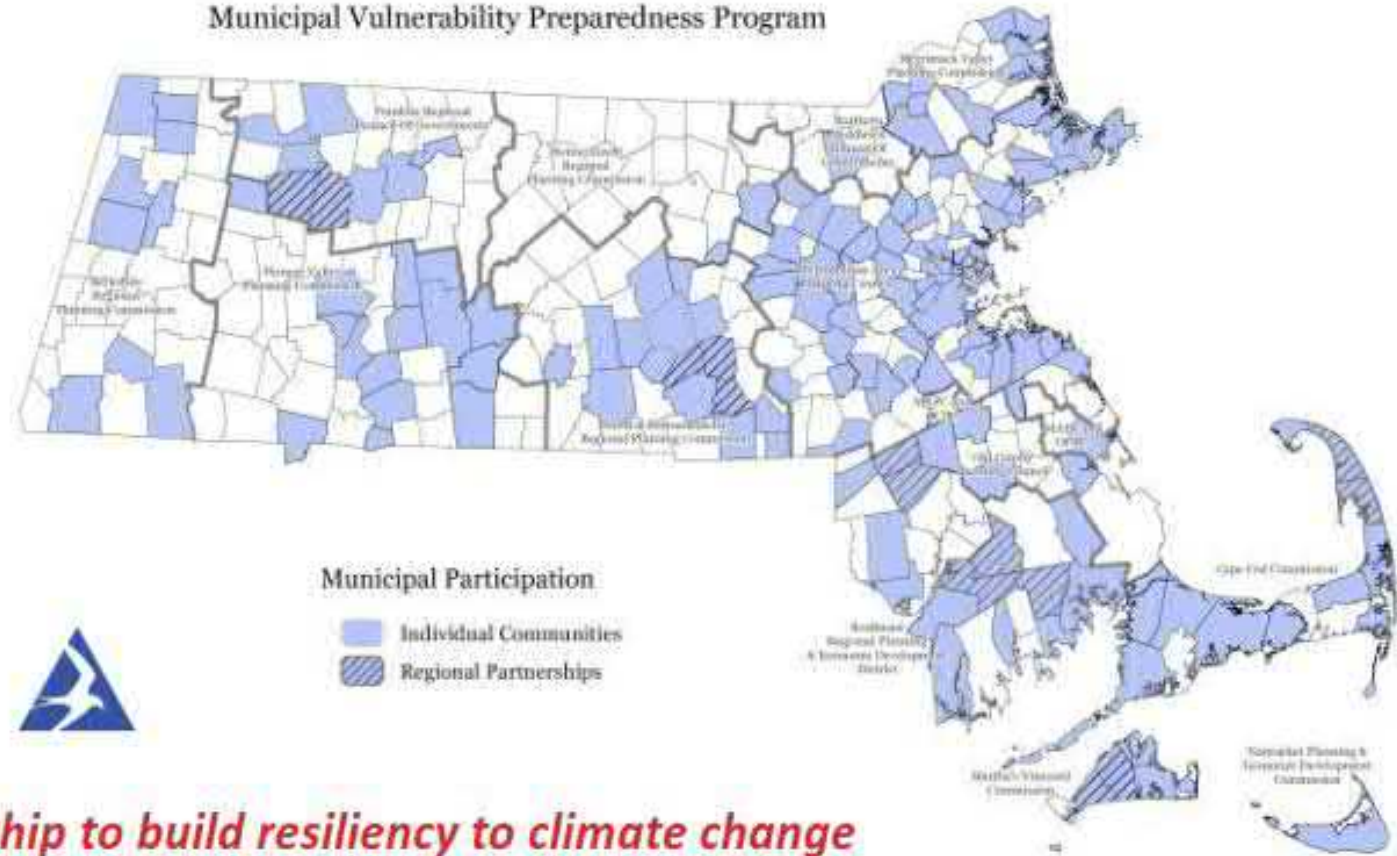
Program Overview

Municipal Vulnerability Preparedness (MVP)

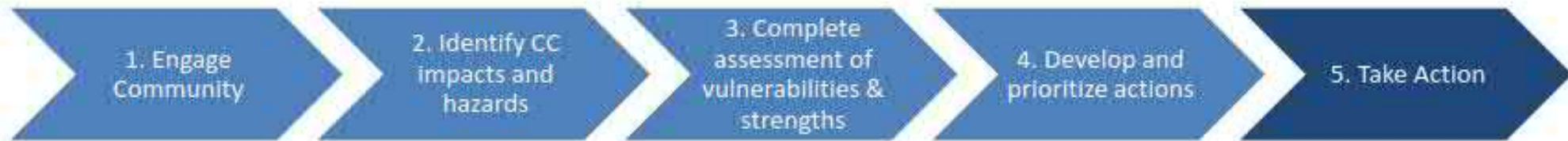
2017-2019



Municipal Vulnerability Preparedness Program



State and local partnership to build resiliency to climate change



Program Overview

Two MVP Grant Opportunities



RFR 1: MVP Planning Grant



RFR 2: MVP Action Grant

Nature Based Solutions

Nature-Based

Nature-Based Solutions use natural systems, *mimic* natural processes, or *work in tandem with* traditional approaches to address natural hazards like **flooding**, **erosion**, **drought**, and **heat islands**.

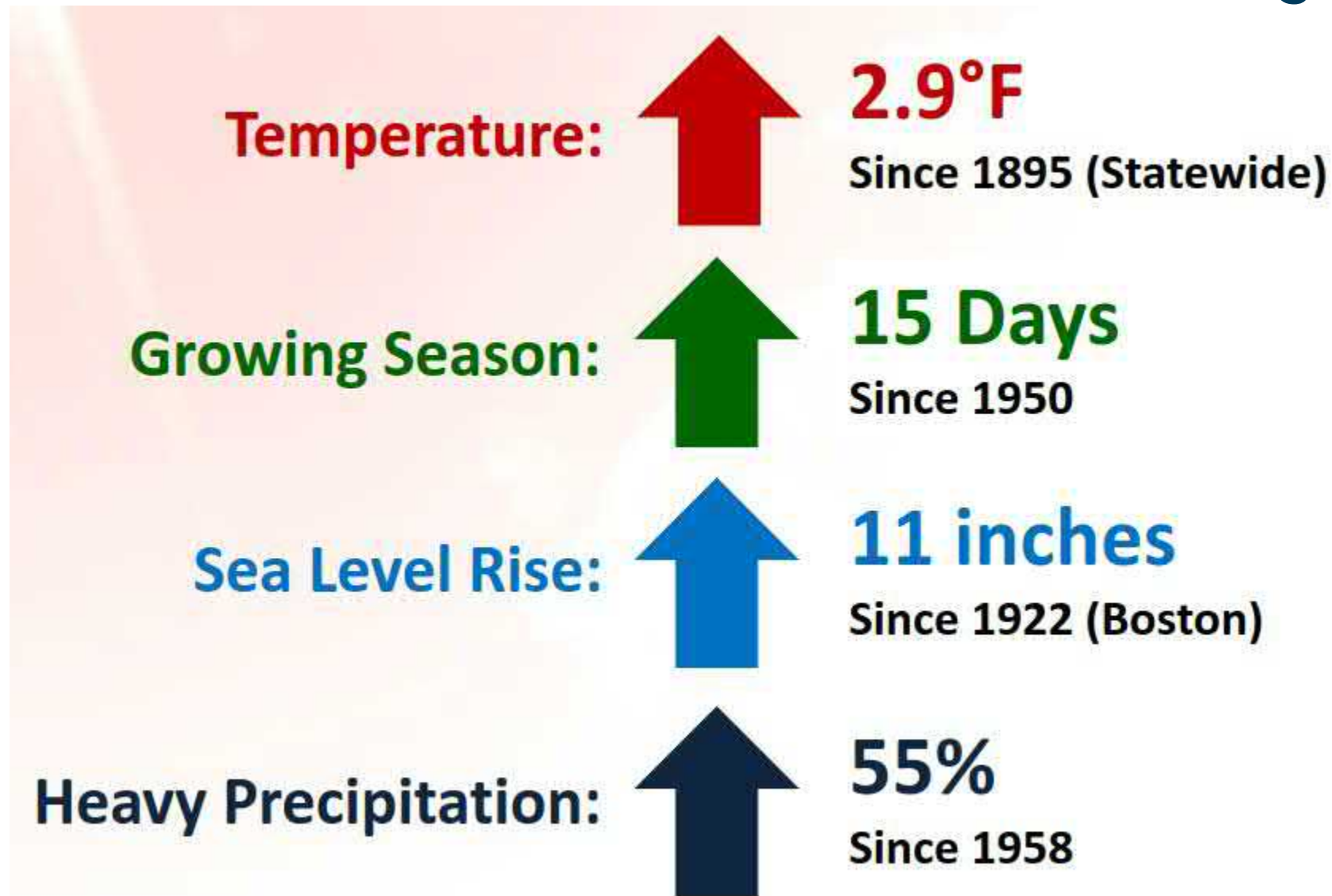


**Green
Infrastructure**

**Low Impact
Development (LID)**



Massachusetts Observed Climate Changes



Massachusetts Projected Climate Changes



Find maps, data products, reports, articles...

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Layers Controls & Legends 1 Quick Zoom

Collapse All Hide All Remove All

Days > 90 °F (Projected)

Opacity: 100%

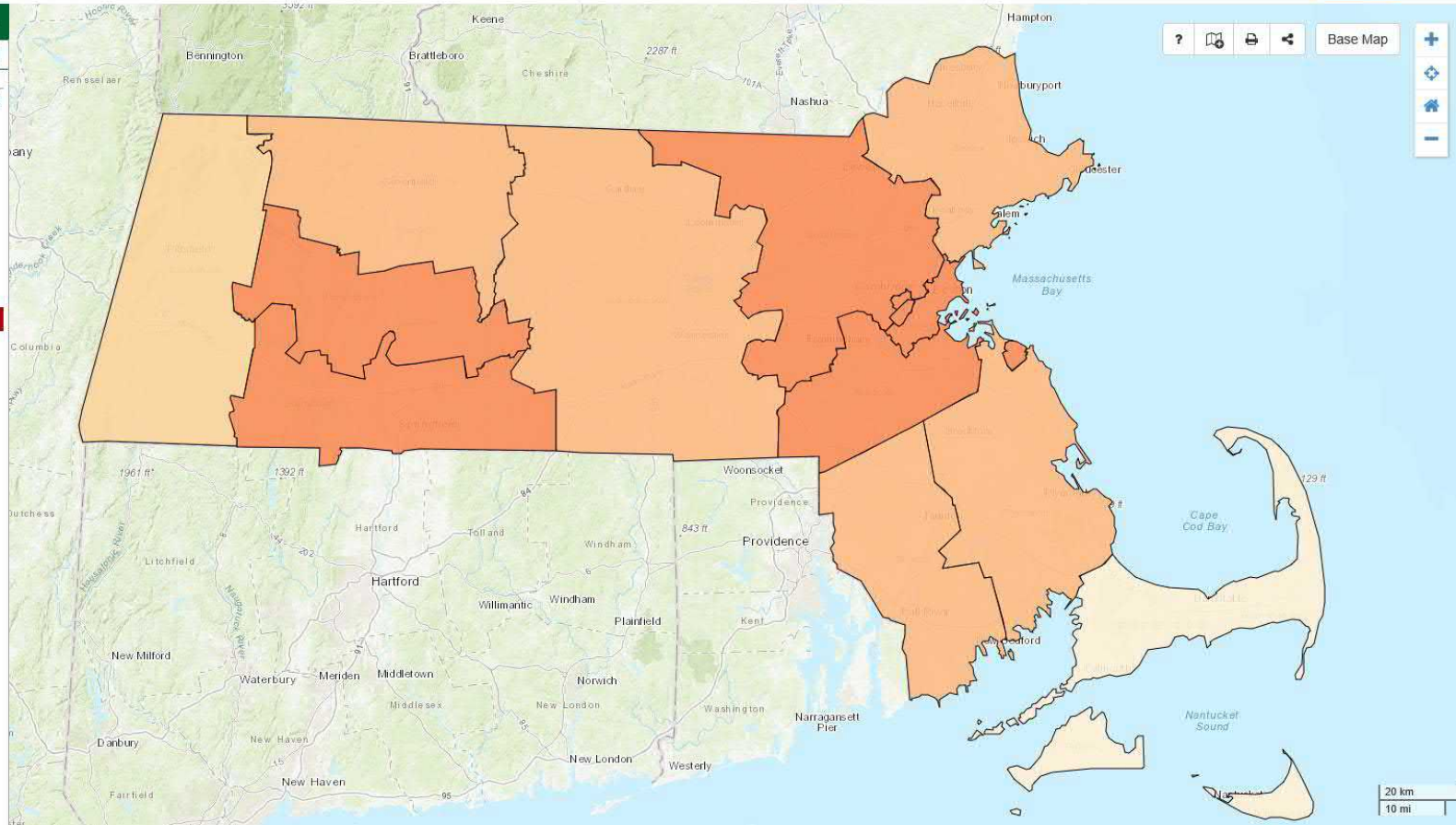
Summary: County

Decade: 2050s

Season: Annual

Projected change in # days above 90°F

+9.1 +13.6 +19 +27.2 +34.1



Massachusetts Projected Climate Changes



Find maps, data products, reports, articles...

Search



Layers Controls & Legends 1 Quick Zoom

Collapse All Hide All Remove All

Days > 90 °F (Projected)

Opacity: 100%

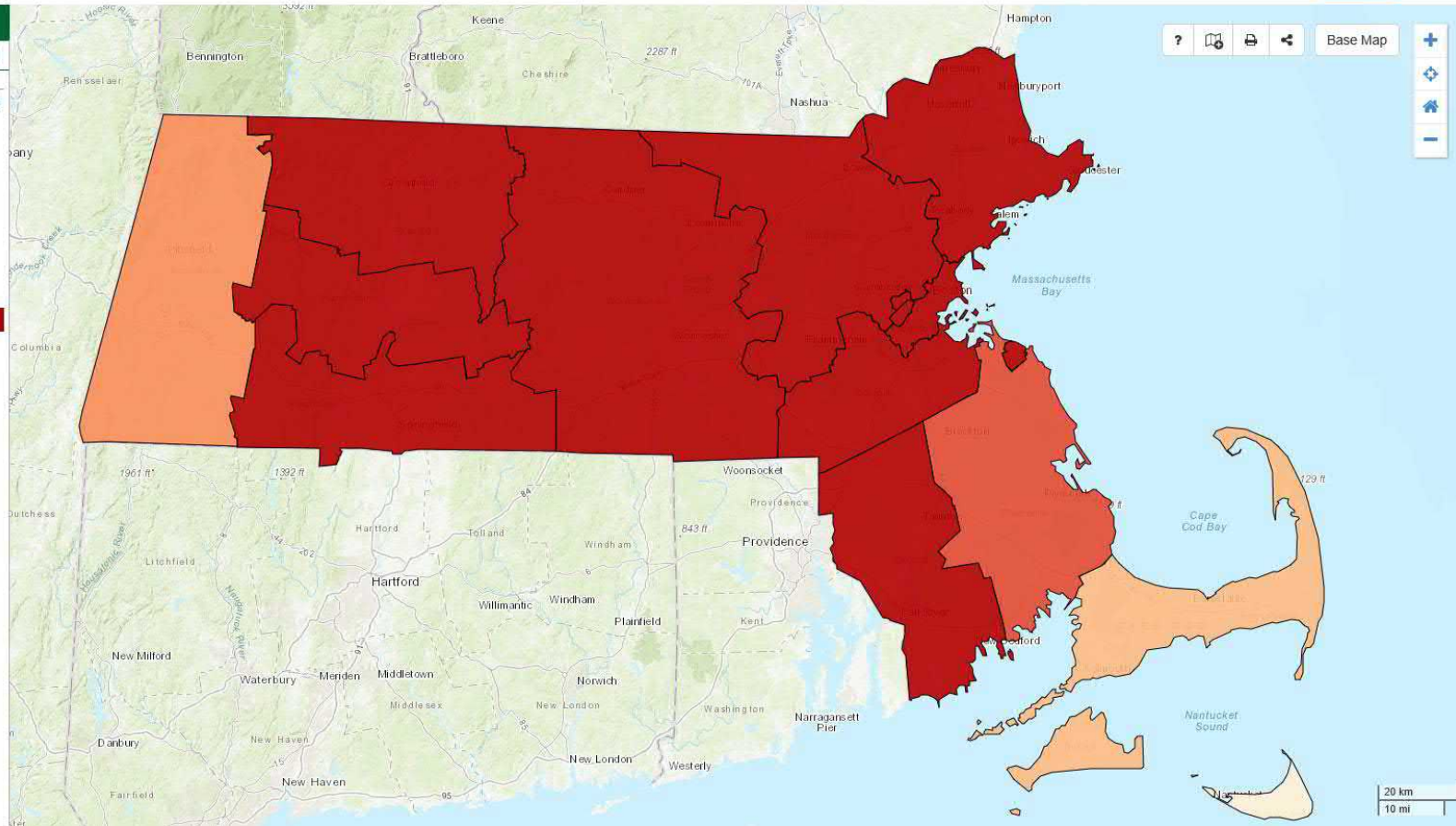
Summary: County

Decade: 2090s

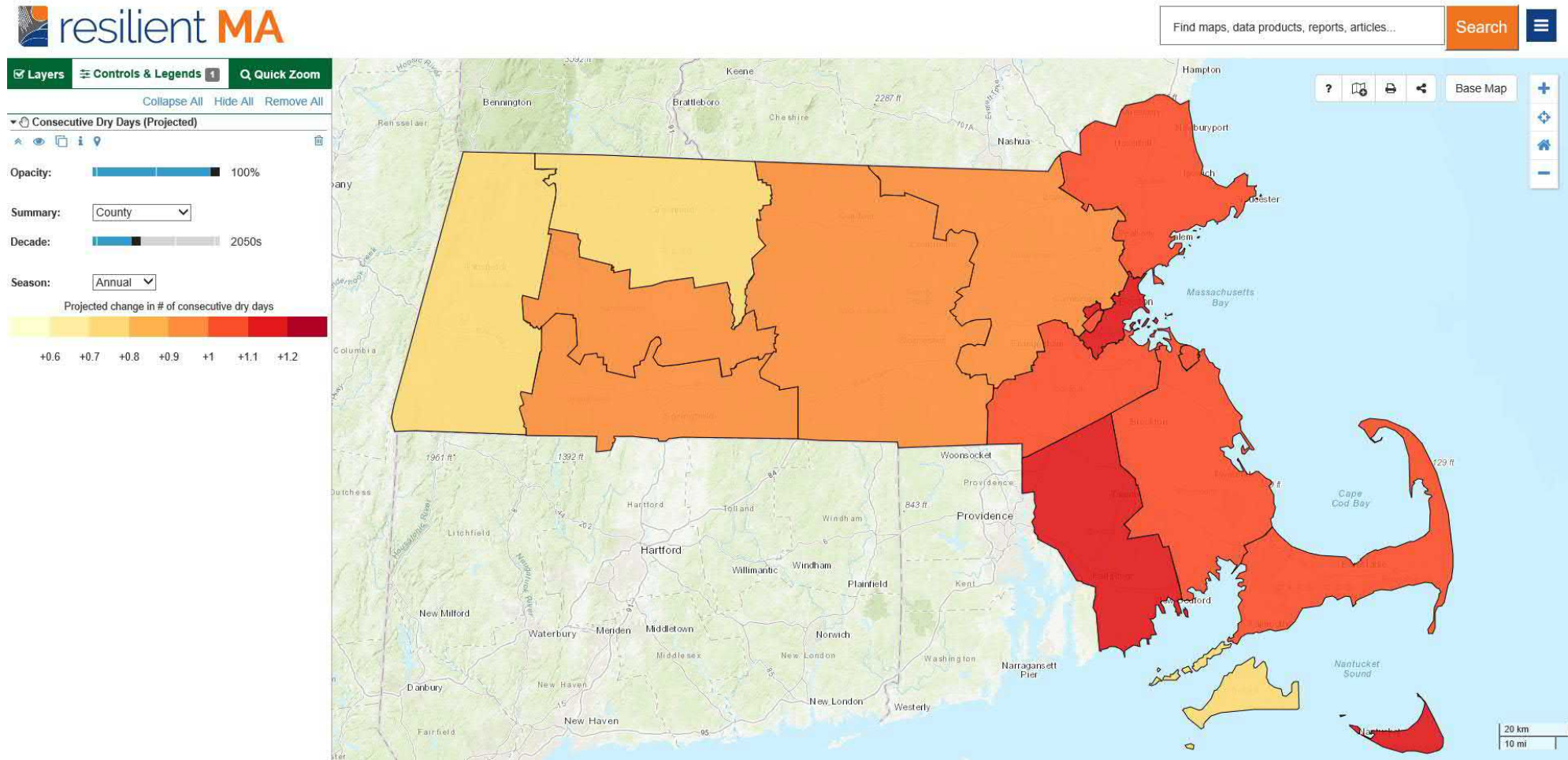
Season: Annual

Projected change in # days above 90°F

+9.1 +13.6 +19 +27.2 +34.1



Massachusetts Projected Climate Changes



Massachusetts Projected Climate Changes



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Consecutive Dry Days (Projected)

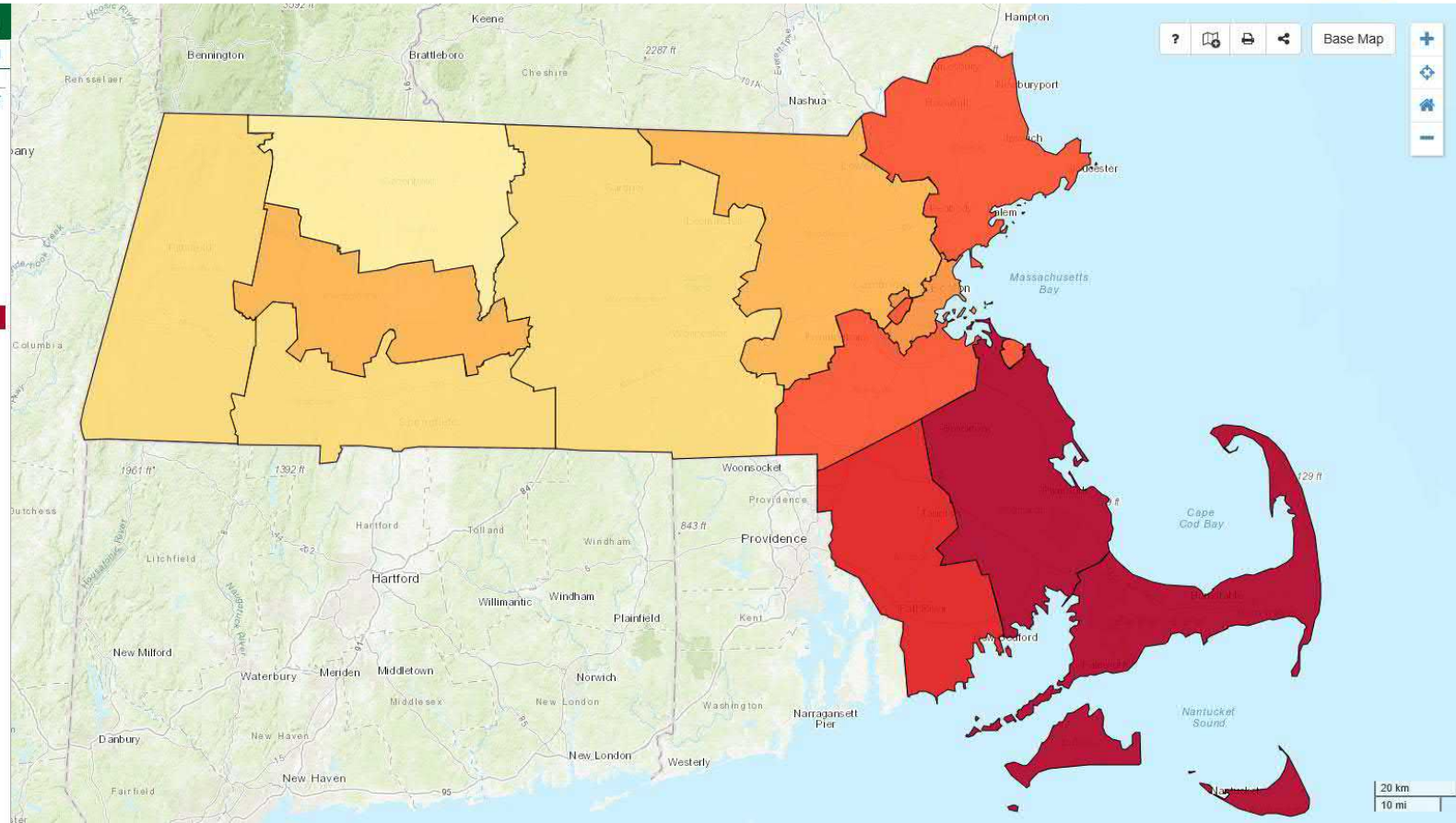
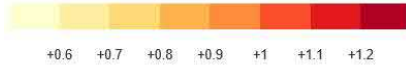
Opacity: 100%

Summary: County

Decade: 2090s

Season: Annual

Projected change in # of consecutive dry days



Massachusetts Projected Climate Changes



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Extreme Precipitation > 1" (Projected)

Opacity: 100%

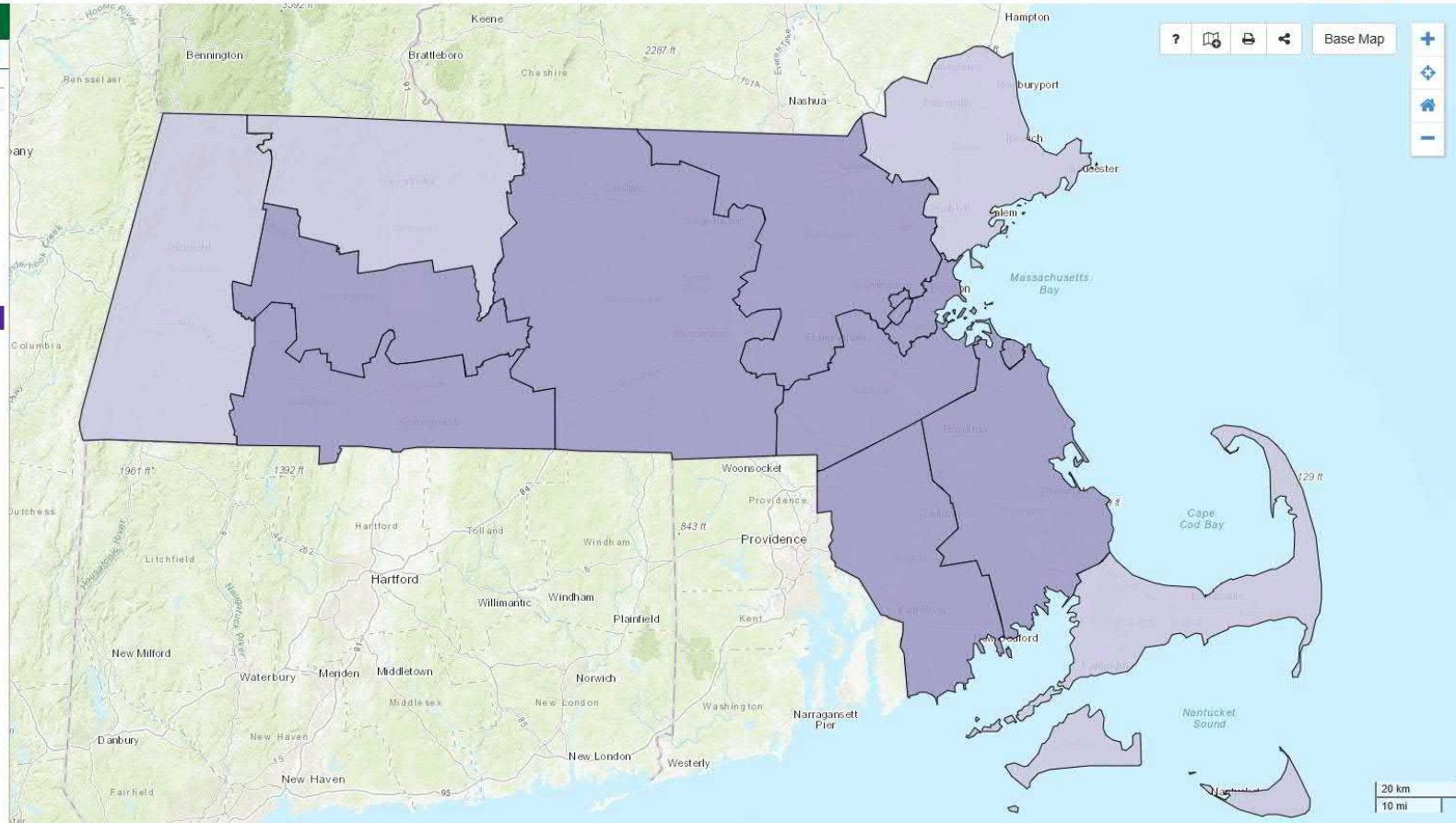
Summary: County

Decade: 2050s

Season: Annual

Projected change in # Days with precipitation > 1"

+1.1 +1.6 +1.8 +2.1



Massachusetts Projected Climate Changes



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Extreme Precipitation > 1" (Projected)

Opacity: 100%

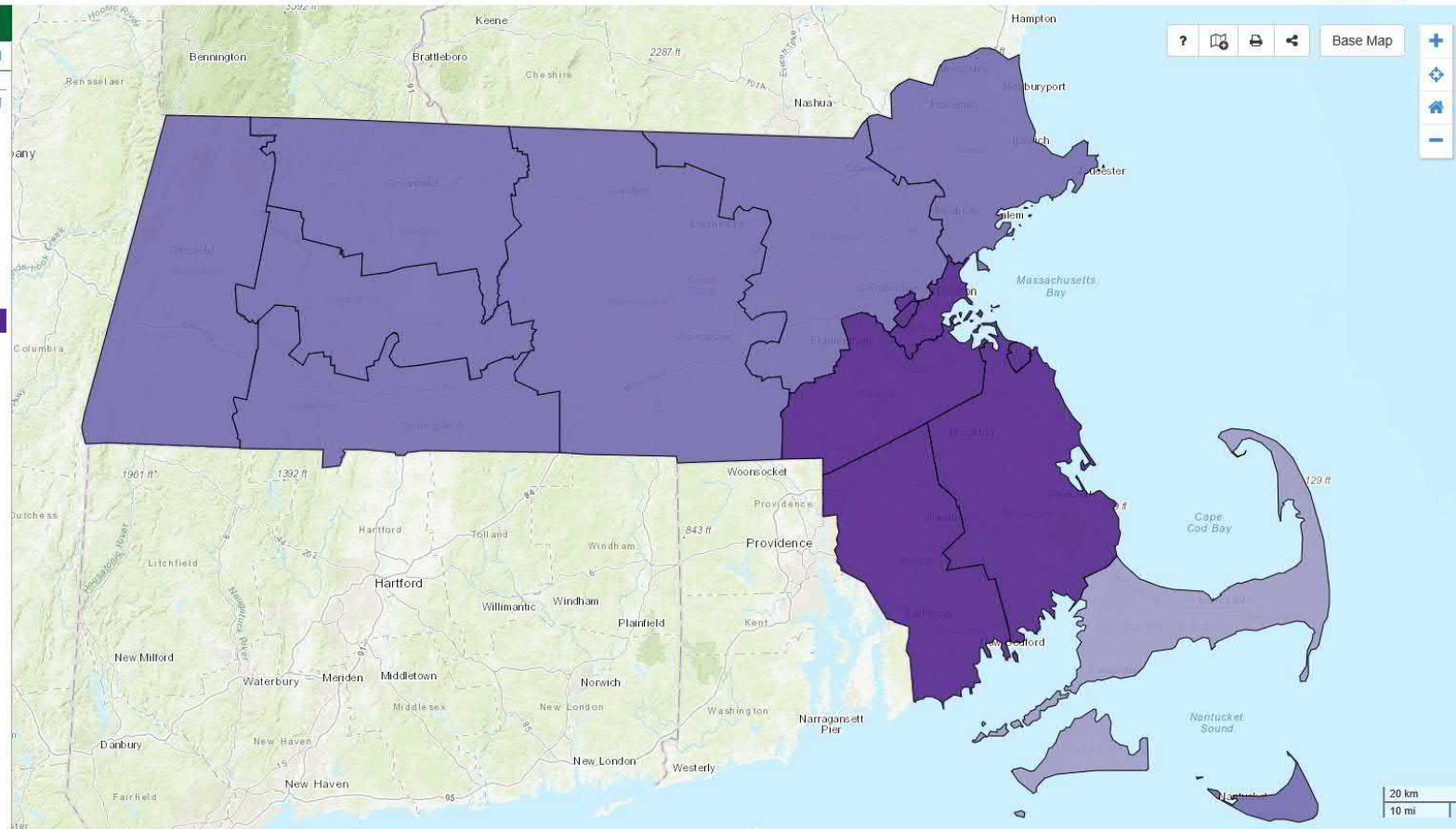
Summary: County

Decade: 2090s

Season: Annual

Projected change in # Days with precipitation > 1"

+1.1 +1.6 +1.8 +2.1



Massachusetts Projected Climate Changes

Variable	Observed Value (1971-2000 average)	Change by 2050s	Change by 2090s
Annual average temperature	47.5 °F	Increase by 2.8-6.2 °F	Increase by 3.8-10.8 °F
Number of days per year with daily Temp > 90°F	5 days	Increase by 7-26 days	Increase by 10-63 days
Number of days per year with daily Temp < 32°F	146 days	Decrease by 19-40 days	Decrease by 24-64 days
Heating degree-days per year (HDD)	6839 Degree-Day °F	Decrease by 773-1627	Decrease by 1033-2533
Cooling degree-days per year (CDD)	457 Degree-Day °F	Increase by 261-689	Increase by 356-1417
Growing degree-days per year (GDD)	2344 Degree-Day °F	Increase by 531-1210	Increase by 702-2347
Total Precipitation per year	47 inches	Increase by 0.9-6 inches	Increase by 1.2-7.3 inches
Number of days with precip > 1 in	7 days	Increase by 0-3 days	Increase by 1-4 days

Impacts from Climate Change

- Increasing Temperatures
 - Increase in heat-related illnesses
 - Changes to growing seasons
 - Larger demands on energy systems
- Increased Precipitation and Downpour Intensity
 - Increased risk of flooding
 - Water quality impacts
 - Impact on agriculture and natural ecosystems
- Changes to Rain and Snow Patterns
 - Reduced snow cover
 - Potential increase in drought events
 - Impacts to habitats and species

Workshop Overview

- Characterize Hazards (Workshop #1)
- Identify Community Vulnerabilities and Strengths (Workshop #1)
- Identify and Prioritize Community Actions (Workshop #2)
- Determine the Overall Priority Actions (Workshop #2)
- Develop Comprehensive Summary Products (Workshop #2)

Workshop Overview

Community Resilience Building Risk Matrix					www.CommunityResilienceBuilding.org				
Features				Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)				Priority	Time
				Location	Ownership	V or S	H	M	L
H-M-L priority for action over the Short or Long term (and Ongoing)								H - M - L	Ongoing
V = Vulnerability S = Strength									
Infrastructural									
Societal									
Environmental									

Characterize Hazards

Identify past, current, and future hazards (large team).

Direct participants to make a list of hazards (causes of impacts) that the community has dealt with, currently faces, and anticipates experiencing in the future (i.e., tornados, ice/wind storms, drought, wildfire, tsunamis, sea level rise, landslides, earthquakes, etc.). Utilize the following triggering questions to accelerate dialogue and surface initial agreement on top four hazards.

- What hazards have impacted your community in the past? Where, how often, and in what ways?
- What hazards are impacting your community currently? Where, how often, and in what ways?
- What effects will these hazards/changes have on your community in the future (5, 10, 25 years)?
- What is exposed to hazards and climate threats within your community?
- What have been the impacts to operations and budgets, planning and mitigation efforts?
- Others concerns or considerations related to impacts?

A **Hazard** is like the sun. The **Risk** from that hazard is sunburn. The **Vulnerability** includes the length of **Exposure** of skin to the sun. The **Action** to reduce risk from the hazard is to apply sunscreen or seek shade.



Top to bottom: © Rich Reid/TNC, © Devan King/TNC, © Jay Harrod/TNC

Identify Community Vulnerabilities and Strengths



Community Resilience Building Workshop Risk Matrix			
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength			
Features	Location	Ownership	V or S
Infrastructural			
Societal			
Environmental			

Steps C1, C2 and C3 below focus on identifying infrastructural, societal and environmental vulnerabilities and strengths. Each step requires three tasks to complete the Risk Matrix: **(i)** identify features, **(ii)** describe feature locations, **(iii)** identify feature ownership, and **(iv)** identify each feature as a vulnerability or strength, or both.

Hazard Characterization

- Flood
- Hurricane/Tropical Storm
- Earthquake
- Snow & Blizzard
- Wildland Fire
- Thunderstorm
- Tornado
- Extreme Temperature
- Dam Failure
- Nor'Easter
- Landslide
- Ice Storm
- Major Urban Fire
- High Wind
- Drought

Introduction to Small Team Exercise

- Team Facilitators
- Introductions
- Choose Team Spokesperson and Scribe
- Discuss 4 Top Hazards
- Develop Community Vulnerabilities and Strengths

Hazard Characterization

- Flood
- Hurricane/Tropical Storm
- Earthquake
- Snow & Blizzard
- Wildland Fire
- Thunderstorm
- Tornado
- Extreme Temperature
- Dam Failure
- Nor'Easter
- Landslide
- Ice Storm
- Major Urban Fire
- High Wind
- Drought

Reporting Small Team Findings

Small Group Breakout #1

- Spokesperson to present findings on hazards to full group
- Full group develops top 4 hazards

Identify Community Vulnerabilities and Strengths



Community Resilience Building Workshop Risk Matrix			
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength			
Features	Location	Ownership	V or S
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Societal			
Environmental			

Steps C1, C2 and C3 below focus on identifying infrastructural, societal and environmental vulnerabilities and strengths. Each step requires three tasks to complete the Risk Matrix: **(i)** identify features, **(ii)** describe feature locations, **(iii)** identify feature ownership, and **(iv)** identify each feature as a vulnerability or strength, or both.

Reporting Small Team Findings

Small Group Breakout #2

- Spokesperson to present findings on features to full group
- Full group discusses findings

Summary Discussion

- Discuss hazards and features/assets

Wrap-up and Introduce Workshop #2

- Consensus on hazards
- Discussion of assets
- Any questions from today's workshop
- Workshop #2
 - Identify and Prioritize Community Actions
 - Determine the Overall Priority Actions

Municipal Vulnerability Program (MVP) North Attleborough, MA

May 9th, 2019



Welcome and Introductions

- Andy Dennehy, Associate, BETA Group, Inc.
- Melissa Recos, Project Manager, BETA Group, Inc.
- Kendra Martin, Engineer, BETA Group, Inc.
- Dan Hammerberg, Engineering Designer

Municipal Vulnerability Workshop Agenda

- Reporting Small Team Findings on Assets
- Summary Discussion on Assets
- Small Group Breakout
 - Develop Actions
 - Prioritize Actions
 - Urgency of Actions
- Reporting Small Team Findings on Priority Actions
- Consensus on Priority Actions
- Wrap-up

Characterize Hazards

Identify past, current, and future hazards (large team).

Direct participants to make a list of hazards (causes of impacts) that the community has dealt with, currently faces, and anticipates experiencing in the future (i.e., tornados, ice/wind storms, drought, wildfire, tsunamis, sea level rise, landslides, earthquakes, etc.). Utilize the following triggering questions to accelerate dialogue and surface initial agreement on top four hazards.

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Identify Community Vulnerabilities and Strengths



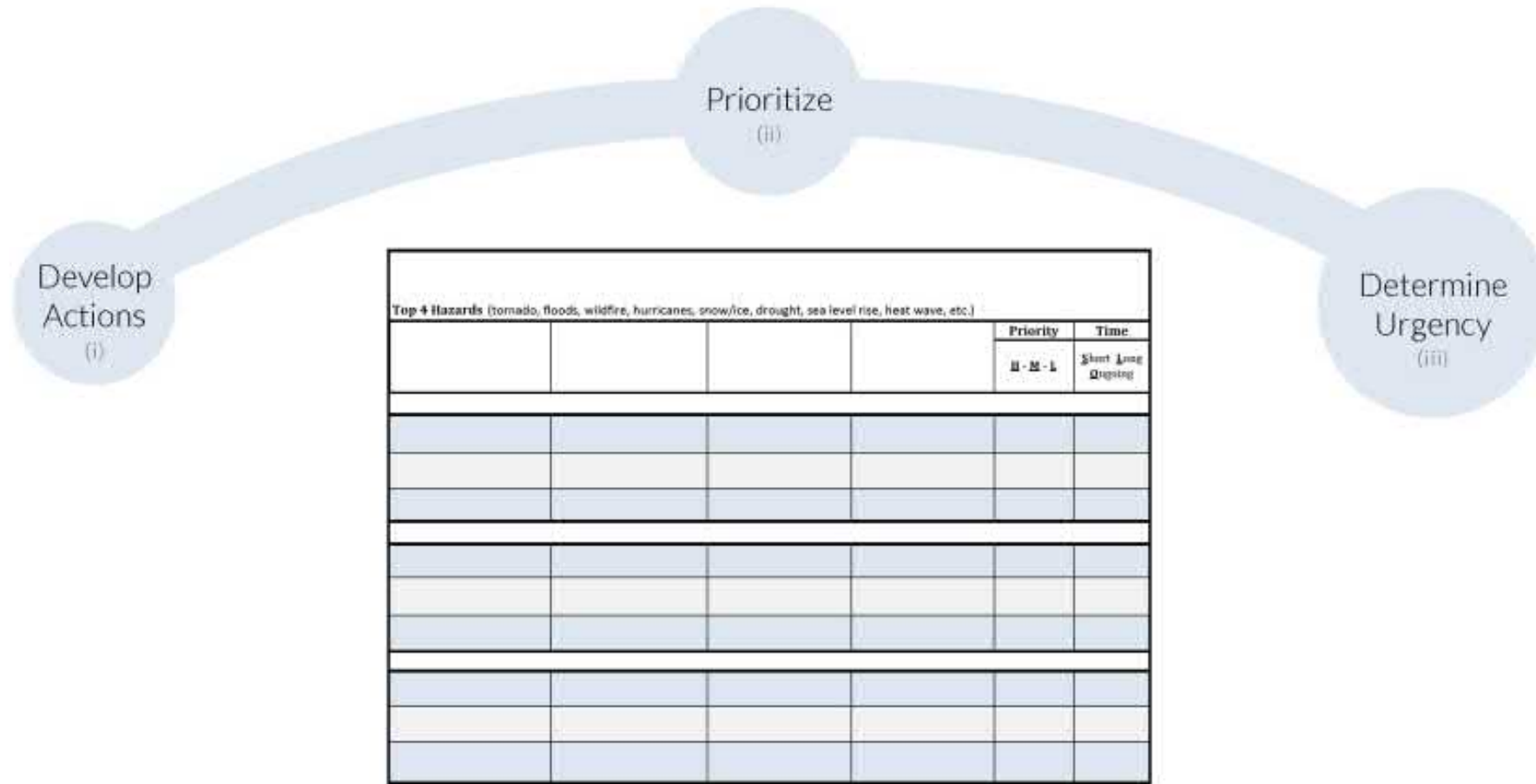
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Introduction to Small Team Exercise

- Team Facilitators
- Introductions
- Choose Team Spokesperson and Scribe
- Develop Actions
- Prioritize Actions
- Develop Urgency

Introduction to Small Team Exercise



Steps D1, D2 and D3 below focus on identifying and prioritizing infrastructural, societal and environmental actions. Each step requires three tasks to complete the Risk Matrix: **(i)** develop actions, **(ii)** prioritize actions (**H**igh, **M**edium, **L**ow), and **(iii)** determine urgency (**O**ngoing, **S**hort-term, **L**ong-term).

Introduction to Small Team Exercise

Community Resilience Building Workshop Risk Matrix				Top 4 Hazards (tornado, floods, wildfire, hurricanes, snow/ice, drought, sea level rise, heat wave, etc.)				Priority	Time
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Coastal Flooding SLR/Storm Surge	Inland Flooding and Rain Events	Ice and Snow	Wind	H - M - L	Short Long Ongoing
Features	Location	Ownership	V or S						
Infrastructural									
Town Campus	Specific	Town	V	Verify risk from flooding events; Identify alternative locations during peak flooding; Verify maintenance plan annually				H	S
Evacuation Routes - Roads	Town-wide	Town/State	V	Install highly visible signage for evacuation routes; Develop and implement communication program				H	S
Electrical Distribution System	Multiple	CL&P/Town	V	Within floodplain area, establish plan to address protection and long-term relocation of equipment		Upgrade transformers; Maintain power line protection zone (tree trimming)		H	O-L
Dams (inland and coastal)	Multiple	Private	V	Prevent possibility of catastrophic dam failure; Identify and remove dams to minimize downstream flooding due to failure				H	L
Railway and State Bridges	Multiple	Amtrak/State	V	Improve communications between parties; Expand green/grass infrastructure and improve bridge structures; Assess vulnerability and prioritize infrastructure improvement list				M	S
State Roads/Intersections	Town-wide	State/Town	V	Coordinate with DOT, volunteers, public works to improve response; Need signage to warn of flooding risk at critical intersections				M	L
Wharves and Shore Infrastructure	Shore	Town-State-Private	V	Pursue comprehensive shoreline management plan; Establish community dialogue on retaining/relocating infrastructure				L	S
Waste Water Treatment Facility	Specific	Town	V	Conduct alternative siting feasibility study; Relocate to low risk area within next 25 years.				L	L
New Ambulance Center	Specific	Town	S	Continue to support services in budget; Add additional staff and vehicle in next annual cycle					Ongoing
Zoning Regulations (maintain large lot size)	Multiple	Town	S	Current building codes control development in risky areas; Consider additional zoning incentives (TDRs) to reduce risk to residential units					Ongoing

More examples of actions:

- Improved access in high-risk locations
- Reduce housing stock in vulnerable areas
- Prioritize development in low-risk areas
- Integrate future risks in capital improvement plans
- Flood-proof manhole covers
- Secure new generators for critical facilities

When prioritizing, consider factors such as:

- Funding availability and terms
- Agreement on outstanding impacts from recent hazard events
- Necessity for advancing longer term outcomes
- Contribution towards meeting existing local and regional planning objectives

Examples of urgency:

- Current project to install hurricane-proof roof on school is an ongoing (O) action.
- Ensuring evacuation procedures are updated annually is considered a short-term (S) action.
- Reducing housing stock in high-risk areas, elevating a road, or replacing a bridge are long-term (L) actions.

Reporting Small Team Findings

Small Group Breakout

- Spokesperson to present findings on priority actions
- Full group develops top five priority actions

Wrap-up

- Discuss actions and priorities
- Consensus on top five priority actions
- Questions?
- Next Steps
- Wrap-up

APPENDIX C: Workshop Handout

- Climate Change Projections (Temperature)
- Climate Change Projections (Precipitation)
- Examples of Strengths and Vulnerabilities
- Demographic Data

North Attleborough Municipal Vulnerability Preparedness (MVP) Program Workshop

TEN MILE RIVER BASIN CLIMATE CHANGE PROJECTIONS (TEMPERATURE)¹

SUMMARY OF MODELING RESULTS

- By 2050, average temperatures could increase by 15%. By 2090, average temperatures could increase by almost 27%.
- Number of days with temperatures +90 °F could increase by 6 times as today by 2050. By 2090, there could be 12 times as many +90 °F than today.
- Number of days with temperatures below freezing could drop as much as 36% by 2050 and 62% by 2090.
- Less energy is expected to be spent on heating in the winter, but more energy is expected to be spent on cooling in the summer.

TEMPERATURE PROJECTIONS

Variable	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Average Annual Temperature (°F)	49.5	54.2 – 57.0	56.7 – 62.8
Maximum Annual Temperature (°F)	60.3	64.8 – 67.5	67.3 – 72.9
Minimum Annual Temperature (°F)	38.6	43.6 – 46.6	46.2 – 52.6
Annual Days with Max Temp over 90°F	8	29 – 53	47 – 97
Annual Days with Min Temp below 32°F	137	107 – 87	90 – 52
Annual Heating Degree-Days (Base 65°F)	6,248	5,035 – 4,410	4,444 – 3,272
Annual Cooling Degree-Days (Base 65°F)	569	1,093 – 1,565	1,460 – 2,472
Annual Growing Degree-Days	2,585	3,547 – 4,240	4,140 – 5,656

¹ Source: Northeast Climate Science Center, 2018. Massachusetts Climate Change Projections. University of MA Amherst. Published by MA Executive Office of Energy and Environmental Affairs. Available at: <http://resilientma.org/data/datamajor-river-basins>.

North Attleborough Municipal Vulnerability Preparedness (MVP) Program Workshop

TEN MILE RIVER BASIN CLIMATE CHANGE PROJECTIONS (PRECIPITATION)¹

SUMMARY OF MODELING RESULTS

- Average annual precipitation could increase 22% by 2050s and 26% by 2090s.
- Greatest increase in precipitation will occur during winter months.
- Greatest increase in consecutive dry days will occur during fall months.

PRECIPITATION PROJECTIONS

Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Annual Precipitation (inches)	47.8	49.4-58.2	50.2-60.2
Winter Precipitation (inches)	11.8	12.4-15.7	13.6-17.4
Spring Precipitation (inches)	12.1	12.7-15.6	13.4-16.8
Summer Precipitation (inches)	11.3	11.2-16.2	10.8-14.8
Fall Precipitation (inches)	12.6	13.0-17.3	12.3-16.8
Annual Days with Precipitation over 1 inch	8	8-11	9-14
Annual Days with Precipitation over 2 inches	1	1-2	1-3
Annual Days with Precipitation over 4 inches	0	0-1	0-1
Annual Consecutive Dry Days	17	15-20	15-21

¹ Source: Northeast Climate Science Center, 2018. Massachusetts Climate Change Projections. University of MA Amherst. Published by MA Executive Office of Energy and Environmental Affairs. Available at: <http://resilientma.org/data/datamajor-river-basins>.

North Attleborough Municipal Vulnerability Preparedness (MVP) Program Workshop

EXAMPLES OF STRENGTH AND VULNERABILITIES¹

INFRASTRUCTURE

Examples of Vulnerabilities:

- Main road floods during storms, blocking emergency response.
- Power outages during heat waves lead to health concerns.
- Wildfire and high winds resulting in supply chain interruptions.
- Sewer pump stations become submerged and inoperable.
- Compromised rail system due to heat-related warping of tracks.

Examples of Strengths:

- Critical road elevated and passable by emergency management
- Hurricane roof installed at school with improved sheltering capacity.
- Hardened utility lines reduce outages due to ice storms.
- Undersized culvert replaced to reduce flooding in key intersection.
- Improvement to communication systems during extreme weather.

SOCIETAL

Examples of Vulnerabilities:

- Senior housing without backup generators during heat waves.
- Residents without access to transportation during hurricane evacuation.
- Household contamination and sewage mobilization during flooding.
- Limited areas of refuge in elementary schools during tornados.

Examples of Strengths:

- Reliable communications protocols across departments for all employees.
- "Neighbor-helping-neighbor" program aligned with emergency operations.
- Well-supported volunteer organizations (fire, ambulance, CERTs).
- Faith-based and civic groups with hazard preparedness plans.

ENVIRONMENTAL

Examples of Vulnerabilities:

- Proliferation of subdivisions in wildfire and flood prone areas.
- Lack of urban tree canopy increasing heat island effect.

Examples of Strengths:

- Forested watersheds maintain drinking water supply during droughts.
- Native, vegetated slopes remain stable after intense 24hr rain events.
- Floodplains provide stormwater storage and downstream flood reduction.

¹ Source: Community Resilience Building Workshop Guide, communityresiliencebuilding.com



North Attleborough Municipal Vulnerability Preparedness (MVP) Program Workshop

DEMOGRAPHIC DATA¹

Parameter	Breakdown
Total Area	19.1 square miles
% of Land Use	Agriculture = 3.6% Forest = 39.0% Open Space = 7.7% Recreation = 1.5% Urban = 45.7% Water = 2.4%
Population	28,732
Age	0-19 = 27% 20-34 = 17% 35-64 = 44% 65+ = 11%
Household Income	<\$40,000 = 22% \$40,000 - \$60,000 = 14% \$60,000+ = 65%
% Below Poverty Line	6%
Race	Asian = 4% Black = 3% White = 90% Other = 3%
Ethnicity	Hispanic = 4% Not Hispanic = 96%
Environmental Justice	3%
% Population Over 65 Living Alone	4.4%
Heart Attack Hospitalizations	17.9 (age-adjusted rate per 10,000 people)
Asthma Emergency Visits	32.3 (age-adjusted rate per 10,000 people)
Pediatric Asthma Prevalence	13.7% of all children enrolled in grades K-8

¹ Source: MA Dept of Public Health, 2018. MA Environmental Public Health Tracking Community Profile for North Attleborough. Report Created on May 3, 2019.

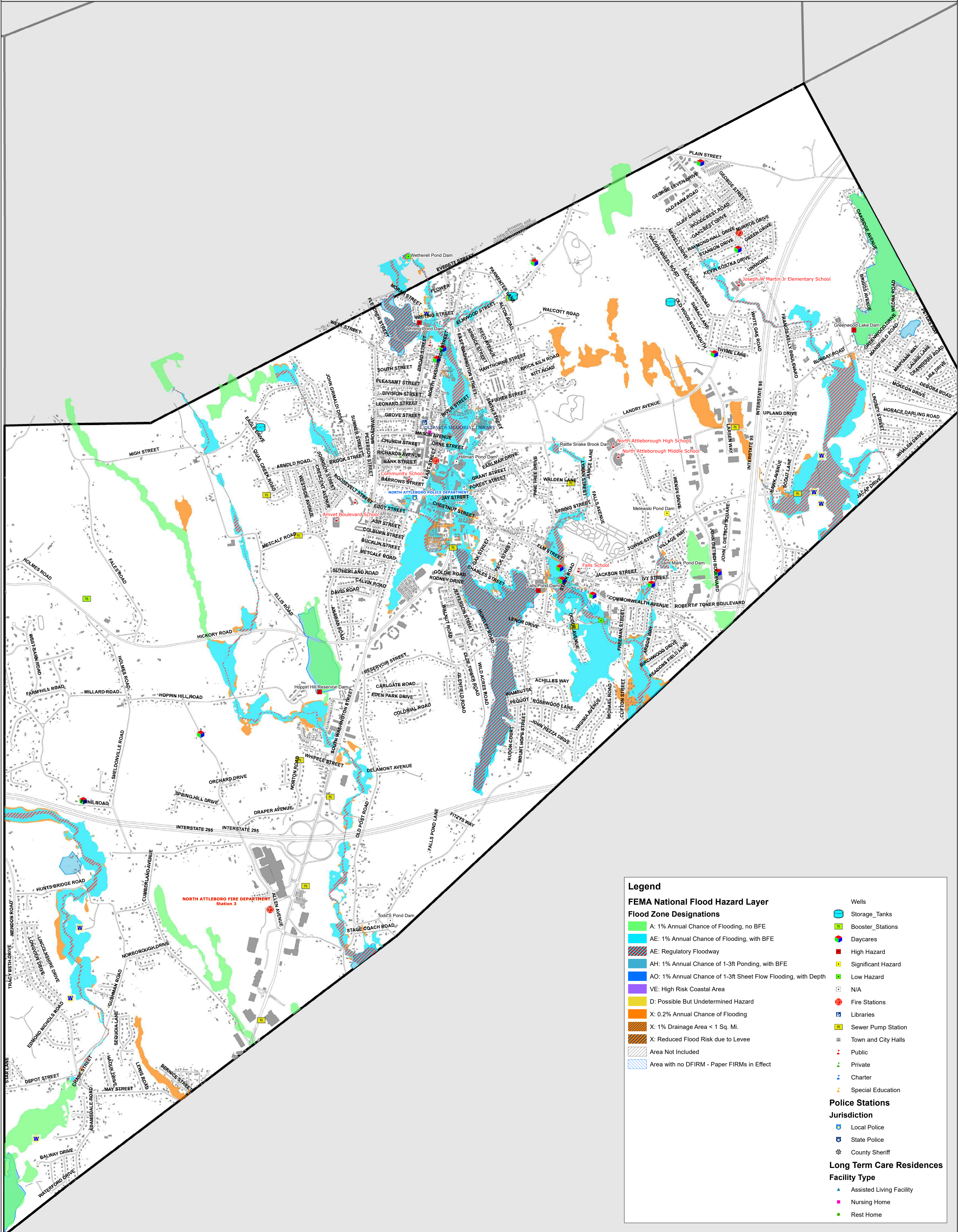
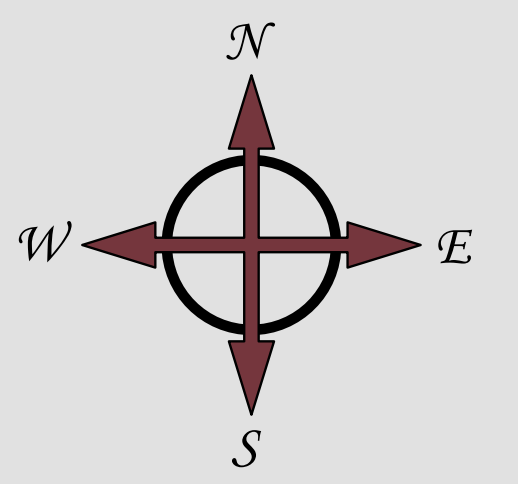
APPENDIX D: Workshop Matrices & Maps

- Critical Facilities Map
- Marked Flood Zones Maps (3)
- Filled in CRB Matrices (3)
- Priority Ranked Matrix

Town of North Attleborough, Massachusetts

Municipal Vulnerability Preparedness (MVP) Workshop

Critical Facilities Map



Legend

FEMA National Flood Hazard Layer

Flood Zone Designations

- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- AH: 1% Annual Chance of 1-3ft Ponding, with BFE
- AO: 1% Annual Chance of 1-3ft Sheet Flow Flooding, with Depth
- VE: High Risk Coastal Area
- D: Possible But Undetermined Hazard
- X: 0.2% Annual Chance of Flooding
- X: 1% Drainage Area < 1 Sq. Mi.
- X: Reduced Flood Risk due to Levee
- Area Not Included
- Area with no DFIRM - Paper FIRMs in Effect

Wells

- Storage_Tanks
- Booster_Stations
- Daycares
- High Hazard
- Significant Hazard
- Low Hazard
- N/A
- Fire Stations
- Libraries
- Sewer Pump Station
- Town and City Halls
- Public
- Private
- Charter
- Special Education

Police Stations

Jurisdiction

- Local Police
- State Police
- County Sheriff

Long Term Care Residences

Facility Type

- Assisted Living Facility
- Nursing Home
- Rest Home

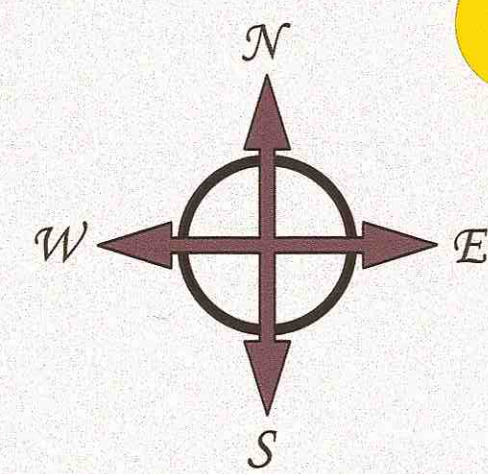
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Town of North Attleborough, Massachusetts

Municipal Vulnerability Preparedness (MVP) Workshop

FEMA Flood Zones

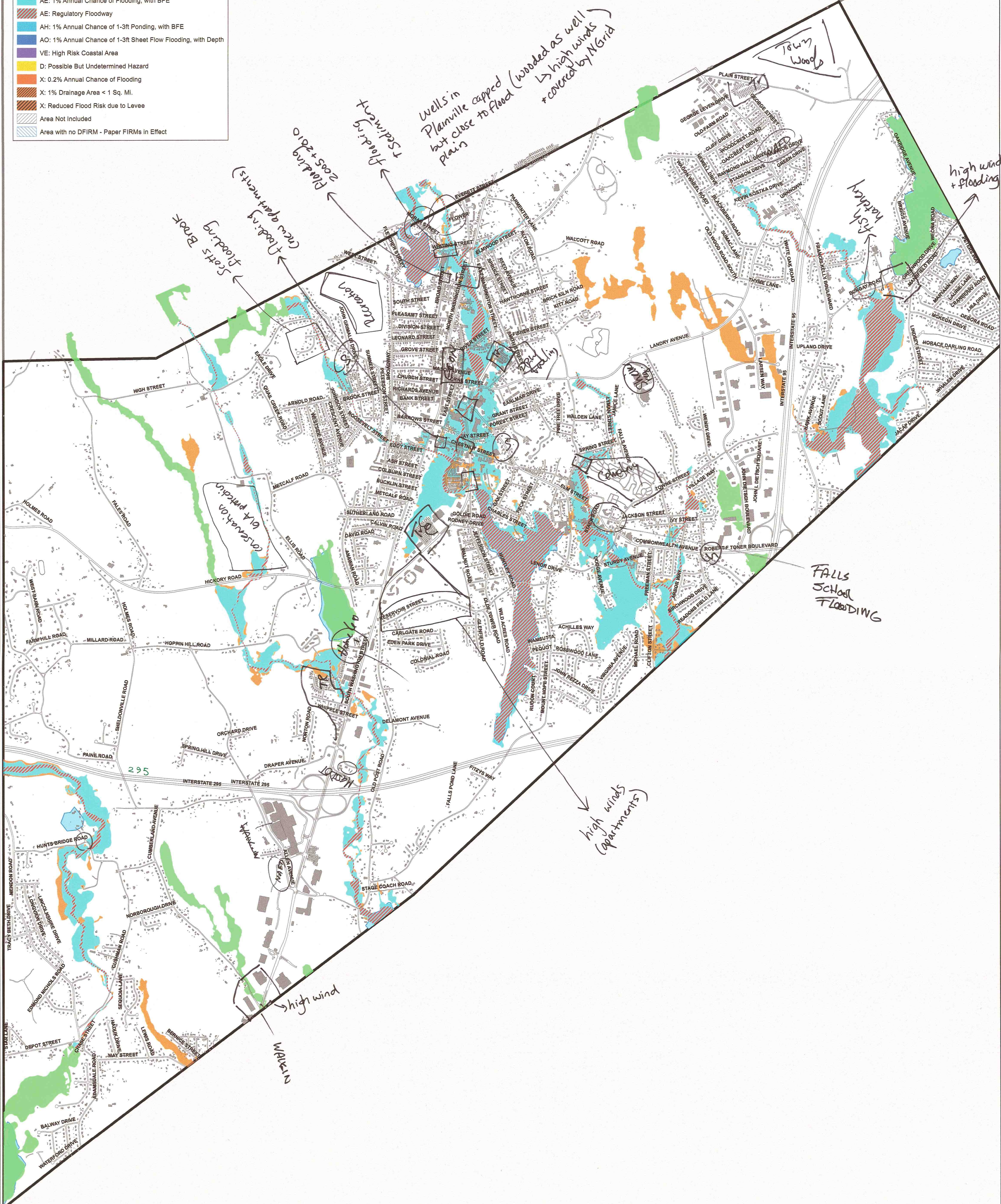


Legend

FEMA National Flood Hazard Layer

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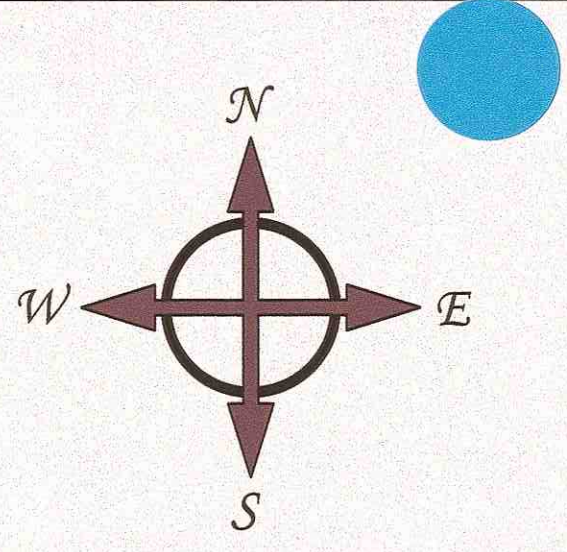
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Town of North Attleborough, Massachusetts

Municipal Vulnerability Preparedness (MVP) Workshop

FEMA Flood Zones

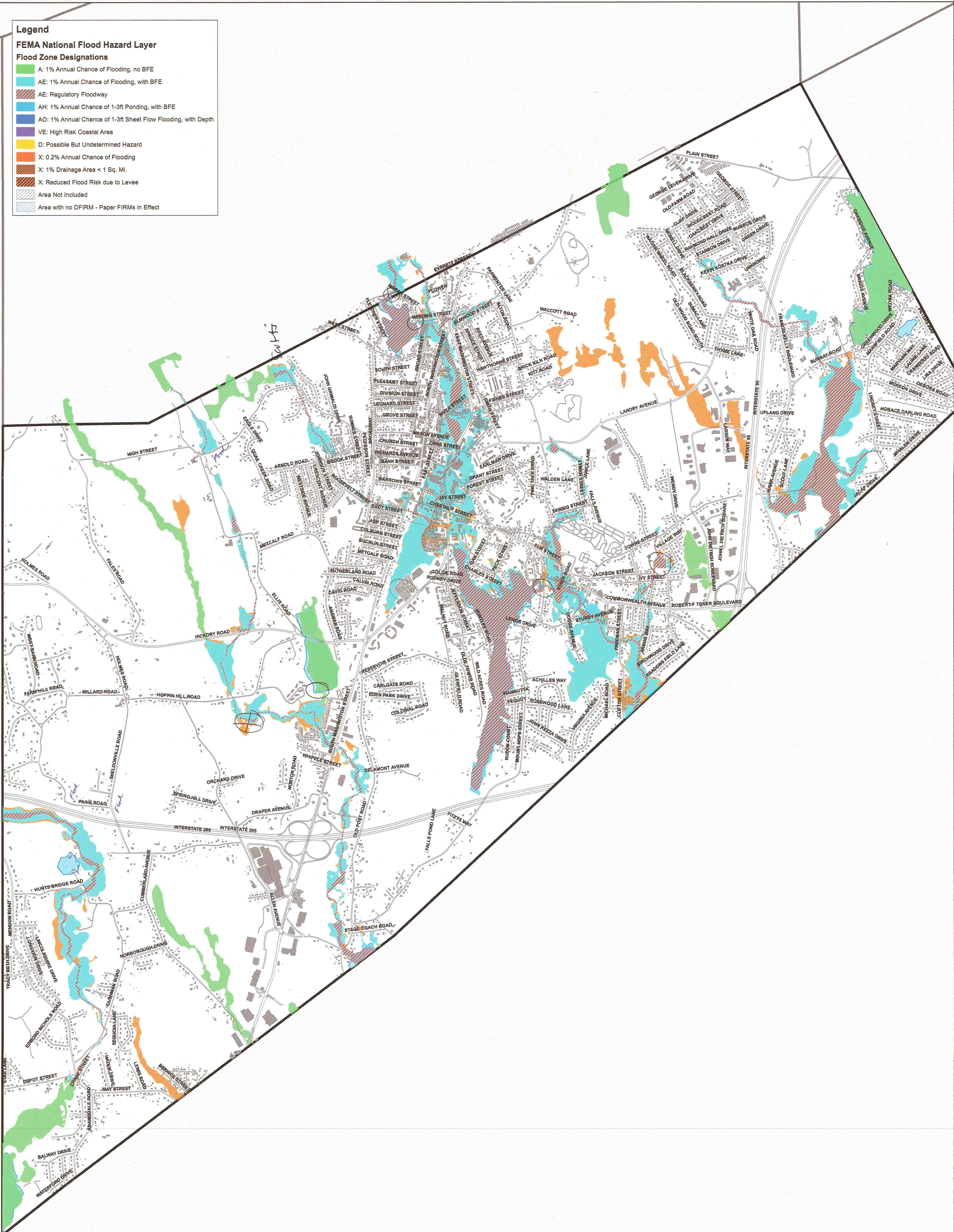


Legend

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0 0.5 1 Miles



Appendix D: Yellow Group Ranking Matrix

Community Resilience Building Risk Matrix				www.CommunityResilienceBuilding.org						
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)						
Features		Location	Ownership	V or S	Flooding	Extreme Winter Weather	Nor'easter/ High Wind	Dam Failure	Priority	Time
									H - M - L	Short Long Ongoing
Infrastructural										
Electrical Distribution System	town-wide	NAED	V & S	Ongoing study to bring power to other parts of town	Construct second substation study, currently under funding; ongoing system upgrades; tree trimming	Construct second substation study, currently under funding; ongoing system upgrades; tree trimming			M	L&O
*Culverts/Bridges	multiple	town, state & private	V & S	study to reduce flooding, sedimentation & cont. dredge under culverts/bridges	Inspection/ surveying ongoing basis and continued maintenance	Inspection/ surveying ongoing basis and continued maintenance		Inspection/ surveying ongoing basis and continued maintenance	H	S&O
Private Sewer & Water	south part of town	Kings Grant (private)	V	Town take over ownership & maintenance to rebuild to town's standards ; obtain easements to access facilities; explore possibility of bylaw for construction standards and connection	Town take over ownership & maintenance to rebuild to town's standards ; obtain easements to access facilities; explore possibility of bylaw for construction standards and connection	Town take over ownership & maintenance to rebuild to town's standards ; obtain easements to access facilities; explore possibility of bylaw for construction standards and connection		Town take over ownership & maintenance to rebuild to town's standards ; obtain easements to access facilities; explore possibility of bylaw for construction standards and connection	L	L
Fiber Optics	municipal facilities	NAED	S		Ongoing Maintenance & tree trimming; rings for redundancy	Ongoing Maintenance & tree trimming; rings for redundancy			L	S&O
Dams	multiple	Town, Federal & Private	V-S					Ongoing maintenance, study potential of removing dams	M	L&O
Interstate Highways	town-wide	State	V&S	Better communication with state; develop evacuation plan, Signage at intersections with flooding	Better communication with state; develop evacuation plan	Better communication with state; develop evacuation plan		Better communication with state; develop evacuation plan	L	O
Societal										
*Town Communications	town-wide	town	S		Upgrade existing equipment; integrate into town-wide system	Upgrade existing equipment; integrate into town-wide system			H	S&O
Neighborhood Groups	town-wide	private	S	Formalize communication system; include in connectCTY; educate groups on hazard risks	Formalize communication system; include in connectCTY; educate groups on hazard risks	Formalize communication system; include in connectCTY; educate groups on hazard risks		Formalize communication system; include in connectCTY; educate groups on hazard risks	M	L&O
Disadvantaged Populations	Pineapple Inn East Street	town	V	Determine reach-out groups to communicate with these populations; share information between departments (Board of Health & School Department) to determine who/where these groups are; single point of contact	Determine reach-out groups to communicate with these populations; share information between departments (Board of Health & School Department) to determine who/where these groups are; single point of contact	Determine reach-out groups to communicate with these populations; share information between departments (Board of Health & School Department) to determine who/where these groups are; single point of contact		Communicate with these populations; share information between departments (Board of Health & School Department) to determine who/where these groups are; single point of contact	M/H	O
Sheltering Facility	Middle School	town	S	Continued communication with state and Board of Health;	Continued communication with state and Board of Health; Microgrind; develop alternate resource options develop equipment resource list;	Microgrind; develop alternate resource options develop equipment resource list		Microgrind; develop alternate resource options develop equipment resource list	L	O
Emergency Services/ EOC	town-wide	town	S	continued training for emergency management; educating public on correct line of communication in case of emergency	continued training for emergency management; educating public on correct line of communication in case of emergency	continued training for emergency management; educating public on correct line of communication in case of emergency		continued training for emergency management; educating public on correct line of communication in case of emergency	M	O
*Senior Housing/ Mobile Home	multiple	State	V	Resource management for relocation	Identify contact personnel for facility; Study to identify relocation location area educate on available services & evacuation	Identify contact personnel for facility; Study to identify relocation location area educate on available services & evacuation		Identify contact personnel for facility; Study to identify relocation location area educate on available services & evacuation	M/H	S&O
Environmental										
Conservation Land	multiple	town	S	Develop land trust; Conservation bylaw	Develop land trust; Conservation bylaw				L	L
*Drinking water Supply Protect	multiple	town	V & S	Local bylaw; study expanding drink water supply protection area	Local bylaw; study expanding drink water supply protection area	Local bylaw; study expanding drink water supply protection area		Local bylaw; study expanding drink water supply protection area	H	S
Aquifer Protection	town-wide	town	V&S	Local bylaw; study expanding drink water supply protection area	Local bylaw; study expanding drink water supply protection area	Local bylaw; study expanding drink water supply protection area		Local bylaw; study expanding drink water supply protection area	M	O
Recreation Land/ Ponds	Falls Pond Whiting's Pond Hatchery	town & federal	V & S		Obtain funding to maintain	Obtain funding to maintain			L	L
*Ten Mile River/ Contaminatio	Center of Town	town	V	Dredging river; identify ownership for potentially widening				Evaluate dam removal; continued maintenance	H	S
Building in Flood Plain	town-wide	town & state	V	Additional zoning restrictions; purchase land in floodplain; transfer development rights; tax incentives to maintain passive recreation					M	O

* Identified as top 5 Hazards by this group



Appendix D: Green Group Ranking Matrix

Community Resilience Building Risk Matrix				www.CommunityResilienceBuilding.org					
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)					
Features				Flooding	Extreme Winter Weather	Nor'easter/ High Wind	Dam Failure	Priority	Time
Location	Ownership	V or S						H - M - L	Short Long Ongoing
Infrastructure									
1* Chestnut Street Bridge		Town	V	Widen Bridge	N/A	N/A	Widen Bridge	H	O
2* Rt 1 Culvert @ Elm Street		Private (State)	V	Clean Culvert	N/A	N/A	Clean Culvert	H	S
Private water - Mendon Rd Area		Private	V	Interconnection (Short term); Obtain System (Long term);		Interconnection (Short term); Obtain System (Long term);		M	L
Arnold Road Culvert		Town	V	Replace with wider culvert	N/A	N/A		M	L
Private Sewer - Rt. 1		Private	V	Communicate with private owners if issues arise (short)		Town Ownership		L	L
Utility Management		Town	S	Continue to be proactive in maintenance of Infrastructure & Coordination	Continue to be proactive in maintenance of Infrastructure & Coordination	Continue to be proactive in maintenance of Infrastructure & Coordination		H	O
Societal									
4* Flooding North Washington Street (Park St to Chestnut)		Town & Private	V	Continue Maintenance; 10 mile improvements; emergency evacuation plan for manor & senior housing			Continue Maintenance; 10 mile improvements; emergency evacuation plan for manor & senior housing	H	O
Trailer park below Attleboro Dam		City	V	Continue Maintenance; Obtain Dam Safety efforts (Con Com)			Establish evacuation Plan (fire department)	H	O (S to obtain)
Sewer System Backups Homes		Private	V	Continue to remove I/I			Establish evacuation Plan	M	O
Reservoir access to out-lying areas		Town	V	Coordinate Electric & DPW; Continue tree maintenance	Coordinate Electric & DPW; Continue tree maintenance	Coordinate Electric & DPW; Continue tree maintenance		H	S
Medium Reserve Corps		Town	S	Continue to Fund with Updating Tech	Continue to Fund with Updating Tech				
Emergency Operation Center (police Station)		Town	S	Continue to Fund with Updating Tech	Continue to Fund with Updating Tech				
Environmental									
3* 10 Mile River Storage Capacity		Town	V	Dredging Filled in Wetlands ; Coordinate with State & DOT to limit silting; Remove stone retaining walls; Add "V" slopes with retaining walls	Dredging Filled in Wetlands ; Coordinate with State & DOT to limit silting; Remove stone retaining walls; Add "V" slopes with retaining walls			H	L
5* Downstream impacts from dam Release		Town	V	Reach out to DEP for more flexible drawdown plan, Anticipated increase in price	Reach out to DEP for more flexible drawdown plan, Anticipated increase in price			H	S (coordination with DEP); O (controlled)
50% Forested & Open Space		Town	S	Continue to Maintain & Protect	Continue to Maintain & Protect	Continue to Maintain & Protect			
Inundation of Town Water Wells		Town	V	Obtain Inspection Report			Obtain Inspection Report	L	O
Private Wells (west) Drawn dry		Town	V	N/A	Extend Water System	N/A	N/A	L	L (extend service); S (replace water)
Ground-water Contamination from Historical Industry		Town	V	Continue to Upgrade system; 10 mile River Improvements	Continue to Upgrade system; 10 mile River Improvements		Continue to Upgrade system; 10 mile River Improvements	L	O

* Identified as top Hazards by this group
 * Order of importance



Appendix D: Blue Group Ranking Matrix

Community Resilience Building Risk Matrix				www.CommunityResilienceBuilding.org					
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)					
				Flooding	Extreme Winter Weather	Nor'easter/ High Wind	Dam Failure	Priority	Time
Features	Location	Ownership	V or S					H - M - L	Short Long Ongoing
Infrastructural									
^{1*} Dams	Multiple	T, P, F	V, S	Maintenance/ Fortifying	Maintenance/ Fortifying	Maintenance/ Fortifying	Maintenance/ Fortifying; Implement Emergency Action plan	H	O
Waste water treatment Plant	Cedar Rd	T	V, S	Emergency Shut down; Reduce I/I; Maintenance (Backup) Mitigate Flooding Impacts	Emergency Shut down; Reduce I/I; Maintenance (Backup) Mitigate Flooding Impacts	Emergency Shut down; Reduce I/I; Maintenance (Backup) Mitigate Flooding Impacts		L	L
^{2*} Bridges/ Culverts	Town-wide	T, S	V	Repair/ Replace (Arnold Rd, Chestnut, Elm); Dredge/ Remove sediment			Properly sizing	H	S/O
^{5*} Downtown Roads that flood	Downtown	T, S	V	O & M (catch basins); Upgrade/ add drainage Inspection program; Regrade roads;	O & M (catch basins); Upgrade/ add drainage Inspection program; Regrade roads;			H	S/O
Town wells/ Water Treatment Plant	Multiple	T	V	Inspections Prevent contamination	Improve access to Emergency Power	Improve access to Emergency Power		M	L
EOC/Police Station	Chestnut St	T	S	Ensure access; Emergency Back-up Communication	Ensure access; Emergency Back-up Communication	Ensure access; Emergency Back-up Communication		L	L
Societal									
Nursing Home	N. Washington	P	V	Evacuation plan, Emergency backup Access, communication	Evacuation plan, Emergency backup Access, communication	Evacuation plan, Emergency backup Access, communication		L	L
Schools (Middle school/shelter)	Multiple	T	V, S	Access transportation/ communication supplies, inventory	Access transportation/ communication supplies, inventory	Access transportation/ communication supplies, inventory		M	S/O
Senior/ Disabled Housing	Multiple	F, P	V	Evacuation Plan; Communication/ transportation access; Emergency Power	Evacuation Plan; Communication/ transportation access; Emergency Power	Evacuation Plan; Communication/ transportation access; Emergency Power		M	O
[*] (Dams) Population Inundation Areas	Multiple	P	V	Communication; Evacuation Plan; Fortifying dams; Flood Response Plan			Communication; Evacuation Plan; Fortifying dams; Flood Response Plan	H	O
^{**} Communication Program	Town-wide	T	V, S	Expand/ Improve CTY; Siren (warning) System/Evacuation Rt. ; Public Outreach	Expand/ Improve CTY; Siren (warning) System/Evacuation Rt. ; Public Outreach	Expand/ Improve CTY; Siren (warning) System/Evacuation Rt. ; Public Outreach	Expand/ Improve CTY; Siren (warning) System/Evacuation Rt. ; Public Outreach; Automatic CTY	H	S/O
Sewer System Backup	Town-wide	P, T	V	Emergency Power @ Pump Stations; I/I removal; Public Outreach/programs (check valves)				M	L
Environmental									
^{3*} Ten Mile River	Ten Mile/ Downtown	T, P	V	Dredging Program - O&M drainage system, preserve trees/ vegetation; Repair or remove walls - Reduce sand, sediment, replace culverts (Chestnut, Rte. 1/Elm); Increase flood storage - wetland restoration along river; prevent development/ bylaw - Maintenance/cleaning of river;	Dredging Program - O&M drainage system, preserve trees/ vegetation; Repair or remove walls - Reduce sand, sediment, replace culverts (Chestnut, Rte. 1/Elm); Increase flood storage - wetland restoration along river; prevent development/ bylaw - Maintenance/cleaning of river;	Dredging Program - O&M drainage system, preserve trees/ vegetation; Repair or remove walls - Reduce sand, sediment, replace culverts (Chestnut, Rte. 1/Elm); Increase flood storage - wetland restoration along river; prevent development/ bylaw - Maintenance/ cleaning of river;	Dredging Program - O&M drainage system, preserve trees/ vegetation; Repair or remove walls - Reduce sand, sediment, replace culverts (Chestnut, Rte. 1/Elm); Increase flood storage - wetland restoration along river; prevent development/ bylaw - Maintenance/cleaning of river;	H	S/O
Development in Flood prone Areas	Multiple	P	V	Regulations/ Bylaw; Purchase land/Restore to natural condition				L	L
Aquifer Protection District	Zoning Districts	P	V, S	Improve Bylaws; Education/ Outreach; Improve BMP's (Existing Industry Uses)				L	L
Open Space Protection Trees/ Vegetation	Town-wide Town-wide	T, P P, T	S V	Purchase Land; Bylaws/Protection Education/ Outreach Bylaws		Maintenance Program	Maintenance Program; O&M	M L	L L
[*] Scott's Brook	Multiple	T, P	V	Arnold Rd. Culvert Replacement; Prevent development-Regulations, O&M Drainage systems; Maintenance/ Cleaning				H	S/O

^{*} Identified as top Hazards by this group

¹ Order of importance



Appendix D: Summary of all Actions by Priority, Category, and Small Group

Small Group	Category	Resiliency Action	Priority	S or V	Time Frame
Yellow	Infrastructural	Conduct study to reduce flooding, sedimentation & continue dredging under culverts/bridges. Continue inspection and ongoing surveying to maintain assets	H	V&S	Short Term & Ongoing
Yellow	Societal	Winter Weather & Nor'easters: Upgrade existing town communication equipment; integrate into town-wide system	H	S	Short Term & Ongoing
Yellow	Environmental	Flooding, Winter Weather & Nor'easters: Local bylaws to protect drinking water supply; study expanding drink water supply protection area	H	V&S	Short Term
Yellow	Environmental	Flooding: Dredging river to aid Ten Mile River contamination; identify ownership for potentially widening	H	V	Short Term
Yellow	Environmental	Dam Failure: Evaluate dam removal to determine if it would aid Ten Mile River Contamination; Continue maintenance	H	V	Short Term
Green	Infrastructural	Flooding/ Dam Failure: Widen Chestnut Street Bridge	H	V	Ongoing
Green	Infrastructural	Flooding/ Dam Failure: Clean Culvert @ Route 1 & Elm Street	H	V	Short Term
Green	Infrastructural	Flooding, Dam Failure & Winter Weather: Continue to be proactive in maintenance of infrastructure & coordination of utility management	H	S	Ongoing
Green	Societal	Flooding & Dam Failure: Continue Maintenance of flooding at N. Washington St. from Park St. to Chestnut St.; Ten Mile River improvements; emergency evacuation plan for manor & senior housing	H	V	Ongoing
Green	Societal	Flooding: Continue Maintenance of Trailer Park below Attleboro Dam; Obtain Dam Safety efforts (Conservation Commission)	H	V	Ongoing
Green	Societal	Dam Failure: Establish evacuation Plan of Trailer Park below Attleboro Dam(Fire Department)	H	V	Ongoing
Green	Societal	Flooding, Dam Failure & Winter Weather: To address reservoir access to out-lying areas Coordinate Electric & DPW ; Continue tree maintenance	H	V	Short Term
Green	Environmental	Flooding & Winter Weather: To increase Ten Mile River storage capacity dredge filled in wetlands ; Coordinate with State & DOT to limit silting; Remove stone retaining walls; Add "V" slopes with retaining walls	H	V	Long Term
Green	Environmental	Flooding & Winter Weather: Reach out to DEP for more flexible drawdown plan, Anticipated increase in price	H	V	Short Term & Ongoing
Blue	Infrastructural	Maintain/ Fortify Dams; Implement Emergency Action plan for Dam failure	H	V&S	Ongoing
Blue	Infrastructural	Flooding: Repair/ Replace Bridges & Culverts (Arnold Rd, Chestnut, Elm); Dredge/ Remove sediment	H	V	Short Term & Ongoing
Blue	Infrastructural	Dam Failure: Properly sizing culverts	H	V	Short Term & Ongoing
Blue	Infrastructural	Flooding & Winter Weather: O&M catch basins on Downtown roads that flood; Upgrade/ add drainage Inspection program; Regrade roads;	H	V	Short Term & Ongoing
Blue	Societal	Flooding & Dam Failure: Communication; Evacuation Plan; Fortifying dams; Flood Response Plan	H	V	Ongoing
Blue	Societal	To improve communication system expand/ improve CTY; Siren (warning) system& evacuation route ; Public outreach	H	V&S	Short Term & Ongoing
Blue	Environmental	Ten Mile River Dredging Program - O&M of Ten Mile drainage system, preserve trees/ vegetation; Repair or remove walls - Reduce sand, sediment, replace culverts (Chestnut, Rte. 1/Elm); Increase flood storage - wetland restoration along river; prevent development/ bylaw - Maintenance/cleaning of river;	H	V	Short Term & Ongoing
Blue	Environmental	Flooding: Arnold Rd. Culvert Replacement; Prevent development- Regulations, O&M Drainage systems to Scott's Brook; Maintenance/ Cleaning of Scott's Brook	H	V	Short Term & Ongoing

Table # : Summary of all Actions by Priority, Category, and Small Group

Yellow	Societal	Winter Weather, Nor'easters & Dam Failure: Determine reach-out groups to communicate with disadvantaged populations; share information between departments (Board of Health & School Department) to determine who/where these groups are; single point of contact	M/H	V	Ongoing
Yellow	Societal	Identify contact personnel for senior housing & mobile home facilities; Study to identify relocation location area educate on available services & evacuation	M/H	V	Short Term & Ongoing
Yellow	Infrastructural	Winter Weather & Nor'easters: Construct second Electrical distribution substation, study currently under funding; ongoing system upgrades; tree trimming	M	V&S	Long Term & Ongoing
Yellow	Infrastructural	Flooding: Ongoing study to bring power to other parts of town	M	V&S	Long Term & Ongoing
Yellow	Infrastructural	Ongoing maintenance of dams, study potential of removing dams	M	V&S	Long Term & Ongoing
Yellow	Societal	Formalize communication system of neighborhood groups; include in connectCTY; educate groups on hazard risks	M	S	Long Term & Ongoing
Yellow	Societal	Emergency Services/EOC, continued training for emergency management; educating public on correct line of communication in case of emergency	M	S	Ongoing
Yellow	Environmental	Local bylaw for aquifer protection; study expanding drink water supply protection area	M	V&S	Ongoing
Yellow	Environmental	Flooding: Additional zoning restrictions for building in flood plain; purchase land in floodplain; transfer development rights; tax incentives to maintain passive recreation	M	V	Ongoing
Green	Infrastructural	Flooding & Nor'easter: To protect Private water in Mendon Rd. area - Interconnection (Short term); Obtain System (Long term);	M	V	Long Term
Green	Infrastructural	Flooding: Replace Arnold Rd culvert with wider culvert	M	V	Long Term
Green	Societal	Flooding: Continue to remove I/I to prevent sewer system back-ups in homes	M	V	Ongoing
Green	Societal	Dam Failure: Establish an evacuation plan for homes which experience sewer system backups	M	V	Ongoing
Blue	Infrastructural	Flooding: Inspect wells & water treatments to prevent contamination	M	V	Long Term
Blue	Infrastructural	Winter Weather & Nor'easter: Improve access to Emergency power to ensure water can be treated and pumped up from wells	M	V	Long Term
Blue	Societal	Flooding, Winter Weather & Nor'easters: Access transportation/ communication supplies, inventory for schools as emergency shelters	M	V	Short Term & Ongoing
Blue	Societal	Flooding, Winter Weather & Nor'easters: Evacuation Plan for housing for seniors and those with disabilities; Communication/ transportation access; Emergency Power	M	V	Ongoing
Blue	Societal	Flooding: Emergency Power @ Pump Stations; I/I removal; Public Outreach/programs (check valves) Sewer system Backup	M	V	Long Term
Blue	Environmental	Flooding: Purchase Land; Bylaws/Protection of open space	M	V	Long Term
Yellow	Infrastructural	Town take over ownership & maintenance of private sewer and water systems to rebuild to town's standards; obtain easements to access facilities; explore possibility of bylaw for construction standards and connection	L	V	Long Term
Yellow	Infrastructural	Winter Weather & Nor'eastes: Ongoing Maintenance of Fiber Optics & tree trimming; rings for redundancy	L	S	Short Term & Ongoing
Yellow	Infrastructural	Protect Interstate Highways by Better communication with state; develop evacuation plan	L	V&S	Ongoing
Yellow	Societal	Winter Weather, Nor'easter & Dam Failure: Microgrind sheltering facility; develop alternate resource options develop equipment resource list	L	S	Ongoing

Table # : Summary of all Actions by Priority, Category, and Small Group

Yellow	Societal	Flooding & Winter Weather: Continued communication with state and Board of Health about sheltering facility	L	S	Ongoing
Yellow	Environmental	Flooding & Winter Weather: Develop land trust to protect conservation land; Conservation bylaw	L	S	Long Term
Yellow	Environmental	Winter Weather & Nor'easter: Obtain funding to maintain Recreation Land/Pond	L	V&S	Long Term
Green	Infrastructural	Flooding: Communicate with owners of private sewer - Rt. 1 if issues arise	L	V	Short Term
Green	Infrastructural	Nor'easter: Town Ownership for Rte. 1 Private sewer	L	V	Long Term
Green	Environmental	Flooding & Dam Failure: Obtain Inspection Report of Inundation of Town Water Wells	L	V	Ongoing
Green	Environmental	Winter Weather: Extend Water System to protect private wells drawn dry	L	V	Long Term & Short Term
Green	Environmental	Flooding, Winter Weather & Dam Failure: Continue to Upgrade system - Ground-water Contamination from Historical Industry; 10 mile River Improvements	L	V	Ongoing
Blue	Infrastructural	Flooding, Winter Weather & Nor'easter: Waste water treatment Plant Emergency Shut down; Reduce I/I; Maintenance (Backup) Mitigate Flooding Impacts	L	V&S	Long Term
Blue	Infrastructural	Flooding, Winter Weather & Nor'easters: Ensure access to EOC & Police Station; Emergency Back-up Communication	L	S	Long Term
Blue	Societal	Flooding, Winter Weather & Nor'easters: Evacuation plan for Nursing home, Emergency backup Access, communication	L	V	Long Term
Blue	Environmental	Flooding: Regulations/ Bylaw to prevent Development in Flood prone areas; Purchase land/Restore to natural condition	L	V	Long Term
Blue	Environmental	Flooding: Improve Bylaws for Aquifer protection district; Education/ Outreach; Improve BMP's (Existing Industry Uses)	L	V&S	Long Term
Blue	Environmental	Flooding: protect trees and vegetation through education, outreach & bylaws	L	V	Long Term
Blue	Environmental	Nor'easter & Dam Failure: Maintenance program of trees & vegetation	L	V	Long Term
Green	Societal	Flooding & Winter Weather: Continue to Fund with Updating Tech for Medium reserve Corps	-	S	-
Green	Societal	Flooding & Winter Weather: Continue to Fund with Updating Tech for Emergency Operation Center (police station)	-	S	-
Green	Environmental	Flooding, Winter Weather & Nor'easters: Continue to maintain and protect the 50% forested & open spaces	-	S	-

APPENDIX E: Top Priority Voting Results

- Top Hazards from Each Group
- Overall Top 4 Hazards
- Infrastructural Features
- Societal Features
- Environmental Features
- Top Features from Each Group
- High Priority Actions from Each Group
- Overall Top 5 Priority Actions

Flooding

Dams

Snow+Blizzard

Nor'easter

Flooding

High Wind

Ice Storm

Hurricane

Flooding

Dams

Hurricane

Snow+Blizzard

Nor'easter

Flooding

Snow + Blizzard/Ice Extreme Winter Weather

Hurricane + Nor'easter + High Wind

Dam Failure

Infrastructure

Elec distribution system

Culverts/bridges ✓

Priv. sewer + water ✓

fiber optics

dams, ✓

interstate highways

WWTP

DT roads flood

town wells/WTP

EOC/Police Station

Chestnut St bridge

Rte 1/Elm St culvert

Arnold Rd culvert

Utility management

Societal

town comm. ✓

neighborhood groups

disadvantaged pop.

sheltering facility ✓

emergency services

senior housing/mobile home

dam ind. areas ✓

DT flooding

sewer system backups

residential access to outlying areas
medical reserve corp

EOC

senior/dis. housing
nursing home

Environmental

Building in FP ✓

10 Mile River ✓✓

Recreation Land

Aquifer Protection ✓

DW Supply Protection

Conservation Land

Open space ✓

Loss of trees/veg

Scotts Brook

Downstream impacts dam release

water wells inundation
drying up of priv. wells

GW contamination from industry

Dams

Bridges/Culverts

Downtown Roads that Flood

Communication Program

10 Mile River

Chestnut St Bridge

Rte 1/Elm St Culvert

10 Mile River

Downstream Impacts Dam Release

Culverts/Bridges

Town Communications

Senior Housing/Mobile Homes

Drinking Water Supply Prot.

10 Mile River/Contamination

Dredging/widening

dredging, repairs
flood storage

dredging, widening
repair to flood
storage

Arnold Rd
Elm St/Rte 1
Chestnut St
Orne/Rte 1

Maintenance
Fortify, EAP

Drop dead dates
Falls/whittings
Conversation w/ DEP

CB cleaning
Upgrade drainage
regrade road
review evac plan

review evacuation
plan

Upgrade exist equip
town wide system
relax town backup

expand/improve CTY
SKEN automate CTY
public outreach

10 Mile River

→ River dredging/widening program to increase flood storage

Bridges/Culverts

→ Chestnut St Bridge widening + lowering

→ Elm St/Rte 1 culvert cleaning (Orme)

DAMS

→ Review O+M plan to address climate impacts (improve)

Downtown Flooding

→ maintenance + cleaning drainage pipes

→ Review + revise evacuation plan

Town Communications

→ review + revise as necessary → educate residents on systems available

Municipal Vulnerability Program (MVP)

Public Listening
Session

North Attleborough, MA

May 22nd, 2019



Welcome and Introductions

- Andy Dennehy, Associate, BETA Group, Inc.
- Kendra Martin, Engineer, BETA Group, Inc.



Municipal Vulnerability Program Listening Session Agenda

- Program Overview
- Science and Resources Information
- Workshop Overview
- Findings:
 - Hazards
 - Features
 - Actions



Program Overview

EXECUTIVE ORDER 569: AN INTEGRATED CLIMATE CHANGE STRATEGY FOR THE COMMONWEALTH 9.16.16



- Reducing greenhouse gas emissions to combat climate change
- Preparing for the impacts of climate change
 - State Adaptation Plan
 - Agency Vulnerability Assessments
 - Municipal Support
 - Climate Coordinators

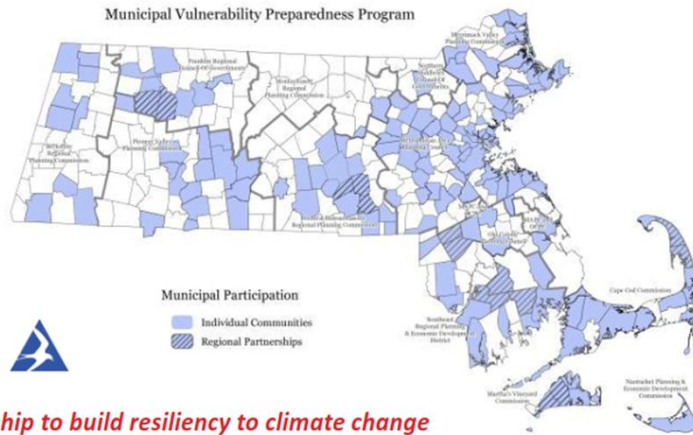
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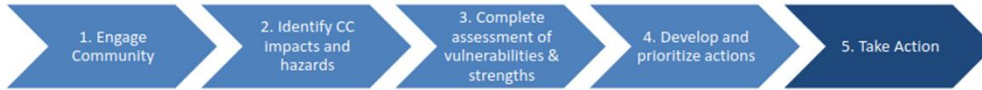
Program Overview

Municipal Vulnerability Preparedness (MVP)

2017-2019



State and local partnership to build resiliency to climate change



7



Program Overview

Two MVP Grant Opportunities



RFR 1: MVP Planning Grant



RFR 2: MVP Action Grant



Nature Based Solutions

Nature-Based

Nature-Based Solutions use natural systems, *mimic* natural processes, or *work in tandem with* traditional approaches to address natural hazards like **flooding**, **erosion**, **drought**, and **heat islands**.

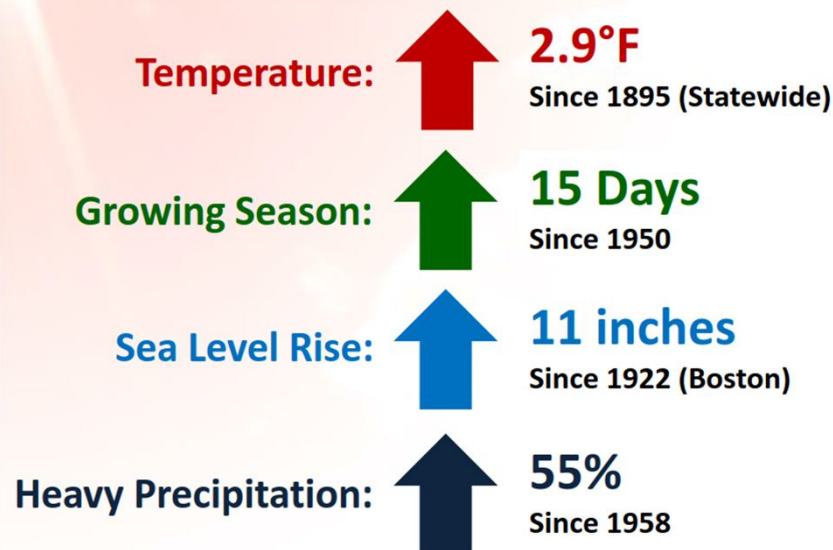


**Green
Infrastructure**

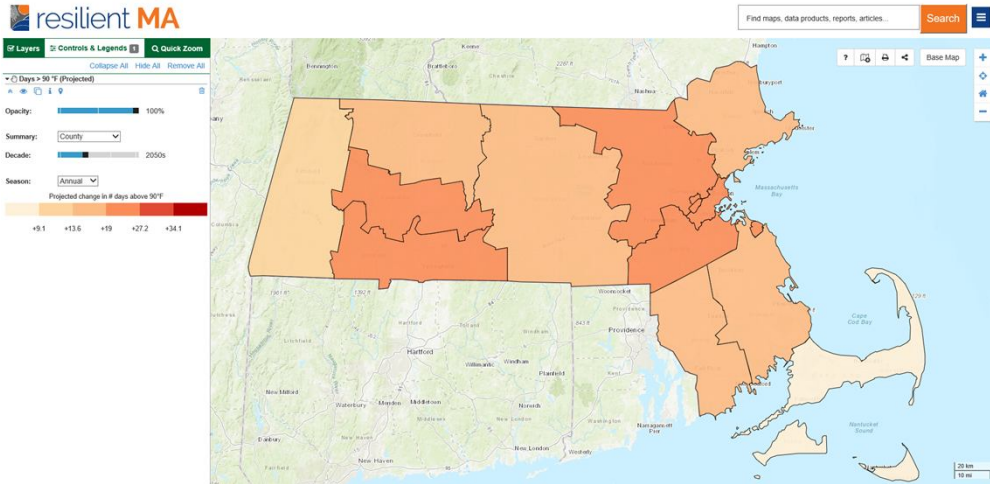
**Low Impact
Development (LID)**



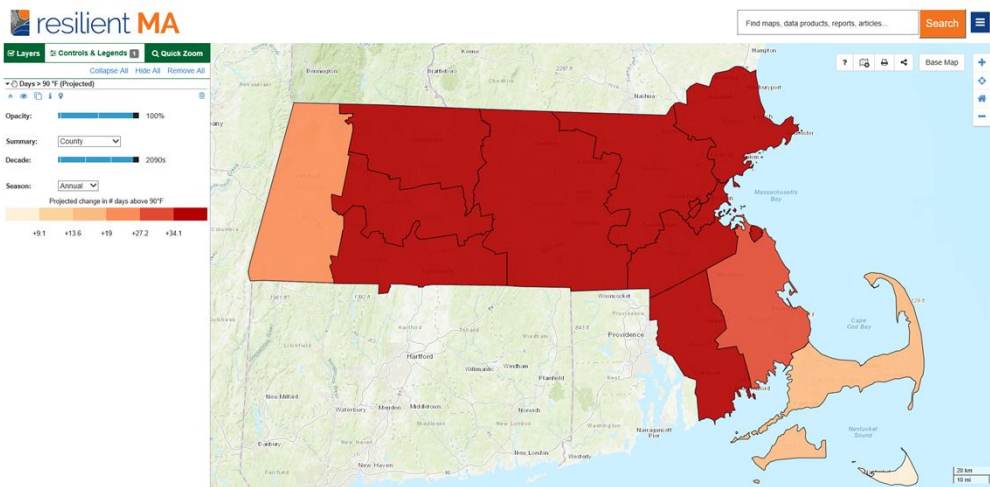
Massachusetts Observed Climate Changes



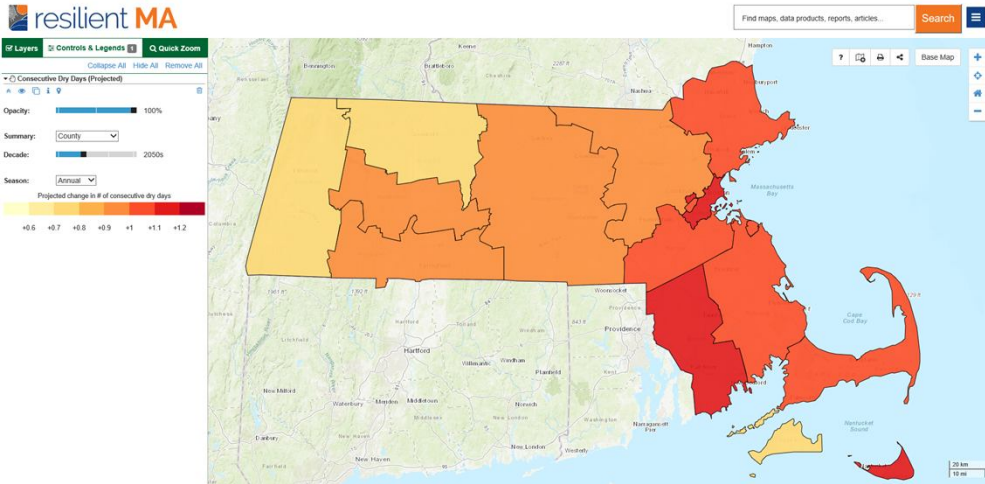
Massachusetts Projected Climate Changes



Massachusetts Projected Climate Changes



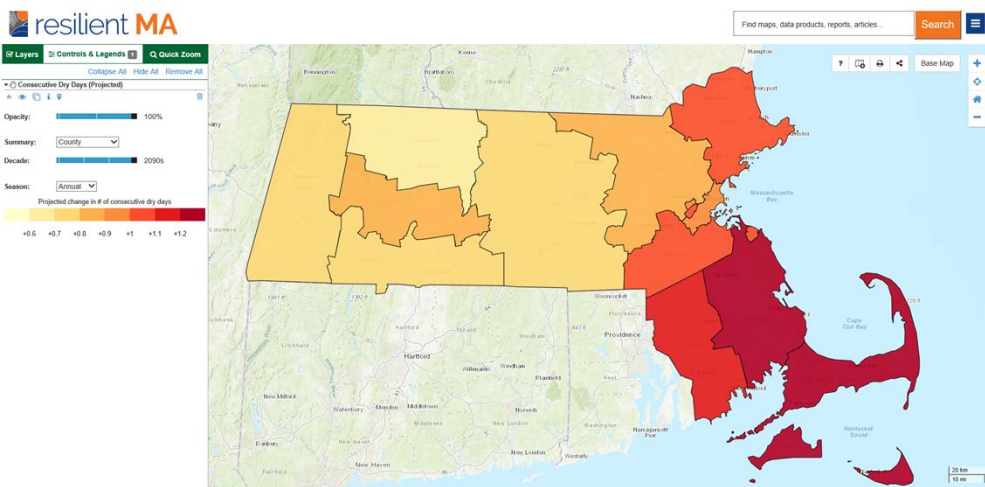
Massachusetts Projected Climate Changes



Bristol County: +1.13 consecutive dry days annually by 2050s



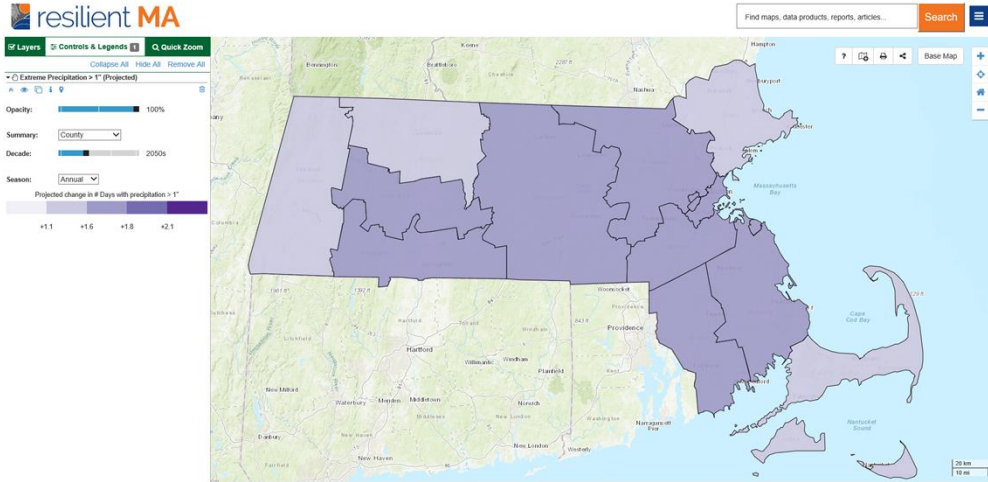
Massachusetts Projected Climate Changes



Bristol County: +1.15 consecutive dry days annually by 2090s



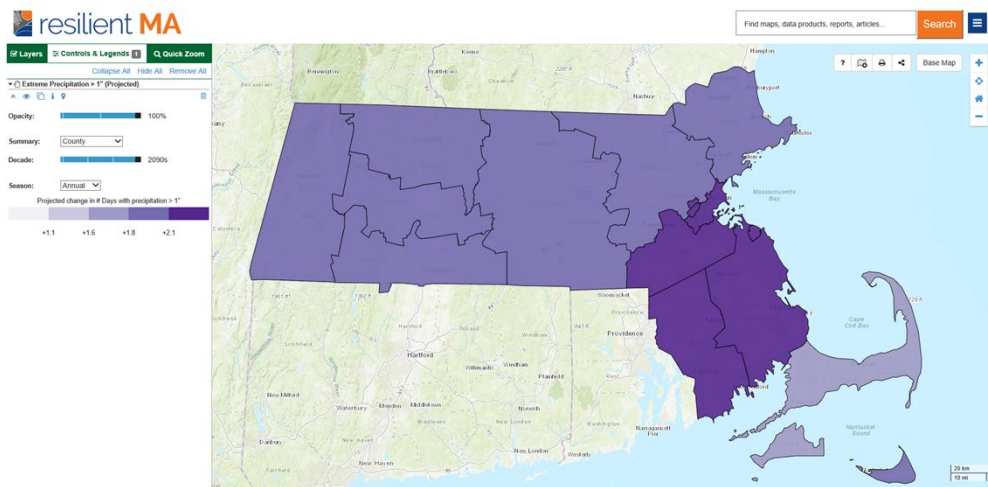
Massachusetts Projected Climate Changes



Bristol County: +1.75 days annually with precipitation >1" by 2050s



Massachusetts Projected Climate Changes



Bristol County: +2.43 days annually with precipitation >1" by 2090s



Massachusetts Projected Climate Changes

Variable	Observed Value (1971-2000 average)	Change by 2050s	Change by 2090s
Annual average temperature	47.5 °F	Increase by 2.8-6.2 °F	Increase by 3.8-10.8 °F
Number of days per year with daily Temp > 90°F	5 days	Increase by 7-26 days	Increase by 10-63 days
Number of days per year with daily Temp < 32°F	146 days	Decrease by 19-40 days	Decrease by 24-64 days
Heating degree-days per year (HDD)	6839 Degree-Day °F	Decrease by 773-1627	Decrease by 1033-2533
Cooling degree-days per year (CDD)	457 Degree-Day °F	Increase by 261-689	Increase by 356-1417
Growing degree-days per year (GDD)	2344 Degree-Day °F	Increase by 531-1210	Increase by 702-2347
Total Precipitation per year	47 inches	Increase by 0.9-6 inches	Increase by 1.2-7.3 inches
Number of days with precip > 1 in	7 days	Increase by 0-3 days	Increase by 1-4 days



Impacts from Climate Change

- Increasing Temperatures
 - Increase in heat-related illnesses
 - Changes to growing seasons
 - Larger demands on energy systems
- Increased Precipitation and Downpour Intensity
 - Increased risk of flooding
 - Water quality impacts
 - Impact on agriculture and natural ecosystems
- Changes to Rain and Snow Patterns
 - Reduced snow cover
 - Potential increase in drought events
 - Impacts to habitats and species



Workshop Overview

- Characterized Hazards
- Identified Community Vulnerabilities and Strengths
- Identified and Prioritized Community Actions
- Determined the Overall Priority Actions
- Developing Comprehensive Summary Products



Characterize Hazards

Identify past, current, and future hazards (large team).

Direct participants to make a list of hazards (causes of impacts) that the community has dealt with, currently faces, and anticipates experiencing in the future (i.e., tornados, ice/wind storms, drought, wildfire, tsunamis, sea level rise, landslides, earthquakes, etc.). Utilize the following triggering questions to accelerate dialogue and surface initial agreement on top four hazards.

- What hazards have impacted your community in the past?
Where, how often, and in what ways?
- What hazards are impacting your community currently?
Where, how often, and in what ways?
- What effects will these hazards/changes have on your community in the future (5, 10, 25 years)?
- What is exposed to hazards and climate threats within your community?
- What have been the impacts to operations and budgets, planning and mitigation efforts?
- Others concerns or considerations related to impacts?

A **Hazard** is like the sun. The **Risk** from that hazard is sunburn. The **Vulnerability** includes the length of **Exposure** of skin to the sun. The **Action** to reduce risk from the hazard is to apply sunscreen or seek shade.



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Findings – Hazards Discussed

- Flood
- Hurricane/Tropical Storm
- Earthquake
- Snow & Blizzard
- Wildland Fire
- Thunderstorm
- Tornado
- Extreme Temperature
- Dam Failure
- Nor'easter
- Landslide
- Ice Storm
- Major Urban Fire
- High Wind
- Drought



Findings – Hazards Identified as Priority

- Flooding
- Extreme Winter Weather
- Nor'easter/High Wind
- Dam Failure



Identify Community Vulnerabilities and Strengths



Community Resilience Building Workshop Risk Matrix			
H = High priority for action over the Short or Long term (and Ongoing)			
V = Vulnerability S = Strength			
Features	Location	Ownership	V or S
Infrastructural			
Societal			
Environmental			

Steps C1, C2 and C3 below focus on identifying infrastructural, societal and environmental vulnerabilities and strengths. Each step requires three tasks to complete the Risk Matrix: (i) identify features, (ii) describe feature locations, (iii) identify feature ownership, and (iv) identify each feature as a vulnerability or strength, or both.



Findings – Vulnerabilities and Strengths Discussed (Infrastructure)

- Dams
- Wastewater Treatment Plant
- Bridges/Culverts
- Downtown Roads that Flood
- EOC/Police Station
- Private Water System in Mendon Area
- Electrical Distribution System
- Fiber Optics
- Interstate Highways
- Private Sewer – Route 1
- Utility Management



Findings – Vulnerabilities and Strengths Discussed (Societal)

- Nursing Home
- Schools
- Senior/Disabled Housing
- Dam Inundation Areas
- Communication Program
- Sewer System Backups
- Downtown Flooding
- Rescue Access to Out-Lying Areas
- Conservation Land
- Drinking Water Supply
- Aquifer Protection
- Recreation Lands/Ponds
- Ten-Mile River
- Buildings in Flood Plains
- Med. Reserve Corps



Findings – Vulnerabilities and Strengths Discussed (Environmental)

- 10-Mile River
- Development in Flood Prone Areas
- Aquifer Protection District
- Open Space Protection
- Trees and Vegetation
- Scotts Brook
- Electrical Distribution System
- Downstream Impacts from Dam Release
- Inundation of Town Wells
- Private Wells Drawn Dry
- Groundwater Contamination from Industry



Findings – Identified Actions

- Widen Bridges
- Clean/Replace Culverts
- 10-Mile River Improvements
- Emergency Evacuation Plans
- Continued Dam Maintenance
- Continued I/I Removal
- Continued Tree Maintenance
- Dam Removal
- Additional Zoning Restrictions
- Mitigating Flooding
- Emergency Back-Up Power
- Public Outreach
- Updating Regulations/By-Laws
- Land Acquisition
- Updating Communication Technology
- Emergency Management Training



Findings – Identified Priority Actions

- 10-Mile River Dredging/Widening
- Chestnut St. Bridge Widening and Lowering
- Elm St./Rte. 1 Culvert Cleaning
- Review O&M Plan to Address Climate Impacts to Dams
- Maintenance and Cleaning of Drainage Pipes Downtown
- Review & Revise Evacuation Plan
- Review and Revise Town Communications
 - Educate Resident on Available Systems



Next Steps

- Submit Findings Report to the State
- Apply for Actions Grants for Priority Actions



Questions?



5/14/19

LEGALS

MVP



**Municipal Vulnerability Preparedness (Climate Change)
Public Listening Session and Report**

The Board of Public Works is working with BETA Group, Inc. and key Town stakeholders to establish the Town's vulnerabilities to climate events and develop an assessment and action plan. This plan will allow the Town to be better prepared in our response to these events and certify the Town as an MVP community. This designation will allow the Town to become eligible for MVP Action grant funding and other opportunities.

The Board of Public Works will hold a public listening session and report on Wednesday, May 22nd, 2019 from 6:00-7:00pm in the Public Meeting Room at the Department of Public Works at 49 Whiting Street.

Board of Public Works
Town of North Attleborough

Michael S. Thompson, Chairman
Donald Cerrone, Vice-Chairman
Joan Marchitto, Member
5/14/2019

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