TOWN OF WAKEFIELD

Municipal Vulnerability Preparedness Program

Community Resilience Building Workshop
Summary of Findings Report
February 2020

Prepared for the Town of Wakefield, MA, by Kim Lundgren Associates, Inc. with a grant from the Massachusetts Executive Office of Energy & Environmental Affairs

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TABLE OF CONTENTS

Town of Wakefield
Community Resilience Building Workshops
Summary of Findings

I. OVERVIEW

Lake Quannapowitt on a summer day.

Photo Credit: KLA

This Summary of Findings Report presents the results of a six-month effort by the Town of Wakefield to start the conversation about climate change within the community. In the spring of 2019, Wakefield received funds from the Massachusetts Municipal Vulnerability Preparedness (MVP) Program to begin the conversation. The MVP program provides funding for cities and towns in Massachusetts to plan for climate change resilience and implement priority projects. The state awards communities with funding to complete vulnerability assessments and develop action-oriented resilience plans. Communities who complete the MVP program become certified as an MVP community and are eligible for action grant funding. In June 2019, Wakefield convened two workshops where local and regional stakeholders assessed current and future strengths and vulnerabilities and identified potential actions to create a more resilient community. This report summarizes the results of the two workshops and a public listening session as well as the input received from community members through an enhanced scope that included an online survey and in-person engagement activities.

Changes in climate are becoming more apparent in Wakefield, taking shape through four primary hazards:

- ***Heat Waves****: The Northeastern United States has experienced just over a 1.4°F increase in average annual temperature since the early- to mid-1900s,[1] and the number of hot days in Wakefield has been on the rise.*

[1] U.S. Global Change Research Program. 2017. Climate Science Special Report: Fourth National Climate Assessment. Chapter 6. U.S. Global Change Research Program. Retrieved from https://science2017.globalchange.gov/chapter/6/

- ***Drought**: Wakefield (along with the rest of Massachusetts) experienced the impacts of drought during the latter half of 2016.[2] In October 2016, 52% of the land area in Massachusetts was considered to be in "Exceptional Drought."[3] This is especially relevant to Wakefield as drought impacts Crystal Lake, the Town's water supply.*

- ***Intense Storms**: Another notable change is the increase in the intensity and frequency of rain events. The northeast has already seen a 70% increase in the intensity of rain events from 1958 to 2010.[4]*

- ***Flooding**: Flooding is not only an inconvenience and a public safety issue, but it also takes an economic toll on Wakefield. In March of 2010, flooding caused $35.2 worth of damage in Middlesex County.[5]*

Combined, these hazards have inspired the Town to begin identifying and implementing actions that will enhance local resilience to these existing conditions and projected changes.

Wakefield has already taken several steps to adapt to the impacts of climate change and protect its natural resources. The Town has a tree trimming program to reduce the damage to power lines and other infrastructure during storms. Similarly, the Town has improved flood control and stormwater management by updating the Floodplain District Zoning Bylaw, creating a Stormwater Management Plan, hiring a Stormwater Manager, and implementing maintenance programs. Finally, the Town is also pursuing a Complete Streets program and Downtown Revitalization project to improve sustainable transportation options. The MVP program allows the Town to further its ability to address current and future climate impacts by proposing specific actions.

In May 2019, the Town of Wakefield partnered with Kim Lundgren Associates, Inc. (KLA) to design a process that would allow the Town to become an MVP Community. The work described in this report is a crucial step in Wakefield's journey to a more resilient future. To complete the work outlined in this report, the Town worked with KLA to:

- *Create a Core Team comprised of key internal stakeholders;*
- *Establish goals for the MVP process;*
- *Conduct research on historic and projected changes and impacts from climate change;*
- *Determine an initial set of high-priority hazards;*
- *Collaboratively design two MVP workshops using the Community Resilience Building process;*

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[2] National Oceanic and Atmospheric Administration. Massachusetts. Retrieved from https://www.drought.gov/drought/states/massachusetts
[3] National Oceanic and Atmospheric Administration. Massachusetts. Retrieved from https://www.drought.gov/drought/states/massachusetts
[4] City of Boston. 2016. Climate Ready Boston. Retrieved from https://www.boston.gov/sites/default/files/02_20161206_executivesummary_digital.pdf
[5] National Oceanographic and Atmospheric Association. Storm Events Database. 2016.

- *Identify and invite key stakeholders to participate in the MVP workshops;*
- *Host two MVP workshops where:*
    - *the highest priority hazards were confirmed;*
    - *the impacts, strengths, and vulnerabilities to infrastructure, socio-economic systems, and environmental systems were identified;*
    - *several adaptation actions were created; and*
    - *a final set of high priority action items were collectively defined and agreed upon by workshop participants;*
- *Prepare for and host a listening session to discuss the results from the workshop and solicit feedback from the community.*

The cornerstone of this work was the two MVP workshops hosted by the Town. The attendees of the workshops represented a diverse group of stakeholders that each brought a specific area of expertise to the table. The workshops served to collaboratively develop solutions that serve the entire Wakefield community.

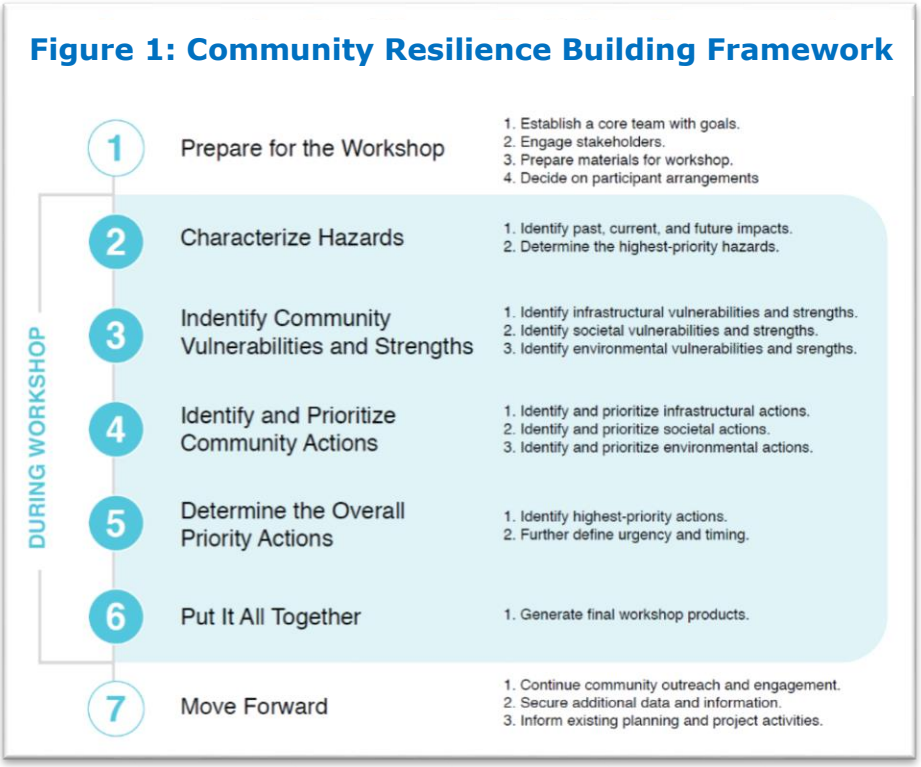
This report provides greater detail about the MVP process that Wakefield followed, and the actions identified as high priorities to enhance local and regional resilience. The Town would like to thank the Massachusetts Executive Office of Energy and Environmental Affairs for their financial and technical support for this effort.

Americal Civic Center. Photo credit: KLA

MVP Planning Process

In May 2019, KLA worked with staff from Wakefield Public Works to identify individuals to serve on the MVP Core Team (see Appendix 2 for a list of the members). On May 14, 2019, the Core Team members met to learn about the MVP process which is based on the Community Resilience Building Framework (see Figure 1). This meeting was combined with the final meeting regarding the Town's Hazard Mitigation Plan since the two processes are closely related. They learned more about their role as a Core Team member, confirmed materials and logistics for the MVP Workshops, brainstormed the top hazards to be discussed at the workshops, and reviewed how Wakefield can leverage the results of MVP to spark greater community conversation and action on climate change. The Core Team also discussed maps that need to be created to support the MVP workshops. Maps were generated using data from the Hazard Mitigation Plan and the Town's GIS Department. These maps displayed environmental, socio-economic and infrastructural features of the Town. The maps are available in Appendix 1.

Figure 1: Community Resilience Building Framework



The Core Team identified individuals to participate in two MVP workshops. The Core Team was careful to ensure that invitees represented the diversity of the community, including key Town departments, schools, environmental groups, the Housing Authority, the Senior Center/Council on Aging, faith-based organizations, the Chamber of Commerce, and regional organizations.

Public Works Department staff sent invitations to the stakeholders for the MVP workshops for two, four-hour workshops, scheduled for June 3, 2019 and June 4, 2019 from 12:00pm to 4:00pm. In total, 46 individuals were invited to participate in the MVP workshops (see Appendix 2 for a list of stakeholders).

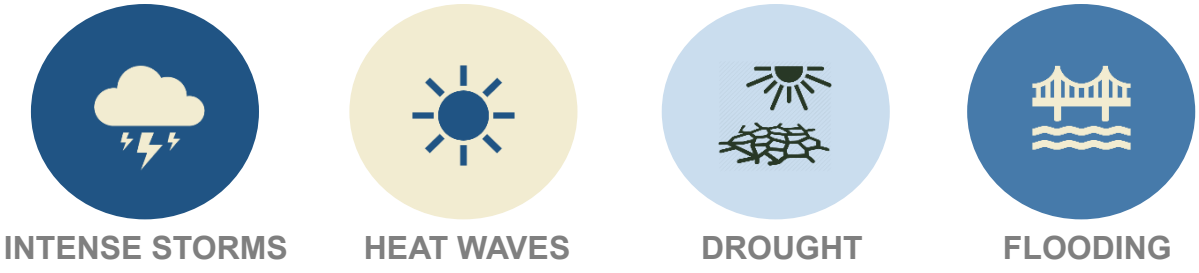
To engage the larger community in the conversation, the Town hosted a public listening session on August 29th. At this meeting, the consultant team presented on the identified hazards and the results of the previous workshops. The 24 meeting attendees then had the opportunity to share their concerns and proposed solutions through an open house engagement activity with posters for each of the hazards Outcomes and materials from the Listening Session can be found in Appendix 5.

Additionally, the Town conducted an online survey as well as several in-person engagement activities throughout the community. The full details on these additional community engagement activities can be found in Appendix 7. The priorities from the community are also reflected in various places throughout this report. In-person community engagement activities included:

- Pop Ups at Festival Italia & Festival by the Lake
- Preparedness Education Drive with the Wakefield Food Pantry
- Preparedness training with the Wakefield/Lynnfield Chamber of Commerce
- Emergency Management Focus Group on Vulnerable Populations

II. TOP HAZARDS AND VULNERABLE AREAS

The first step in the MVP process was to identify the four main hazards that have historically impacted the community and are projected to have notable impacts going forward due to climate change. The hazards were identified by the Core Team



and confirmed at the beginning of the MVP Workshops. The four hazards identified for Wakefield are:

Like most Massachusetts communities, Wakefield has seen an increase in the frequency and severity of intense storm events, flooding, and extreme heat. These impacts effect everything from the health of the Town's residents and natural environment, to the built environment and utilities. Appendix 3 provides a summary of the historic trends and projected changes in weather and climate experienced in Wakefield. This information was foundational to the MVP process as it helped to establish common ground for the stakeholders and discuss what types of changes and associated impacts to expect going forward.

At the MVP Workshops, participants discussed the impacts of the four hazards and articulated features they saw as community strengths and vulnerabilities. These features were discussed as they relate to three community components: Infrastructural, Societal, and Environmental. The workshop attendees were broken into four teams. Each team was tasked with reviewing the details of each feature identified under each of the components. Team members used a matrix to track each feature, whether it was a strength and/or a vulnerability, the hazard that affects it, the priority and timeline associated with implementation. Below are the features identified by the teams for the three community components:

Infrastructural Features:

- Bus Routes
- Communications and IT infrastructure
- Commuter Rail
- Drainage system
- Natural gas pipelines
- Power lines (and substations)
- Public buildings
- Public safety infrastructure (e.g. fire and police stations)
- Roads and highways
- Sewers (and substations)
- Sidewalks
- Stormwater systems
- Transit system
- Utilities
- Water systems
- Yard Waste Site

Societal Features:

- Average resident
- Businesses, especially small businesses
- Families and youth
- Ghost residents
- Houses of worship
- Outdoor workers
- Medically vulnerable residents (both physically and mentally)
- Non-English speakers
- People experiencing homelessness
- Renters
- Residents living in group homes
- Residents with disabilities
- Seniors
- Unemployed or underemployed community members

Environmental Features:

- Air quality
- Lakes (Lake Quannapowitt, Crystal Lake)
- Mill River Floodplain
- Parks and open space
- Rivers (Saugus, Mill, and others)
- Streams
- The Common
- Town forest
- Tree canopy/public trees
- Wetlands
- Wildlife and aquatic life

Most of these features were flagged as both strengths and vulnerabilities. As such, workshop participants discussed the specific strengths as well as vulnerabilities before identifying actions that sought to enhance strengths and mitigate vulnerabilities. Appendix 4 includes the completed matrices from the group discussions.

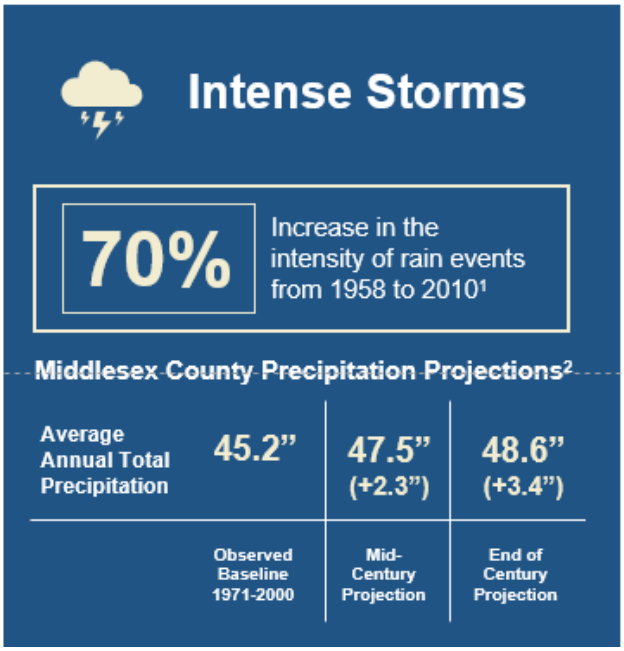
III. CURRENT CONCERNS AND CHALLENGES PRESENTED BY HAZARDS

Wakefield residents are already feeling the impacts of the four identified hazards. Participants in the Workshops discussed their biggest concerns and challenges presented by each hazard, including concern for vulnerable populations and

challenges around maintaining their current way of life. Those discussions are captured below, along with more details on each of the four identified hazards.

Intense Storms

Over the last several decades, the number and intensity of storms has been on the rise. This includes hurricanes, nor'easters, ice storms, and rainstorms. Research shows that these types of storms are likely to become more frequent, intense, and possibly longer in duration in the future.[6] There has already been a 70% increase in the intensity of rain events in this region from 1958 to 2010.[7] Under future climate projections, Middlesex County is expected to see an additional 2.3 inches of annual rainfall by mid-century and 3.4 inches by the end of the century.[8] Intense storms can lead to flooding, property damage, and downed trees and power outages, as well as significant economic disruption.



The MVP Workshop participants had several concerns relating to the increase of intense storms ranging from power outages to the effects of transportation and businesses. Regarding power outages, participants were especially concerned about the effect on seniors and medically vulnerable populations that are more likely to either live alone or be dependent on electricity to power medical devices. Power outages make communicating and reaching out for help far more difficult. This prompted a discussion on providing preparedness kits to residents, which the Town began to help support with the distribution of crank flashlights at public events.

The effect of intense storms on transportation was also raised as a concern. Participants noted that intense storms lead to accelerated wear on roads, obstruct critical routes for safety vehicles, and can increase the number of accidents—particularly during winter storms. Storms can also affect the health of small businesses if they are forced to close due to weather. Finally, several participants pointed to the lack of generators in town as a real issue. Only two of the seven schools have backup generators, which leaves Wakefield residents with limited shelter options in the case of a weather emergency. It was also noted that all of

[6] MA Climate Change Clearinghouse. 2019. "Changes in Precipitation." Retrieved from http://resilientma.org/changes/changes-in-precipitation
[7] City of Boston. 2016. Climate Ready Boston.
[8] Northeast Climate Adaptation Science Center. Resilient MA Datagrapher. MA Climate Change Clearinghouse.

these backup generators run on fossil fuels, which create greenhouse gas emissions and exacerbate the impacts on the town.

Heat Waves

Extreme heat and heat waves—defined as periods of 3 or more days over 90°F—are on the rise in Wakefield. The figure to the right demonstrates this point by showing how Massachusetts' climate may seem more like South Carolina's by the end of the century under a "business as usual" greenhouse gas emission scenario.[9] Between 1970 and 2000, an average of 8 days in one year were over 90°F in Middlesex County. By mid-century it could be closer to 30 days and by the end of the century it could reach 46 days.[10] Similarly, there will be a reduction in the average number of days below 32°F each winter. This information led the MVP Core Team and Workshop participants to prioritize heat waves as one of the four primary hazards in Wakefield.

Of particular concern to Wakefield's MVP participants was the effect of heat waves on vulnerable population. During heat waves, seniors and residents with certain medical conditions can be especially at risk. Workshop participants stated that some of these residents are without reliable access to air conditioning. Accordingly, there was much discussion about the lack of public and municipal buildings with air conditioning that could serve as impromptu cooling stations. In addition, some municipal facilities, such as the Department of Public Works building and public housing, get especially hot during times of extreme heat. The effect of heat on youth in schools was also a concern given that several of the public schools do not have air conditioning.

In addition to keeping residents cool, workshop participants pointed to a couple of other public health issues caused by extreme heat. Heat can cause an elevated level of Manganese in drinking water, which causes staining and an undesireable taste and odor in water. Heat also leads to an increase in mosquito and tick populations, which spread vector-borne diseases. Finally, heat waves were also noted to have an effect on transit: the lack of shade at stops and the potential for interrupted Commuter Rail service were common topics of discussion.

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[9] Confronting Climate Change in the Northeast. 2007. Union of Concerned Scientists. Retrieved from https://www.ucsusa.org/sites/default/files/legacy/assets/documents/global_warming/pdf/confronting-climate-change-in-the-u-s-northeast.pdf

[10] Northeast Climate Adaptation Science Center. 2019. "Days with Maximum Temperature Above 90°F." Resilient MA Datagrapher. MA Climate Change Clearinghouse. Retrieved from http://resilientma.org/datagrapher/?c=Temp/county/tx90/ANN/25017/

Drought

Even though more annual precipitation is projected overall, it is anticipated to fall in fewer, more intense events in the winter and spring rather than in smaller more sporadic events throughout the year. Therefore, there will be longer periods of time that experience no rainfall, especially in the summer and fall, increasing the potential for drought. In October 2016, 52% of the land area in Massachusetts was considered to be in "Exceptional Drought,"[11] and Core Team members indicated that Wakefield's lakes were highly affected by this drought. More of these types of events can be expected in the future.

Wakefield relies on Crystal Lake for its drinking water and Lake Quannapowitt for recreation, so participants were concerned about the effect of drought on the Town's lakes. Lower flow in the Saugus River and other waterways may also affect water quality and the risk of algae blooms. While most concerns over drought centered around water supply and quality, participants also noted that more frequent or longer periods of drought increase the risk of brushfires.

Flooding

Over the last several decades, the entire northeast has seen a remarkable increase in the amount of precipitation falling during extreme rainfall events. In fact, 55% more rain is falling during extreme events today compared to the mid-1900s. This massive increase in rainfall is causing significant localized flooding, which disrupts transportation systems, damages infrastructure and property, leads to public health concerns (e.g., standing water, flooding in basements, mold dissemination), and leads to more combined sewer overflows (CSOs) which impairs water quality and causes economic disruptions. In light of these concerns, MVP Workshop participants unanimously agreed that flooding was a serious hazard that warranted consideration.

Flooding in Wakefield is typically concentrated along the paths of the Saugus and Mill Rivers, although additional isolated areas of flooding exist throughout the Town along drainage ditches. The current drainage systems can only handle a 2-5-year storm, so larger storms stress the system and lead to significant flooding. In the

[11] National Oceanic and Atmospheric Administration. Massachusetts. Retrieved from https://www.drought.gov/drought/states/massachusetts

MVP Workshops, participants pointed to increased runoff into waterways, road blockages, larger insect populations, and flooding of houses and wetlands as the biggest causes of concern.

IV. CURRENT STRENGTHS AND ASSETS

One of the focal points of the MVP Workshops was identifying the Town's vulnerabilities and strengths for the features impacted by the four climate hazards outlined above. Through the workshop discussions, the Town's open space, water features, and its people came to the forefront as the biggest strengths. Participants were especially proud of its lakes and parks. Lake Quannapowitt is a major recreational destination for people from all over Wakefield and beyond. Crystal Lake provides the Town with drinking water. Looking to Wakefield's people, participants felt there was a lot of strength to be drawn from senior residents, as well as families and youth.

Other strengths that came up in the MVP Workshops include:

- Air quality
- Power grid
- Public buildings
- Public safety infrastructure
- Town forest
- Tree canopy/public shade trees
- Wetlands

V. TOP RECOMMENDATIONS AND STRATEGIES TO IMPROVE RESILIENCE

After identifying Town features, strengths and vulnerabilities, MVP Workshop participants brainstormed a list of potential adaptation actions Wakefield could take to combat the impacts from the four climate hazards. Actions were intended to build on the preexisting strengths of the Town, while addressing current or future vulnerabilities. This process was conducted individually in each group and then was followed by a full team prioritization of the actions to identify which steps the Town should take first.

MVP Workshop stakeholders generated a list of over 150 actions. Each participant was asked to vote on their top three priorities across the three community components. The following are the top four actions that were collectively identified as top priorities for Wakefield:

MVP Workshop participants choose their top priorities for resilience actions. Photo Credit: KLA

- Inventory at-risk populations to help prioritize services during/after emergencies (12 votes)
- Build a new Department of Public Works facility, potentially partnering with a neighboring town (10 votes)
- Finish and implement the Lake Quannapowitt study (10 votes)
- Expand and promote energy efficiency and solar programs, including Property Assessed Clean Energy (PACE) with the utility (6 votes)

Below are the top actions identified by each group from the Workshop and through community engagement activities. Each action is organized by community component.

<u>Infrastructure:</u>

- Build a new DPW facility, potentially with neighboring town
- Expand and promote energy efficiency and solar programs, including PACE with the utility
- Seek grant funding to fulfill road rehabilitation priorities
- Build a storage facility for deicers and a new salt shed
- Asset management for sewer system
- Provide safe and accessible travel modes for people of all ages and abilities
- Support energy efficiency programs for residents and businesses

<u>Societal:</u>

- Inventory at-risk populations to help prioritize services during/after emergencies
- Install generators at critical facilities
- Create an "emergency equipment" trade program (sump pumps, dryers, etc.) for residents

- Develop a pet evacuation plan
- Start a town-wide education and engagement campaign on preparedness including providing preparedness kits with targeted messages to different audiences
- Ensure households and businesses are prepared for emergencies and can safely make it through 72 hours without power
- Ensure all residents have access to a shelter in case of emergency
- Conduct a social vulnerability assessment

Environmental:

- Finish and implement Lake Quannapowitt study
- Develop and implement a Lake Quannapowitt Protection Overlay Zone that restricts fertilizer use and promotes appropriate tree, shrub, and plant species
- Pursue purchase of water supply land for permanent protection
- Implement a tree replacement program
- Improve and protect water quality in Lake Quannapowitt utilizing green infrastructure opportunities.
- Conduct an analysis of Wakefield's contribution to climate change and develop a plan of action to minimize it.

VI. CONCLUSION AND NEXT STEPS

In order to continue the momentum started during the MVP process, Wakefield has launched *Envision Wakefield Resilient*. Through this project, Town staff worked with consultant, KLA, to develop a pathway to a healthy, thriving future for Wakefield. The project team engaged residents and businesses in the development of this pathway through surveys, attendance at public events, focus groups with key stakeholders, workshops with Town committees and departments, and a social media campaign. The result is a Resilience Framework (see Appendix 6) that the Town can use to assess future projects, policies, and planning efforts. *Envision Wakefield Resilient*—and the final Resilience Framework—will help advance the actions presented in this report. The MVP process was an essential first step to start Wakefield down the path toward its resilient future. The MVP Final Summary of Findings Report was presented to the Town Council and adopted on February 24, 2020.

VII. ACKNOWLEDGEMENTS

The Town of Wakefield would like to thank all the following Core Team members that made this project a success:

Name	Title/Affiliation
Ruth Clay	Health Department
Andy Dennehy	BETA Group
Steve Maio	Town Administrator
Jennifer McDonald	Communications
Claire Moss	Department of Public Works
Christopher Pierce	Building Manager
Paul Reavis	Town Planner
Bill Renault	Department of Public Works
Bob Schiaroli	Wakefield Public Schools
Richard Stinson	Department of Public Works
Gene Sullivan	Wakefield Municipal Gas & Light Department
Elaine Vreeland	Conservation Commission
Tom Walsh	Emergency Management
David West	Emergency Management

Report Citation

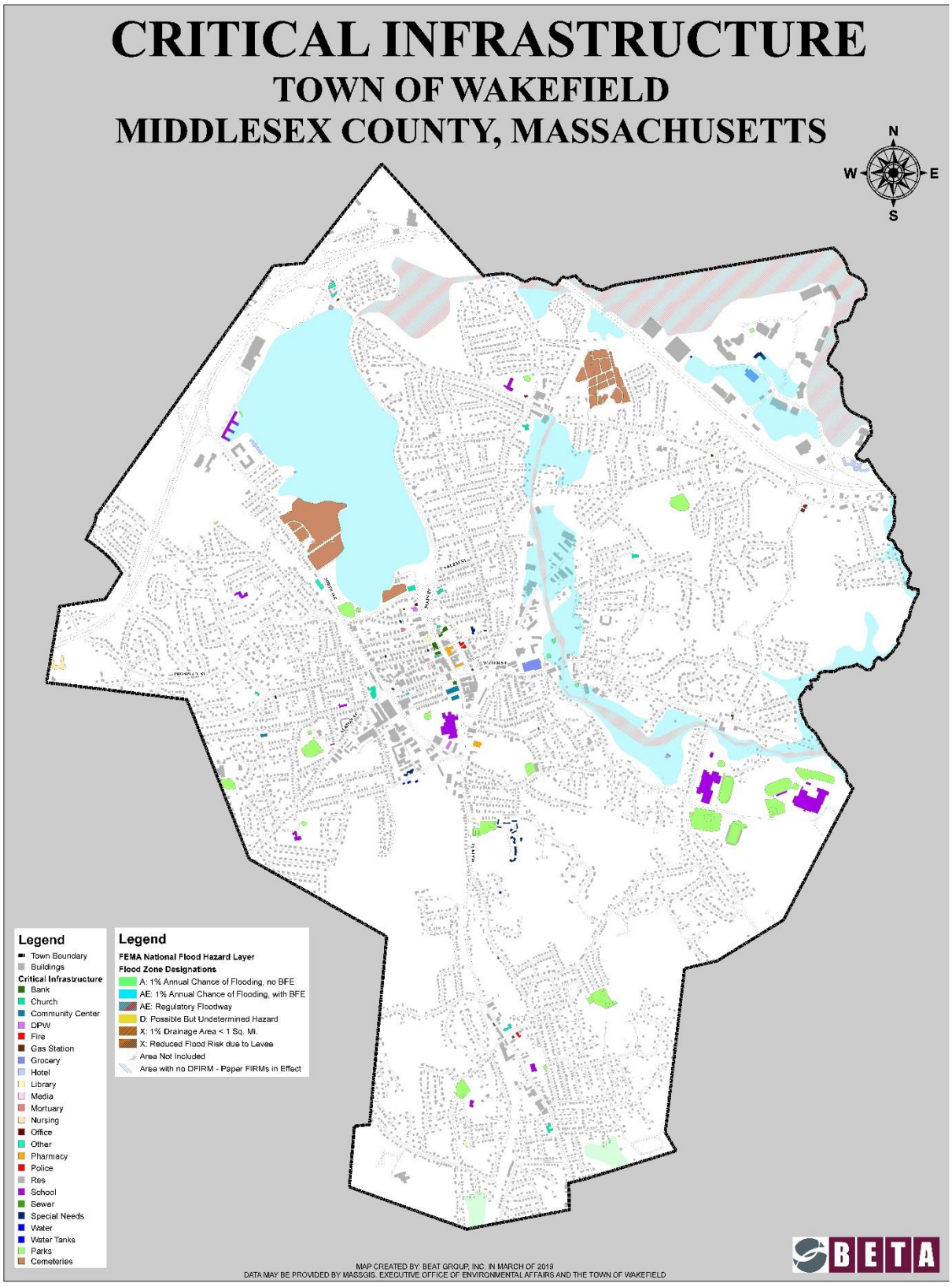
Town of Wakefield (2019). Community Resilience Building Workshop Summary of Findings. Wakefield, Massachusetts.

Community Resilience Building Project Team

Name	Title	Affiliation
Claire Moss	Environmental Manager	Department of Public Works
Jennifer McDonald	Content and Communications Manager	Town Manager's Office
Kim Lundgren	Lead Facilitator	KLA
Angela Cleveland	Facilitator	KLA
Kara Runsten	Facilitator	KLA
Maggie Peard	Facilitator	KLA

APPENDICES

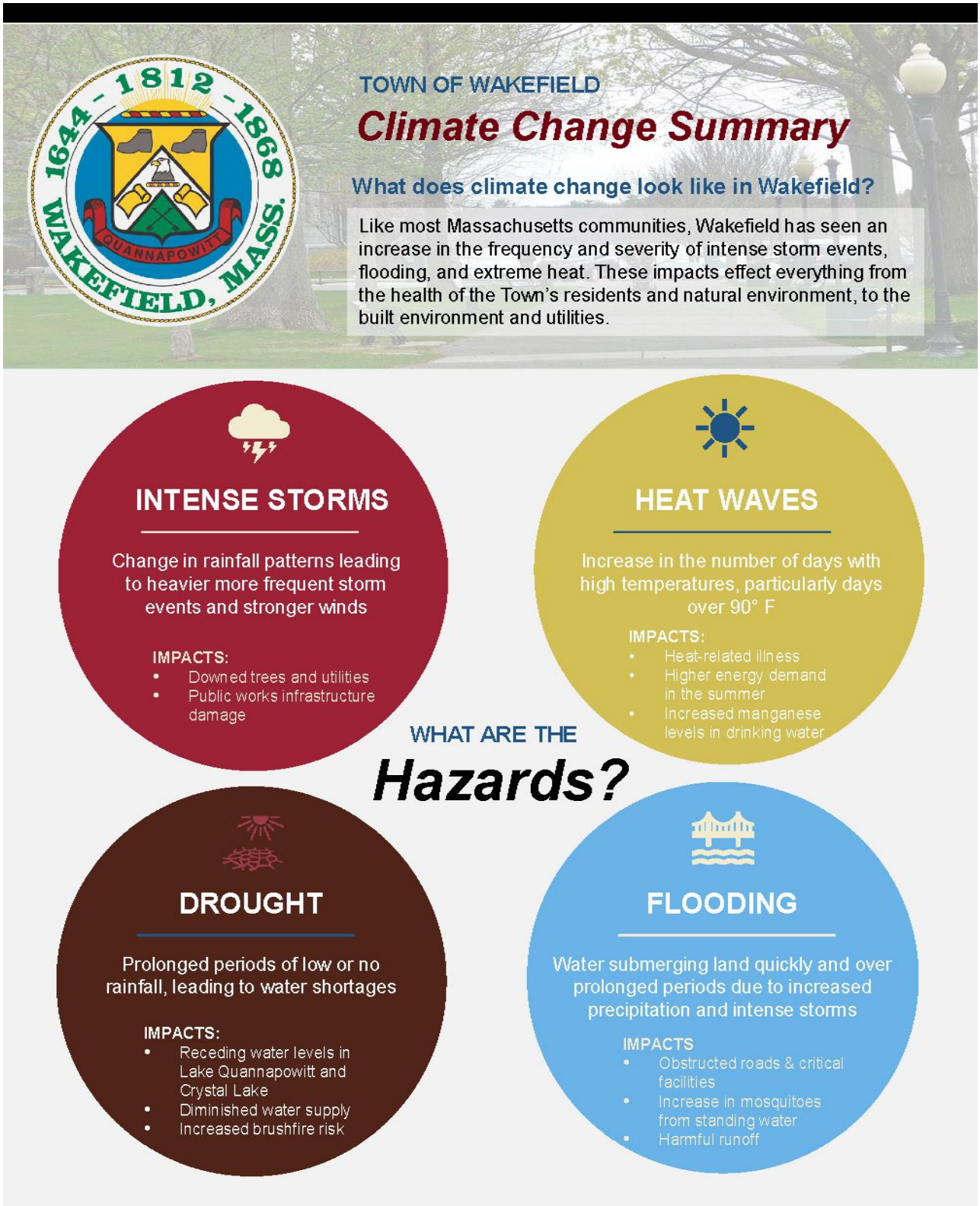
Appendix 1: Maps for MVP Workshops



Appendix 2: MVP Workshop Attendees

Name	Title	Affiliation
Town Lead		
Claire Moss	Environmental Manager	Department of Public Works
Consulting Team		
Kim Lundgren	Lead Facilitator	KLA
Angela Cleveland	Facilitator	KLA
Kara Runsten	Facilitator	KLA
Maggie Peard	Facilitator	KLA
Core Team and Workshop Attendees		
Chris Burne		Riverside Community Care, Inc.
Ruth Clay	Director	Health Department
Joe Conway	Assistant Director	Department of Public Works
Andy Dennehy	HMP Consultant	BETA Group
Hannah Gawrys	Safety Specialist	Bridgewell
Dave Hatfield	Chairperson	Board of Appeals
Meaghan Kinton-Beebe	Head of Circulation	Wakefield Public Library
Steve Maio	Town Administrator	Town of Wakefield
Jennifer McDonald	Content and Communications Manager	Town of Wakefield
Claire Moss	Environmental Manager	Department of Public Works
Maria Palomino	Member	Advisory Board of Public Works
Christopher Pierce	Building Manager	Building Division
Paul Reavis	Town Planner	Town of Wakefield
Bill Renault	Engineer	Department of Public Works
Adam Rodgers	Executive Director	Boys & Girls Club of Stoneham & Wakefield
Bob Schiaroli	Director of Facilities	Wakefield Public Schools
Gene Sullivan	Assistant Management	Wakefield Municipal Gas & Light Department
Michael Sullivan	Chief	Fire Department
Catherine Taatjes	Program Director	Horizon House
Tom Walsh	Director	Emergency Management
Julie Wormser	Deputy Director	Mystic River Watershed Association

Appendix 3: Climate Change Summary



WHAT ARE THE

Trends and Projected Changes?

Intense Storms

70% Increase in the intensity of rain events from 1958 to 2010[1]

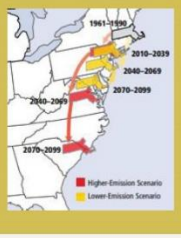
Middlesex County Precipitation Projections[2]

	Observed Baseline 1971-2000	Mid-Century Projection	End of Century Projection
Average Annual Total Precipitation	45.2"	47.5" (+2.3")	48.6" (+3.4")

Heat Waves

Middlesex County Heat Projections[3]

	Observed Baseline 1971-2000	Mid-Century Projection	End of Century Projection
Avg # Days > 90° F	8	30	46
Avg # Days < 32° F	145	116	101



MA could have the climate of South Carolina by the end of the century without emissions reductions[4]

Drought

52% Of the land area in Massachusetts was considered to be in "Exceptional Drought" in Oct '16[5]

Wakefield relies on **Crystal Lake for** drinking water and on **Lake Quannapowitt for** recreation. Drought could compromise these resources and increase the risk of brush fires.

Flooding

$35.2 million Damage from March 2010 floods in Middlesex County[6]

New areas of flooding will strain **drainage infrastructure** and **landscapes**, which public and private property and resources. Standing water will also attract mosquitoes and increase the risk of vector-borne diseases.

1) *Ch. 2: Our Changing Climate. Climate Change Impacts in the United States: The Third National Climate Assessment*,; 2) Northeast Climate Adaptation Science Center. Resilient MA Datagrapher. MA Climate Change Clearinghouse; 3) Ibid 4) Confronting Climate Change in the Northeast. 2007. Union of Concerned Scientists 5) NOAA. Massachusetts. Drought.gov; 6) National Oceanographic and Atmospheric Association. Storm Events Database. 2016.

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www.wakefield.ma.us

Appendix 4: Combined Matrices From Small Groups

The different colors indicate different groups (blue, green, red and yellow).

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	Intense Storms	Flooding	Heat Waves	Drought	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Water systems	Both town & regional	Town/MWRA	V/S	1. Educational campaign around emergency preparedness 2. City-wide emergency preparedness plan		3. Water ban implementation in times of drought	4. Explore desalinization options 5. Water conservation education campaign	1. H 2. H 3. H 4. L 5. L	1. O 2. O 3. S 4. L 5. S/O
Power lines (and substations)	Town wide	WMGLD/National Grid	V/S	1. Move town power lines underground 2. Continue the town tree trimming program and general maintenance of town trees		3. Add solar and wind power sources to bolster the electricity supply during periods of high demand 4. Identify populations especially vulnerable to the heat and develop a program to deliver air conditioning units to them	5. Identify critical facilities that can be used as heating and cooling centers 6. Create a communication plan for resources during heatwaves	1. L 2. H 3. M 4. H 5. H 6. H	1. L 2. O 3. L 4. L 5. S/O 6. O
Sewers (and substations)	Town wide	Town	V/S	1. Assets Management 2. Upgrade old systems 3. Education to homeowners to avoid pumping flooding basements into drainage systems	4. Identify highly susceptible areas to flooding and put in natural filtration systems 5. Clean ups of contaminated water bodies			1. H 2. H 3. H 4. M 5. H	1. O 2. O 3. O 4. L 5. O
Roadways	Town wide	Town/State	V/S	1. Storage facilities for deicers and a new salt shed 2. Continue proactive parking bans	3. Culvert replacements 4. Coordinating roadwork with repaving roads to avoid tearing up roads too many times			1. H 2. H 3. H 4. H	1. L 2. O 3. O 4. O
Railroads/commuter rail	Town wide	MBTA	V/S	1. Build shelters at bus stops 2. Identify populations that are using public transportation 3. Ensure ADA compliance of transportation routes		4. Implement real-time updates for public transit 5. Shade structures at transit stops		1. H 2. H 3. H 4. M 5. H	1. L 2. S 3. L 4. O 5. L
Drainage	Town wide	Town	V/S	1. Increase size of culverts	2. Natural filtration systems at outfalls 3. Use fields as additional natural retention systems around Mill River			1. H 2. M 3. M	1. O 2. O 3. L
Commuter Rail/Bus Routes	N/S along N. Ave	MBTA	V/S					M	L
Public Buildings (DPW, Public House, Public Safety, Schools, Senior Center, Americal)	Town wide	Town	V/S	Build new DPW Barn (potentially with another town) Complete rehabilitation of Public Safety Building Rebuild salt shed				H	S/L

Roads/I-95	Town wide		V/S	Seek funding to fulfill priorities				H	O
Utilities	Town wide	Town	V/S					H	O
Drainage System	Town wide	Town	V/S	Implement town-wide drainage plan Continue replacement of outdated piping Removal of sump pumps connected to sewer system Continue collaborating with neighboring towns on drainage				H	O
Yard Waste Site	Town wide	Town	V/S					H	L
Roads/highways/sidewalks/drainage	Town wide	Town	V/S	1. Grafton, Harrison, and Maple Ave culvert project 2. Assign evacuation routes and routes to get to shelters that are less likely to flood 3. Communications about areas prone to flooding 4. Water Street at Saugus town line--look at drain improvements to prevent flooding 5. Norter Ave by the Light plant drain improvements to prevent flooding				1. M 2. M 3. L 4. H 5. H	1. S 2. S 3. S 4. L 5. L
Electric transmission and generation	Town wide	Town	V/S	1. Bury electric transmission lines 2. Identify more solar/renewable energy sources 3. Look at making solar requirement for new development 4. Add battery storage				1. L 2. M 3. M 4. M	1. L 2. O 3. O 4. L
Public safety infrastructure (Fire, Police, DPW)	Town wide	Town	V/S	1. More generators for critical facilities 2. Inventory of where shut offs are 3. New DPW facility for equipment and staff 4. Energy efficiency				1. H 2. L 3. H 4. H	1. O 2. O 3. L 4. O
Communications and IT Infrastructure	Town wide	Town	V	Add redundancy (new cell tower, servers, etc.)				H	O
Natural gas pipelines	Town wide	Town	V	Convert steel gas lines to plastic				H	O
Stormwater systems	Town wide	Public	S/V	2. Storage systems at specific locations 3. Spillway and overbed assessment lowering water (Lake Q and Crystal)	1. Expand existing drainage study		6. Improve existing water ban bylaw	1. H 2. M 3. H 4. M 5. H 6. M 7. H 8. M 9. H 10. L 11. H 12. M 13. H 14. H	1. S/O 2. L 3. S 4. L 5. S 6. S 7. S/O 8. L 9. O 10. S 11. O 12. O 13. S/O 14. L/O
Water supply	Town wide	Public	S	4. Add holding tanks to slow the runoff into the lakes and brooks 5. By law to further protect Crystal Lake					
Parks and Open Space	Scattered throughout town	Public	S			11. Look at opportunity to add water features and trees to parks 12. Enhance + promote Safe Routes to School program			
Roads (Forrester Rd (potholes), Wiley St, New Salem (flooding), Water St, Spaulding St)	Town wide	Public	S/V	7. New facility for liquid deicer 8. New requirements for underground utilities	9. Clean out nearby rivers to reduce flooding on streets 10. Investigate different road materials				

Buildings	Town wide	Public/Private	S/V	13. Educational campaign on preparedness 14. Add more back up generators to critical facilities		16. Identify priority municipal buildings and schools with A/C, cool roofs program		15. H 16. H 17. H 18. H 19. L 20. H 21. M	15. S/L 16. L/O 17. L/O 18. O 19. S 20. O/L 21. L/O
Power Grid (electricity + gas)	Town wide	Public (mostly)	S	17. Identify vulnerable poles and upgrade or bury		15. Enhance EE and promote commercial PACE 18. Expand solar program			
Transit system	Main corridors	Public	S/V			19. Upgrade tech for timing 20. More shelters at stops and stations 21. Identify vulnerable populations to ensure clean buses go through their neighborhoods			

Adults w/ Disabilities	Bridgewell Town wide		V	Post disaster inspections Lake Q Emergency communication and evacuation plan during power outage Emergency education campaign for residents Public schools--online assignments during power outage (Learn Anywhere)	H	O
Seniors	Town wide		V/S	Outdoor Employee Training Pet evacuation plan (vet/doggie day care)	H	O
People with Health Issues	Town wide		V	Generators for Americal, senior centers, etc. Virtual village	H	O
Ghost Residents	Town Center		V	"Check on your neighbor" campaign A/C donation program	M	O
Families/Youth	Town wide		V/S	Inventory of vulnerable people (people with disabilities, seniors, parents with young kids, single parents, people with health issues) Town invest in "Emergency Equipment"-- sump pumps, AC, heaters, industrial dryers	H	O
Outdoor Workers (DPW, Police/bikes, fire, verizon, ML dept, park/camp)	Town wide		V/S	Share evacuation plans for nursing homes Learn from seniors and their experiences with extreme weather Partner with COA on vans and transportation	H	O
Medically vulnerable and seniors	Town wide		V	1. Adopt a senior/medically vulnerable program (perhaps teenagers matched with seniors) 2. Communications campaign about resources for vulnerable populations in the case of emergencies (translated in multiple languages) 3. Inventory of at-risk populations (including those with medical devices): where people live and where to prioritize services during/post disaster 4. Identify additional cooling stations (e.g. Horizon House) 5. Generator for critical facilities	1. H 2. H 3. H 4. M 5. L	1. O 2. O 3. O 4. S 5. S
People experiencing homelessness	Town wide		V	1. Identify a shelter in case of emergency and make sure it is well stocked with food, water, medical assistances, and has clear signage 2. Communications campaign, creative outreach at fast food restaurants, through police, message boards 3.Program to restock homeless after disasters	1. M 2. M 3. L	1. S 2. S 3. S
Small businesses	Town wide	Private	V/S	1. Improvement of arterial roads and infrastructure so people can reach businesses 2. Resources available for businesses to bounce back quickly from emergencies 3. Campaign to rally around small businesses after disaster 4. Small businesses as unofficial shelters during heatwaves	1. M 2. L 3. M 4. L	1. L 2. O 3. S 4. S
Average resident	Town wide		V/S	1. Communication and educational campaign about resources available during emergency, preparedness tips, where shelters are, etc. 2. Program to offer emergency kits at reduced costs	1. M 2. M	1. S 2. S

Youth	Town wide		V/S	1. Targeted online communications campaign on preparedness 2. Alternative programs for hot days for outdoor extracurriculars 3. Program for snow days for working parents	1. M 2. L 3. L	1. S 2. S 3. S
Population experiencing homelessness	Scattered throughout town		V	1. Research what other towns are doing to help keep the homeless populations safe during extreme events	1. H	1. S/O
Senior population	Town wide		S/V	2. Education campaign with preparedness kits 3. A/C take back and subsidy program 4. Create and provide access to a Public Information Officer Training	2. H 3. M 4. M	2. S 3. L 4. S
Youth	Town wide		S/V	5. Identify inability to access food year-round 6. Identify location and access to public cooling 11. Assess heat index around schools and identify sustainable solutions to cool (trees, insulation, etc.)	5. H 6. H 11. H	5. S 6. L 11. L/O
Renters	Town wide		S/V	7. Work with landlords to ensure units meet basic needs in a changing climate 8. Ensure renters know their rights	7. M 8. H	7. S 8. D
Businesses	Town wide	Private	S/V	9. Partner with the Chamber of Commerce to engage, train, and educate businesses on climate change and solutions, including EE	9. H	9. S
Medically vulnerable (both physically and mentally)	Town wide		V	10. Create a climate change policy to ensure all new development meets new needs based on a changing climate	10. H	10. L

Other: un/underemployed, those in group homes, non-English speakers, houses of worship

Environment						
Lakes	2 specific locations	State (Lake Q) Town (Crystal)	V/S	1. Invasive species removal day 2. Water supply land protection purchases at Crystal Lake 3. Water quality treatments (consolidate outfalls to both lakes) 4. Upper water management treatment project (water quality) 5. Aeration of Lake Q	1. L 2. H 3. H 4. H 5. M	1. S/O 2. L 3. L 4. L 5. O
Streams, Rivers, Wetlands	Town wide	Varies	V/S	1. Nitrogen and phosphorus communication/education plan 2. Expand dredging program to include Wiley St and Paon Boulevard 3. Culvert enhancements to meet stream crossing standards 4. Water quality treatment at existing outfalls 5. Developer contributions to enhance streams, rivers, wetlands	1. H 2. L 3. M 4. M 5. M	1. O 2. L 3. L 4. S/L 5. S
Parks	Town wide	Town	V/S	1. Improved agronomy in parks to enhance natural resources 2. Inspection and removal program for invasive species 3. Flood control projects at parks 4. Inspection protocol for droughts/brushfire	1. M 2. L 3. L 4. L	1. O 2. L 3. L 4. S
Town forest	Specific	Town	V/S	1. Preserve forests as wind blocks 2. Value resilience benefits 3. Balance renewable needs with effects of clean cutting	1. M 2. M 3. M	1. O 2. O 3. O
Tree canopy/public shade trees	Town wide	Varies	V/S	1. Replacement program 2. Removing invasive program 3. Structural pruning program	1. H 2. L 3. H	1. O 2. L 3. O
Lake Q	Specific	State owns lake Town maintains Abutters own land around	S/V	1. Conduct an engineering study to determine when to lower 2. Install SW mitigation measures 3. Minimize salt and sand in Lake area 4. Dredge lake to deepen and remove invasive species 5. Install erosion control measures	1. M 2. H 3. H 4. H 5. H	1. L 2. O 3. L 4. L 5. S

Crystal Lake	Specific	Town has permit State/Federal Authority	S/V	6. Enhance educational outreach and signage 7. Lake Q overlay zone with fertilizer restrictions and specific species locations 8. Develop a Quick Response Plan in case there is a contamination issue with the commuter rail (also applies to Lake Q and Saugus River)	6. H 7. H 8. H	6. S 7. L 8. L
Trees (street trees/urban canopy)	Town wide	Public/private	S/V	9. Promoting the benefits of trees and identifying appropriate species in changing climate	9. H	9. S
Rivers (Saugus, Mill, Other)	Specific	Public waterways Not all access is	S/V	10. Cleaning and dredging of rivers to remove debris 11. Study diversion opportunities between the two lakes 12. Install a trash boom to monitor and collect micro plastics in lakes and rivers	10. H 11. M 12. H	10. L 11. L 12. S
Wildlife/Aquatic life	Town wide		S/V	13. Identify and find ways to protect wildlife habitat and corridors	13. H	13. S/O
Wetlands	Specific	Public/private	S/V	14. Create a town-specific wetlands bylaw	14. H	14. S
Parks and Open Space and The Common	Specific	Public	S	15. Identify parks in flood plains or those that could be used as detention basins. Study for Saugus River watershed (regional approach to restore wetlands and hold more flood waters	15. H	15. S
Air Quality	Town wide		S	16. Identify "hot spots" for improvements to air and noise quality (trees, solar, etc.) 17. Best Practices Exchange Program with city in Europe	16. H 17. H	16. S 17. S
Mill River	Headwaters start near Toby Lane	Homeowners on either side	V	1. Implement a town-wide drainage study recommendation	M-H	L
Crystal Lake		Town	S/V	2. Purchase land around Lake	M-H	O
Street Trees/Shade Trees	Town wide	Both	V	3. Revise Tree Maintenance Plan 4. Town-wide smart tree planting policy	H	O
Lake Quannapowitt		Town	S/V	5. Implement/finish study	H	O
Wetlands			V	6. Find appropriate wetland restoration projects	L	O
Mill River Floodplain	Salem/New Salem/Water Street	DCR Industrial	V	7. Flood storage project	M	L

Community Resilience Building Risk Matrix

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H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
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	INTENSE STORMS	FLOODING	HEAT WAVES	DROUGHT	Priority H-M-L	Time Short Long Ongoing
Infrastructural				· Signal issues · Issues w/ routes cleared					
Commuter Rail / Bus Routes	N/S Along N. Ave	MBTA	VS	· Tracks freeze · Lack of svcs · Move people (S)	· Flood along Crystal Lake · Behind Subaru	· No covered station		M	L
Public Buildings · DPW · Schools · Public House · Senior Center · Public Safety · Americal		Town	VS	Public Safety – outdated HVAC; Public Housing – [illegible]; (S) Senior Center – could be shelter; (S) Americal – Central & can be used for shelter	DPW Garage Floods; Public Safety – outdated HVAC; Public Housing on Boardwalk; Senior Center – potential for flood	(S) Americal – AC; DPW Garage – HOT; Public Safety – outdated HVAC; Public Housing – no central Air		H	S-L
Roads / I-95	All over		VS	(S) Access to highway; Heaving/Buckling; Roads need work due to utility/[illegible]	Heaving/Buckling; N Ave & Willard Road, North & [illegible] Church, Mill River Floodplain, Wiley Street, Grafton, Messenger Ct	Heaving/Buckling; Tough to work on Roads	(S) Can work on roads!	H	O
Utilities	All over	Town	VS	(S) [illegible] Steel Gas Lines; Unlined & Cast Iron Water; Beyond useful service life (many pieces); Electric – Ice, Tree falling	Underground electric	Price Spiking potential; (S) Power Redundancy	(S) Back up water supplies	H	O
Drainage System	All	Town	V	Pump Stations – rely on electricity; Too Small / Too old; Flows east – potential blockages downstream	Pump Stations – Subject to flooding; Sewer			H	O
Yard Waste Site	Nahant St	Town	SV	(S) Salt degrades system; Temporary storage of debris; Fire Hazard	Building is sloper; Runoff	Smell; Fire Hazard	Fire Hazard	H	L
~~Societal~~ Societal									
Adults w/ Disabilities – Group Homes	Bridgewell; All over		V	Difficult evacuations; Back up sites available		Heat Distress; Limits outside activity	~~Distress~~	H	O
Seniors – Inventory – Greenwood	All over		VS	Being home bound; Comm. mechanism	Recovery fund or retrofit fund	Communication about upcoming Heat Wave; Pride, No AC		H	↓
~~[illegible]~~ People w/ Health Issues – Inventory	All over		V	Homebound – lose power		" " Homebound – lose power		H	↓
Ghost Residents – Horizon House	Town Center		V	Lack of shelter/resources; Underinformed		Lack of shelter/resources; Underinformed		M	↓
Families / Youth	All over		VS	· Single parent ~~[illegible]~~ capacity · Shelter in place · Outside assistance; Strengths: PTOs	· Children in flooding area – drowning	· Health issues – Young · Families w/o air conditioning	· Residents burning during drought	H	↓
Outdoor Workers · DPW · Police/Bike · Fire · ML Dept · Verizon · Park/Camp Counselors · Yacht Club · Boat rentals	All over		VS	· Muni staff well trained (S) · Physically taxing, Injury · Fatigue, Vehicular Safety · Capacity · Committed (S) · Flexibility/Redundancy in Communication (S)	· Live wires · Env. Concerns – Sewer · Safety · Mutual Aid Agreements (S)	· Overheating faster b/c of heavy equipment · Inexperienced clientele · No Shade · Space to keep kids inside during heat wave	· Brushfires · Economic · Lost wages	H	↓
Environmental "Joe Sent study"									
(1) Mill River · Engineering Study · Dredging · Work w/ other Towns	Headwaters start near Toby Lane	Homeowners on either side	V		By Metro Tech, Water St		Poor WQ; Habitat impacted	M-H	L
(2) Crystal Lake – Pesticides? Purchase ~~[illegible]~~ Land		Town	S & V	Not yet	Holding basin	Manganese issues	Loss of Drinking Water	M-H	O
(3) Street Trees / Shade Trees	Town-wide	Both	V	High Winds	Weakens root system			H	S O
(4) Lake Quannapowitt (Great Pond)	Implement (Steve) ~~[illegible]~~ Study	~~[illegible]~~ Town	S & V	Algae Blooms (after lots of rain)	~~Algae Blooms~~ Insects increased	Smells in heat; Recreation source; Potentially beaches	Economic – loss of rec. (someday)	H	O
(5) Wetlands – Wetlands restoration projects	Overdevelopment (residential)		V		Overflooding in areas		Brushfires	L	O
(6) Mill River Floodplain	Salem/New Salem Water St.	DCR Industrial ~~Private~~	V		Restoration of floodplain – Flood storage (could be strength)			M	L

Margin notes: (S) Move freight; No Backup plan for displacement; (S) Schools well [illegible]; · Go to hotels · Shelter in place · Ensure they can be off-grid for 72 hours; (S) [illegible] Coach; (S) Police Social Workers; · 2015 – Snow Storm · No place to go in intense storms; Strength: Connections; Tree · Maintenance Plan · Town-[illegible] Smart [illegible] Policy · Solar [illegible]

Community Resilience Building Risk Matrix

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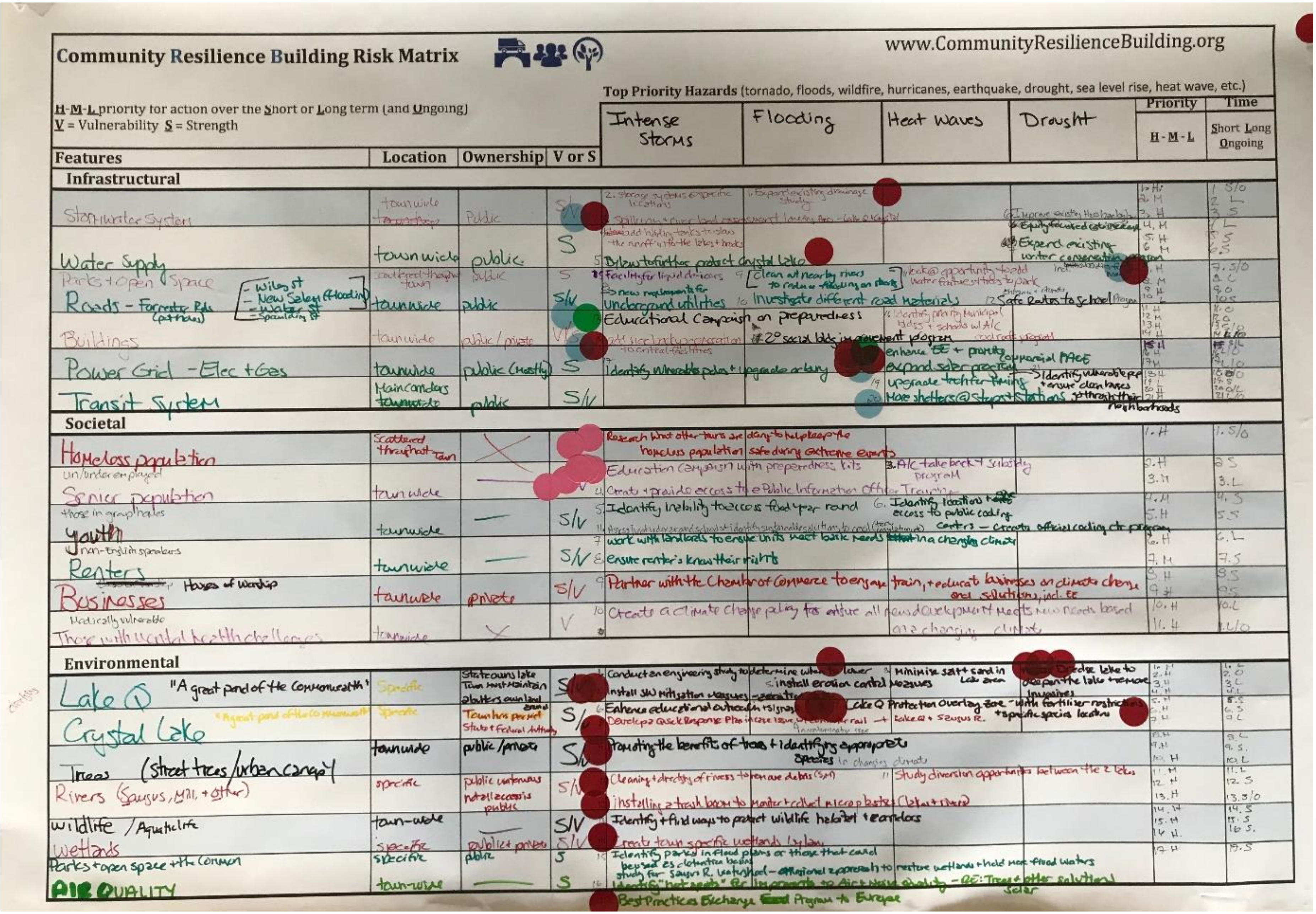
V = Vulnerability **S** = Strength

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

Features	Location	Ownership	V or S	INTENSE STORMS	FLOODING	HEAT WAVES	DROUGHT	Priority H-M-L	Time Short Long Ongoing
Infrastructural				-Grafton + Maple Ave culvert project (M,S)					
Roads/highways/Sidewalks/Drainage	Town-wide	Town	V/S	-Assign evacuation routes and routes to get to shelters that are less likely to flood (M,S) -Communications about areas prone to flooding (L,S) -Water street at Saugus Town Line - look at drains improvements to prevent flooding (H,L) -North Ave by the Light plant improvements to prevent flooding (H,L)					
Electric transmission+ generation	Town-wide	Town	V/S	-Bury electric transmission (L,L) -Identify more solar/renewable energy sources → (M,O) -Look at making solar requirement for new development → (M,O) -Expand tree pruning program → (M,L) -Add battery storage					
Public Safety Infrastructure (Fire, Police, DPW)	Town-wide	Town	V/S	-More generators for critical facilities (Town Hall, 11 Lafayette) (H,O) or renewables/battery -Inventory of where shut offs are (L,O) -New DPW facility for equipment + staff (H,L) -Energy efficiency (H,O)					
Communications+IT Infrastructure	Town-wide	Town	V	-Add redundancy (new cell tower, servers, etc.) → (H,O)					
Natural gas pipelines	Town-wide	Town	V	-Convert steel gas lines to plastic (H,O)					
Societal				-Adopt a Senior/medically vulnerable program (perhaps teenagers matched w/ seniors) (H,O) -Communications campaign about resources for vulnerable populations in the case of emergency (+ translator in multiple languages) (H,O)					
Medically Vulnerable + Seniors	Town-wide	N/A	V	-Medical device list - identify at-risk populations where they live + where prioritize services (including those w/ medical devices) during (H,O) -Well being check program after extreme event (e.g. Horizon House) (M,S) -Identify additional cooling stations (e.g. Horizon House) (L,S) -Generator for critical facilities					
Homeless	Town-wide	N/A	V	-Identify a shelter in case of emergency, and make sure well stocked w/ food, water, + medical assistance, clear signage (M,S) -Communications campaign, creative outreach at fast food restaurants, through police, message boards (M,S) -Program to re-stock homeless after disasters (L,S)					
Small businesses	Town-wide	Private	V/S	-Improvement of arterial roads/infrastructure so people can reach businesses (M,L) -Resources available for businesses to bounce back quickly (L,O) -Campaign to rally around small businesses after disaster (M,S)		-Small businesses as unofficial shelters during heat waves (L,S)			
Average resident	Town-wide	N/A	V/S	-Communications/educational campaign (resources avail + preparedness tips), where shelters are) (M,S) -Program to offer emergency kits at reduced cost (M,S)					
Youth	Town-wide	N/A	V/S	-Targeted online communications campaign on preparedness (M,S) -Programs for snowdays for working parents (L,S)		-Alternative programs for hot days for outdoor extracurriculars (L,S)			
Environmental									
Lakes	Specific 2 Locations	State - Lake Q Town - Crystal	V/S	-Expand Nitrogen + phosphorus communications/education (H,O)	-Invasive species removal day (L,S)	-Water quality treatments (consolidate outfalls to both lakes) (H,L) -Upper watershed management treatment project (H,L) -Aeration of at Lake Q (M,O)	-Water supply land protection purchases @ Crystal (H,L)		
Streams, rivers, wetlands	Town-wide	Varies	V/S	-Dredging program to include Wiley St. + Moon Blvd. (L,L) -Culvert enhancements to meet stream crossing standards (M,L) -Developer contributions to enhance streams, rivers, wetlands (M,S)		-Water quality treatment at existing outfalls (M,S/L)			
Parks	Town-wide	Town	V/S	-Improved agronomy in parks to enhance natural resilience (M,O)	-Flood control projects at parks (L,L)	-Inspection + removal program for invasives (L,L) -Inspection protocol for droughts/brush fires (L,S)			
Town forest	Specific	Town	V/S	-Preserve forest as wind block (M,O) -Value resilience benefits (H,O) -Balance renewables needs w/ ecological affect of clear cutting (M,O)		-Structural pruning program			
Tree Canopy/Public Shade Trees	Town-wide	Varies	V/S	-Replacement program (H,O) -Removing (invasive program) (L,L)		-Structural pruning program (H,O)			



Community Resilience Building Risk Matrix

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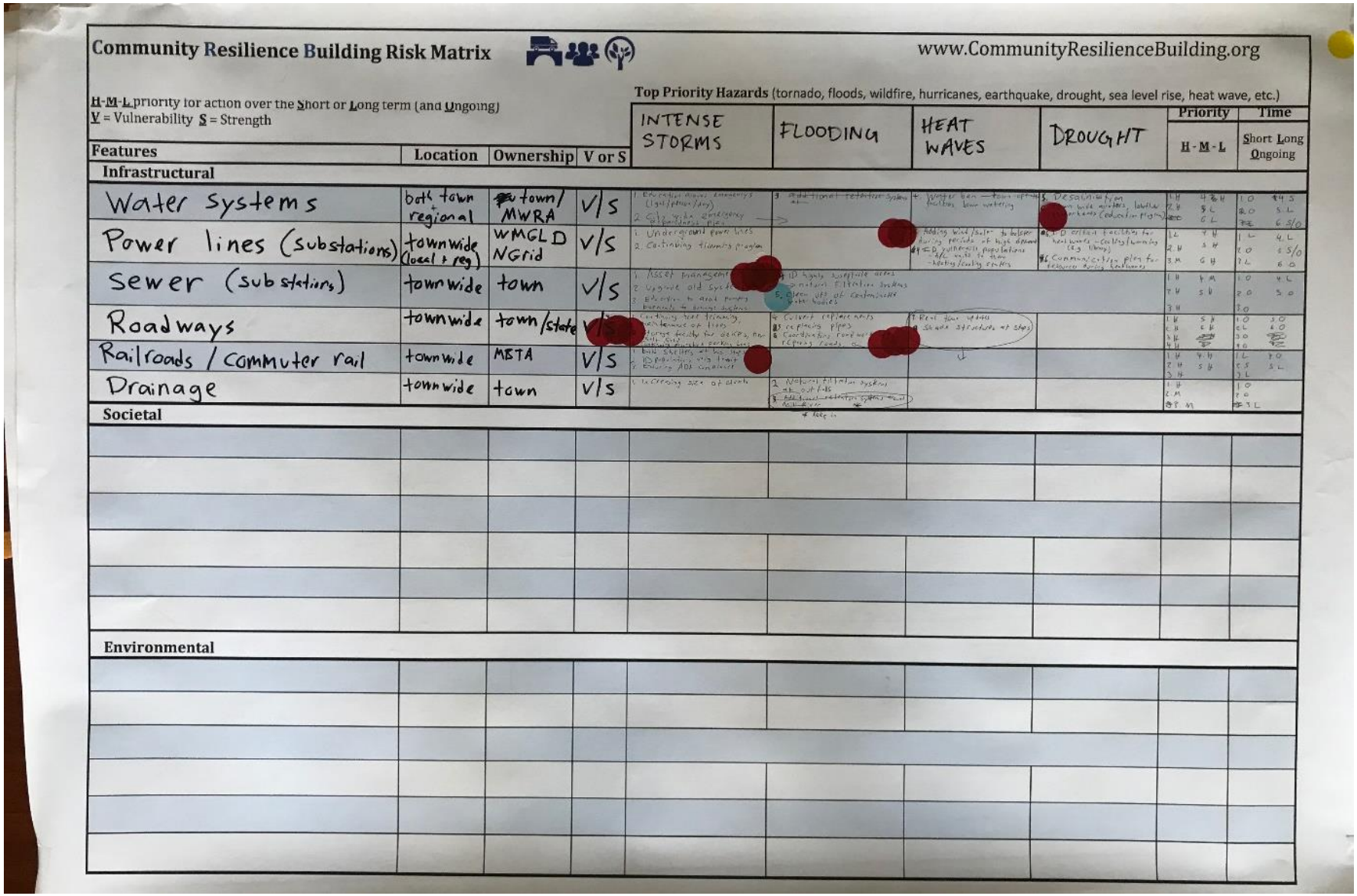
H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.): Intense Storms | Flooding | Heat Waves | Drought

Features	Location	Ownership	V or S	Actions (Intense Storms / Flooding / Heat Waves / Drought)	Priority H-M-L	Time Short Long Ongoing
Infrastructural						
Stormwater System	townwide	Public	S/V	1. Expand existing drainage study; 2. Storage systems @ specific locations; 3. Spillway + riverbed assessment lowering flow – Lake Q + Crystal; 4. add holding tanks to slow the runoff into the lakes + brooks; 6. Improve existing H2O bylaw	1. H; 2. M; 3. H	1 S/O; 2 L; 3 S
Water Supply	townwide	public	S	5. Bylaw to further protect Crystal Lake; Equity focused rate increase; Expand existing water conservation program	4. M; 5. H; 6 M	4 L; 5 S; 6. S
Parks + Open Space	scattered throughout town	public	S	Facility for liquid de-icers; 9. Clean out nearby rivers to reduce flooding on streets; 11. look @ opportunity to add water features + trees to parks	7. H; 8. M	7. S/O; 8. L
Roads – Forrester Rd (potholes); – Wiley St; – New Salem (flooding); – Water St; – Spaulding St	townwide	public	S/V	new requirements for underground utilities; 10. Investigate different road materials; 12. Safe Routes to School Program	9. H; 10. L	9. O; 10. S
Buildings	townwide	public / private	V/S	13. Educational Campaign on preparedness; add resiliency/generation to critical facilities; 12° social bldgs improvement program; 14. Identify priority municipal bldgs + schools w/ A/C; cool roof program	11. H; 12. M; 13. H; 14. H	11. O; 12. O; 13. S/O; 14. L/O
Power Grid – Elec + Gas	townwide	public (mostly)	S	17. Identify vulnerable poles + upgrade or bury; enhance EE + promote commercial PACE; expand solar program; 21. Identify vulnerable people + ensure clean houses	15. H; 16. H; 17. M; 18. H	15. S/L; 16. L/O; 17. L/O; 18. S/O
Transit System	Main corridors	public	S/V	19. upgrade traffic timing; 20. More shelters @ stops + stations; go through their neighborhoods	19. L; 20. H; 21. H	19. S; 20. O/L; 21. L/O
Societal						
Homeless population; un/underemployed	Scattered throughout town	X		Research what other towns are doing to help keep the homeless population safe during extreme events	1. H	1. S/O
Senior population; those in group homes	town wide	—	V	Education campaign with preparedness kits; 3. A/C take back + subsidy program; 4. Create + provide access to e Public Information Officer Training	2. H; 3. M; 4. M	2 S; 3. L; 4. S
Youth; non-English speakers	townwide	—	S/V	5. Identify inability to access food year round; 6. Identify locations + ensure access to public cooling centers – create official cooling ctr program; 11. Assess what indoor spaces + schools to identify sustainable solutions to cool (insulation etc.); 7. work with landlords to ensure units meet basic needs in a changing climate	5. H; 6. H	5. S; 6. L
Renters; Houses of Worship	townwide	—	S/V	8. ensure renter's know their rights	7. M; 8. H	7. S; 8. S
Businesses; Medically vulnerable	townwide	private	S/V	9. Partner with the Chamber of Commerce to engage, train, + educate businesses on climate change and solutions, incl. EE	9. H	9. S
Those with mental health challenges	townwide	X	V	10. Create a climate change policy to ensure all new development meets new needs based on a changing climate	10. H; 11. H	10. L; 11. L/O
Environmental						
Lake Q "A great pond of the Commonwealth"	Specific	State owns lake; Town must maintain; abutters own land	S/V	1. Conduct an engineering study to determine when to lower; install SW mitigation measures; install erosion control measures; Minimize salt + sand in Lake area; Dredge lake to deepen the lake + remove invasives	1. H; 2. H; 3. H; 4. H	1. L; 2. O; 3. L; 4. L
Crystal Lake "A great pond of the Commonwealth"	Specific	Town has permit; State + Federal Authority	S/V	6. Enhance educational outreach + signage; Develop a Quick Response Plan in case… rail; Lake Q Protection Overlay Zone – with fertilizer restrictions + specific species locations; Lake Q + Saugus R.	5. H; 6. H; 7. H	5. S; 6. S; 7. L
Trees (street trees / urban canopy)	townwide	public / private	S/V	Promoting the benefits of trees + identifying appropriate species in changing climate	8. H; 9. H; 10. H	8. L; 9. S; 10. L
Rivers (Saugus, Mill, + other)	specific	public waterways; not all access is public	S/V	Cleaning + dredging of rivers to remove debris (S+M); 11. Study diversion opportunities between the 2 lakes; installing a trash boom to monitor + collect microplastics (lakes + rivers)	11. M; 12. H; 13. H	11. L; 12. S; 13. S/O
Wildlife / Aquatic life	town-wide	—	S/V	Identify + find ways to protect wildlife habitat + corridors	14. H; 15. H; 16. H	14. S; 15. S; 16. S
Wetlands	specific	public + private	S/V	Create town specific wetlands bylaw		
Parks + open space + the Common	specific	public	S	15. Identify parks in flood plains or those that could be used as detention basins; study for Saugus R. watershed – regional approach to restore wetlands + hold more flood waters	17. H	19. S
AIR QUALITY	town-wide	—	S	16. Identify "hot spots" for improvements to Air + Noise Quality – RE: Trees + other solutions; solar; Best Practices Exchange Program to Europe		



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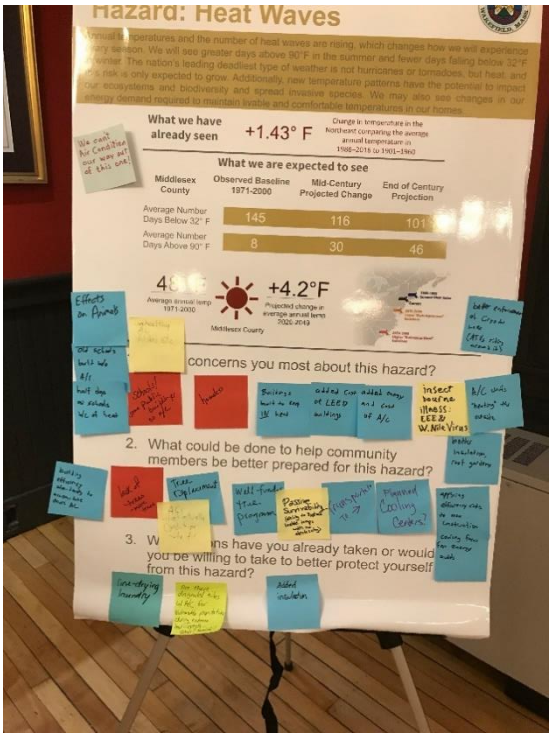
H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

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

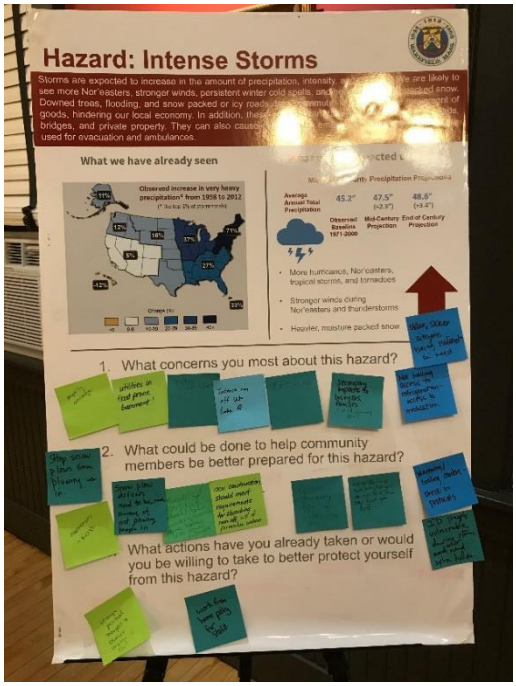
Features	Location	Ownership	V or S	INTENSE STORMS	FLOODING	HEAT WAVES	DROUGHT	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Water Systems	both town + regional	~~town~~ / MWRA	V/S						
Power lines (substations)	townwide (local + reg)	WMGLD NGrid	V/S						
Sewer (substations)	townwide	town	V/S						
Roadways	townwide	town/state	V/S						
Railroads / commuter rail	townwide	MBTA	V/S						
Drainage	townwide	town	V/S						
Societal									
Environmental									

*The second day of the MVP workshop consisted of three, rather than four, small groups. This matrix was from the additional group on the first day.

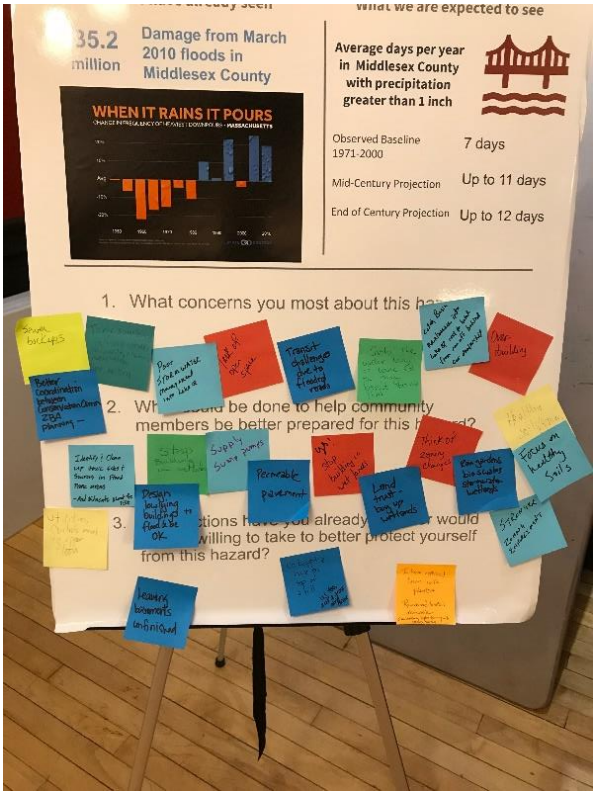
Appendix 5: Community Input at August 29th Listening Session



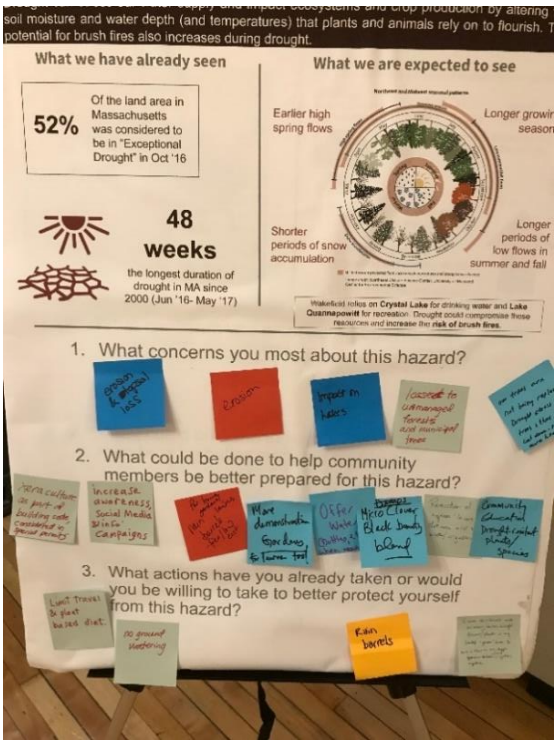
Heat Waves		
What concerns you most?	**What could be done?**	**What are you already doing?**
Effect on animals	Better insulation, roof gardens	Added insulation
Old schools built without A/C	Building efficiency standards to accommodate more AC	line-drying laundry
Half days at schools because of heat	More trees	
unhealthy AC filters	Tree replacement	
schools/some public buildings with no AC	AC that actually condition the air	
Homeless	Well-funded tree program	
Buildings around here built to keep heat IN	Passive survivability (ability to sustain high temps with no electricity)	
Added cost of LEED buildings	planned cooling centers (and transportation to them)	
added energy and cost of AC	Applying efficiency codes to new construction	
Insect borne illness: EEE and West Nile Virus	Cooling focus for energy audits	
Better enforcement of Crystal Lake (ATVs have been riding around it)	are there designated sites with AC for vulnerable populations during extreme heat events?	
AC units "heating" the outside		



Intense Storms		
What concerns you most?	**What could be done?**	**What are you already doing?**
Property damage	Stop snow plows from plowing us in	Change political thought: Climate change is real
Utilities in flood prone basement	Awareness kiosk	work from home policy for staff
Safety and injuries	Snow plow drivers need to be more aware of not plowing people in	
Intense run off into Lake Q	Electric/utilities should be underground to reduce power outages	
Electric lines	New construction should meet requirements for absorbing run off, use of permeable surfaces	
Older, sicker citizens being isolated in need	Educate to stay away from lines and water with lines, etc.	
Not having access to refrigeration--access to medication	Not at the town level, but jobs you can miss for a few days and not get fired	
	Warming/cooling centers	
	Check in protocols	
	ID vulnerable populations and when they need help	



Flooding		
What concerns you most?	**What could be done?**	**What are you already doing?**
Sewer backups	Better coordination between conservation commission, ZBA, planning	Leaving basement unfinished
Poor stormwater management into Lake Q	Control the water level of Lake Q so my basement does not flood	We bought a house on top of a hill
Toxic substances in flood waters: soil, waste, chemicals, heavy metals, algae, bacteria	Identify and clean up toxic sites and sources in flood prone areas (and educate about the risk)	Grass strip driveway
lack of open space	Design low lying buildings to flood and be OK	I have replaced lawn with plants
Transit challenges due to flooded roads	Stop building in wetlands	Rain barrels to store rainwater
Over-building	Supply sump pumps	I am considering replacing driveway with pervious surface
Catch basin maintenance into Lack Q next to hotel from run off behind car dealership	Permeable pavement	
	stop building in wetlands	
	Land trust should buy up wetlands	
	Think of zoning changes	
	Rain gardens, bioswales, stormwater wetlands	
	Stronger zoning enforcement	
	Healthy soil/sponges	
	focus on healthy soils	



Drought		
What concerns you most?	**What could be done?**	**What are you already doing?**
Erosion and top soil loss	Terraculture as part of building code, considered in special permits	Limit travel and plant based diet
Erosion	Increase awareness with social media info campaigns	no ground watering
Impact on lakes	Rain barrels at free/low cost	rain barrels
Losses to unmanaged forests and municipal trees	More demonstration gardens	I have rain barrels and as many native flowers/plants in my "gross" lawn
our trees are not being replaced	Offer water with needed	
Drought stresses trees and they are being cut down	Micro clover black beauty blend	
	reduction of "gross" lawns that need a lot of water/irrigation	
	Community education on drought-resistant plants/species	

Appendix 6: Wakefield's Resilience Framework

Appendix 7: Community Engagement Report

envision WAKEFIELD — RESILIENT → OUR PATHWAY TO A HEALTHY, THRIVING FUTURE

WAKEFIELD COMMUNITY ENGAGEMENT EVALUATION

December 2019

KLA KIM LUNDGREN ASSOCIATES, INC.

OVERVIEW

Since the launch of *Envision Wakefield Resilient* in the summer of 2019, the Town and Consultant Team have been busy getting the word out about the project, hosting events and trainings, and collecting feedback from Wakefield residents and businesses. This engagement report highlights the in-person and online engagement efforts made to-date, presents the results of the survey, and reports progress on meeting engagement goals. To the right are the overarching goals for the project's community engagement efforts.

The engagement highlights include attending Festival by the Lake and Festival Italia, hosting a Business Resilience Workshop and a Vulnerable Populations Focus Group, collecting 71 survey responses, and posting weekly to social media.

GOALS FOR COMMUNITY ENGAGEMENT

PHASES OF THE ENGAGEMENT PROCESS

Phase One

- Open conversation about climate change with the community
- Assess baseline knowledge about the topic
- Learn about resident concerns

Phase Two

- Assess results from community engagement
- Establish priorities to create an evaluation framework
- Complete an evaluation framework and dashboard to measure progress

2

IN-PERSON **ENGAGEMENT:** Events

Pop-Ups at Events: Festival Italia & Festival by the Lake
The Town has seen great success from pop-ups and has leveraged this model at the various events throughout Town including the Festival by the Lake in June and the Festival Italia in August. Events like this provided an opportunity to engage with a wide range of community members, not just those that are inclined to attend an event on climate change. The team compiled the responses collected from these events and incorporated them into the Summary of Findings Report and informed the development of the evaluation criteria.

Preparedness Drive
In coordination with the Wakefield Food Pantry, the Town held a preparedness drive that was paired with education about how to make sure you are prepared for up to 72 hours without power. Participation was limited, but the Town walked away with concrete action steps to improve this kind of drive in the future, such as better publicizing and additional partnering with community organizations.

4

IN-PERSON **ENGAGEMENT:** Focus Groups

Focus Group: Chamber Workshop
The Town and Consultant Team partnered with the Wakefield/Lynnfield Chamber of Commerce to host a preparedness training and discussion with businesses in October. Discussion centered on businesses biggest needs after an emergency, where they turn to for information, and generally how they can build resilience in the face of climate impacts. There were around 15 people in attendance.

Focus Group: Vulnerable Populations
The Town and Consultant Team hosted an informal conversation with the Police Chief, Fire Chief, and Emergency Management Director to learn more about who the vulnerable populations are in Wakefield, the current outreach techniques and protocol to these residents, and what resources are available to provide assistance and support to both the vulnerable residents and emergency service providers to help them. The biggest takeaway was around community engagement and education, specifically using CodeRed, the Town's website, and providing orientation to key personnel to assist vulnerable populations.

4

SURVEYS & ONLINE **ENGAGEMENT**

Survey
The survey was used to assess the baseline knowledge of and community concerns about climate change and determine a vision for a resilient Wakefield and the actions needed to get there. The survey was available online, promoted through social media, and distributed at in-person events and through partner organizations. The team collected 71 survey responses. Results can be found on the following pages.

Social Media, Blogs, and Newsletters
The KLA Team provided 2-3 social media posts per week to highlight why Wakefield needs to take action on climate change and how community members can do it together, as well as promoting *Envision Wakefield Resilient* events. Posts generated 5-15 engagements (likes, shares, comments). Social media was especially helpful in publicizing the survey: 31% of survey respondents reported hearing about the survey through social media—second only to taking the survey at an in-person event.

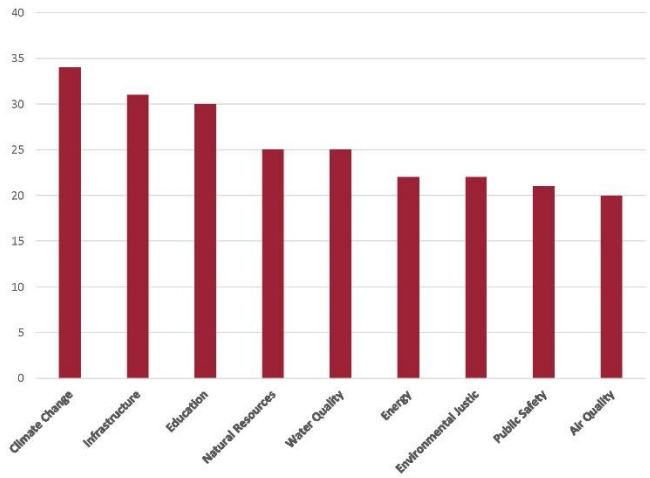
Business Resilience Checklist
To support the Business Resilience Focus Group co-sponsored with the Chamber, a Business Resilience Checklist was help communities prepare for the impacts of climate change and other emergency situations. The Checklist is on the Town's website and was distributed through QR codes at the Focus Group.

5

SURVEY RESULTS: What's Important?

71 Total Responses

Respondents were asked to choose up to 5 issues that they feel are most important to address. Below are the topics that received 20 votes or more.



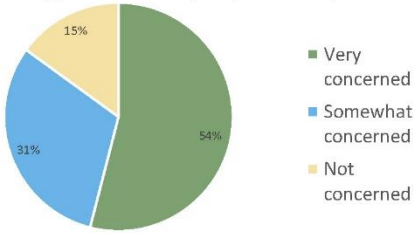
Survey respondents were given the space to elaborate on what is most important to address. Here is what we heard:

- Improve quality of Lake Q, maintain quality of Crystal Lake
- Replace aging infrastructure
- Increase renewable energy supply
- Add public transportation options
- Reduce municipal waste
- Educate the public about all of these issues
- Assess impact of development
- Protect open space
- Eliminate food insecurity
- Reducing the throw-away mentality
- Hold education in schools to a higher standard
- Manage loitering downtown
- Provide well paying jobs for college graduates

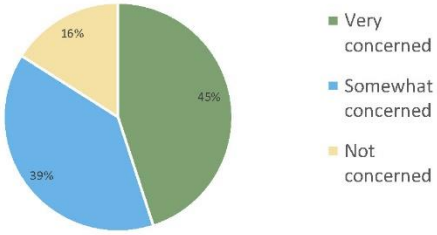
6

SURVEY RESULTS: Concerns and Visions

How concerned are you that climate change will affect you personally?



How concerned are you that climate change will affect the Town of Wakefield?



What is your vision of resilience in Wakefield?

"A town where people come together to help each other, support the environment and face the future with confidence and the ability to adapt to change"

"I want Wakefield to embrace change when it comes to protecting our planet for future generations. So that there will still be a Wakefield in 100 years."

"To be knowledgeable about climate change and its effects and being prepared for them; having a Plan B and C; be aware of the effects of what we do now and how it will affect us later."

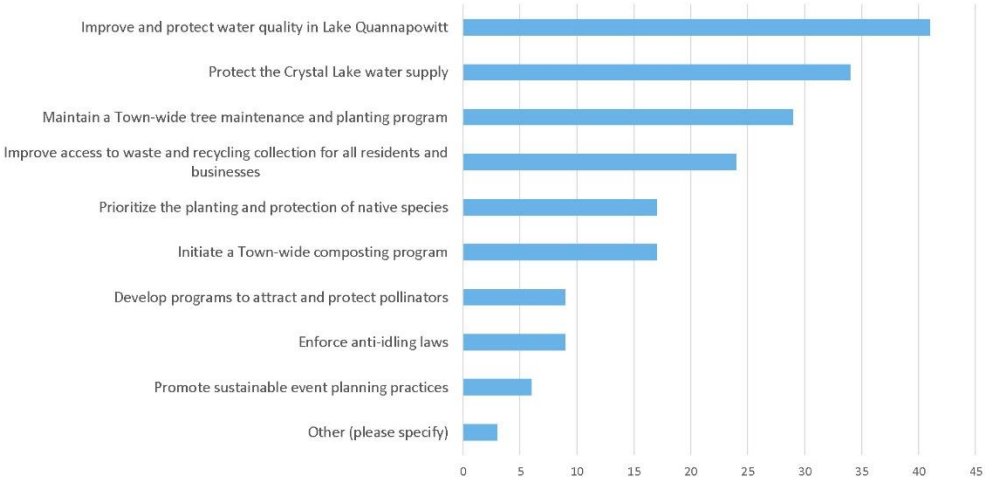
"Neighbors helping neighbors"

"In the event of a disaster, how our citizens, business and town government get back to where we were."

7

SURVEY RESULTS: Environmental Actions

Environmental: Which of the following actions will help to ensure that Wakefield's environmental features are able to withstand the impacts of climate change?

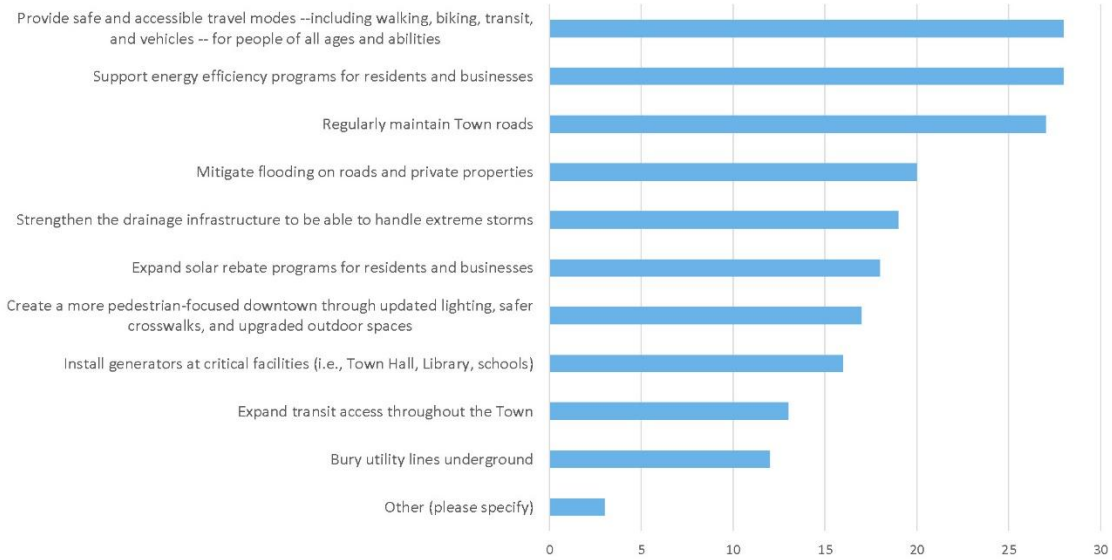


Other ideas included: Monitor roads and infrastructure; and change the salt product used on the roads in the winter

8

SURVEY RESULTS: Infrastructure Actions

Infrastructure: Which of the following actions do you think will strengthen Wakefield's infrastructure and prepare the community to withstand the effects of climate change?

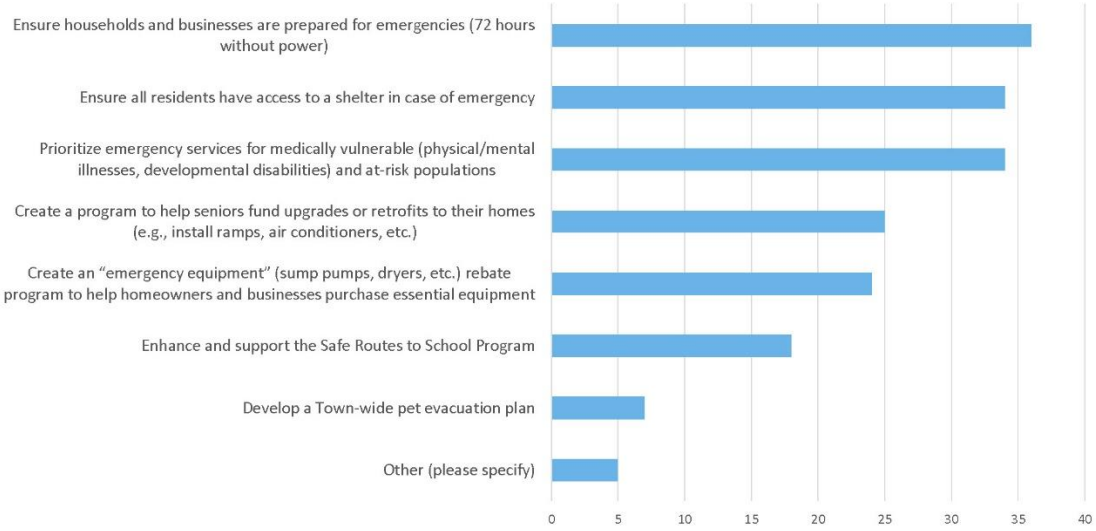


Other ideas included: implement a composting program; ban single-use plastics; localize the energy supply; and make Wakefield more walkable

9

SURVEY RESULTS: Societal Actions

Societal: Which of the following actions would you like to see to ensure Wakefield is prepared to protect our societal assets?



Other ideas included: provide parking downtown to help businesses prosper; combat loneliness in the elderly community; prioritize community policing in neighborhoods; build trust in Town government

10

SURVEY RESULTS: Word Association

To get a baseline evaluation of residents' impressions and priorities, we asked participants to list the words they associated with five specific topics. The responses are below; the larger texts indicates more frequently included words.

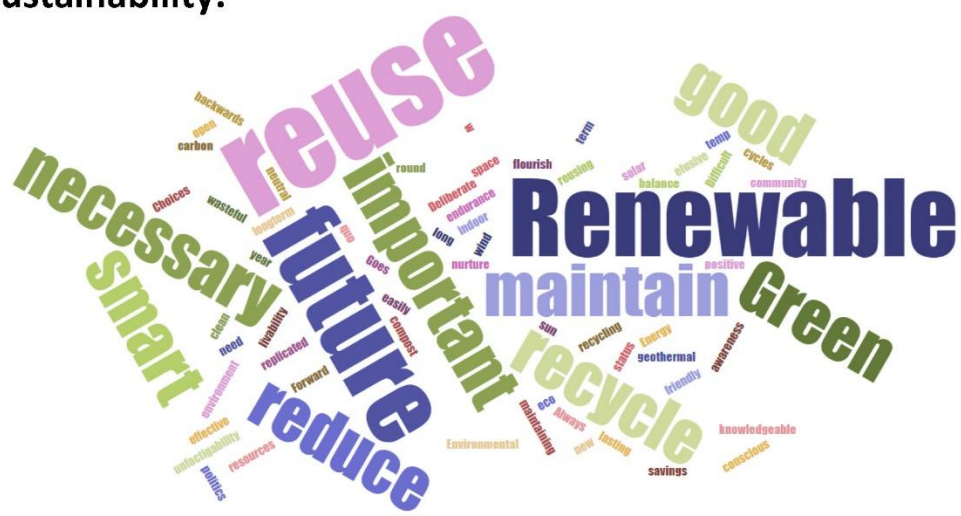
Resilience:

SURVEY RESULTS: Word Association

Environment:

SURVEY RESULTS: Word Association

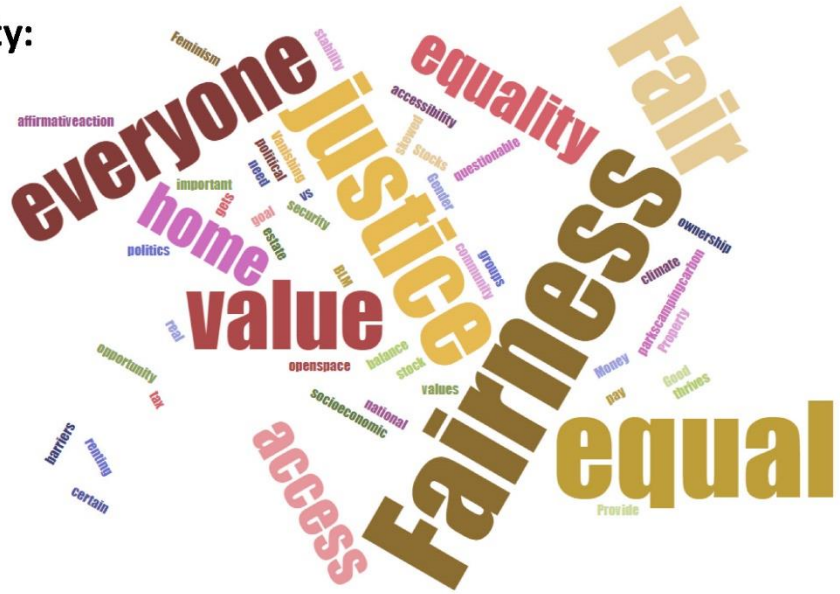
Sustainability:



13

SURVEY RESULTS: Word Association

Equity:



14

SURVEY RESULTS: Word Association

Economy:

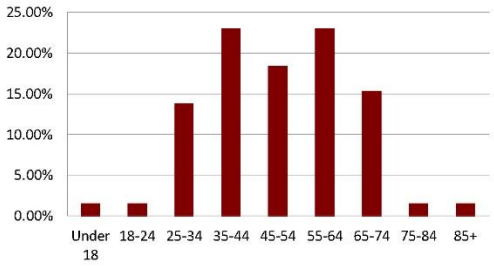
SURVEY RESULTS: Wakefield ESC Actions

The survey gave respondents the option to share what actions they want the Town's Environmental Sustainability Committee to take. Below are top actions mentioned:

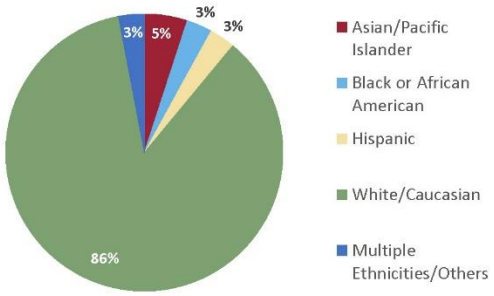
- Expand recycling and composting programs (weekly town recycling, town composting, programs in schools, require businesses to recycling)
- Climate plan that reduces emissions to net zero
- More renewable energy (municipal energy supply, better incentives for residential solar)
- Ban single-use plastics
- More electric vehicle charging stations
- Education campaigns and events
- Reduce litter
- Assessment of development on the environment
- Clean up Lake Q
- New LEED certified high school with a climate-focused curriculum
- Regionalization of climate action
- Improvement of multimodal transportation options
- Reduction of landscaping chemicals
- Preparedness trainings targeted at vulnerable populations

SURVEY RESULTS: Demographics

Age of Respondents



Race/Ethnicity of Respondents



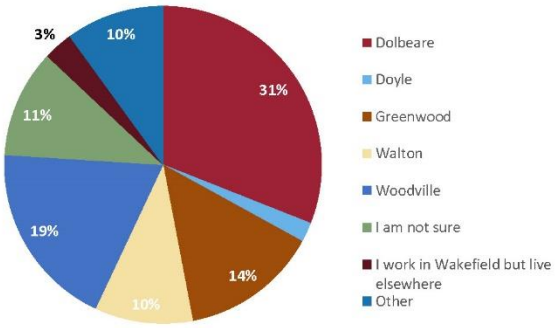
Race/Ethnicity of Residents in Wakefield, 2017	
Asian/Pacific Islander	2.0%
Black/African American	1.1%
Hispanic	3.9%
White/Caucasian	91.6%
Multiple Ethnicities/Other	1.3%

Source: American Community Survey, 2013-2017

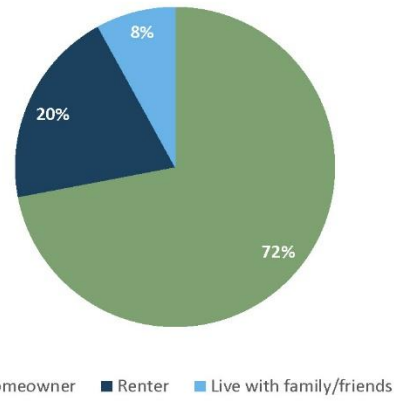
17

SURVEY RESULTS: Demographics

School District of Respondents



Housing Status of Respondents



18

Target Population	Number*	Organizations	Specific Tactic(s)	Metrics of Success	Progress To Date
Low-Income	1,097	• Wakefield Housing Authority • Wakefield Food Pantry	• Pop-up at events • Preparedness training	• Host 1 preparedness training	• Hosted Preparedness Drive • Hosted a Vulnerable Populations Focus Group
Non-English Speakers/ Immigrants	2,262	• Wakefield Housing Authority	• Pop-up at events	• Attend 1 event geared toward this community	• Not complete
Seniors	4,648	• Senior Center • Council on Aging • Retirement Communities	• Pop-up at events • Preparedness training	• Host 1 preparedness training (could be combined with the low-income community training); 17% of survey respondents 65 or older	• Hosted Preparedness Drive • Hosted a Vulnerable Populations Focus Group • 18.5% of survey respondents were 65 or older
Small Business Owners	N/A	• Wakefield Lynnfield Chamber of Commerce	• Attendance at an event (Focus group)	• Hold 1 focus group	• Attended BYOB Event hosted by the Chamber • Hosted a Business Resilience Workshop • Created a Business Resilience Toolkit
Youth (Under 18)	5,127	• Schools • Boys and Girls Club • Americal Civic Center • Wakefield High Green Coalition • Back to School Nights in September	• Presentation at related classes or clubs • Pop-up at events	• Hold 1 presentation or attend 2 events	• Attended high school environmental studies class

**Numbers based on American Community Survey, 2017*

19