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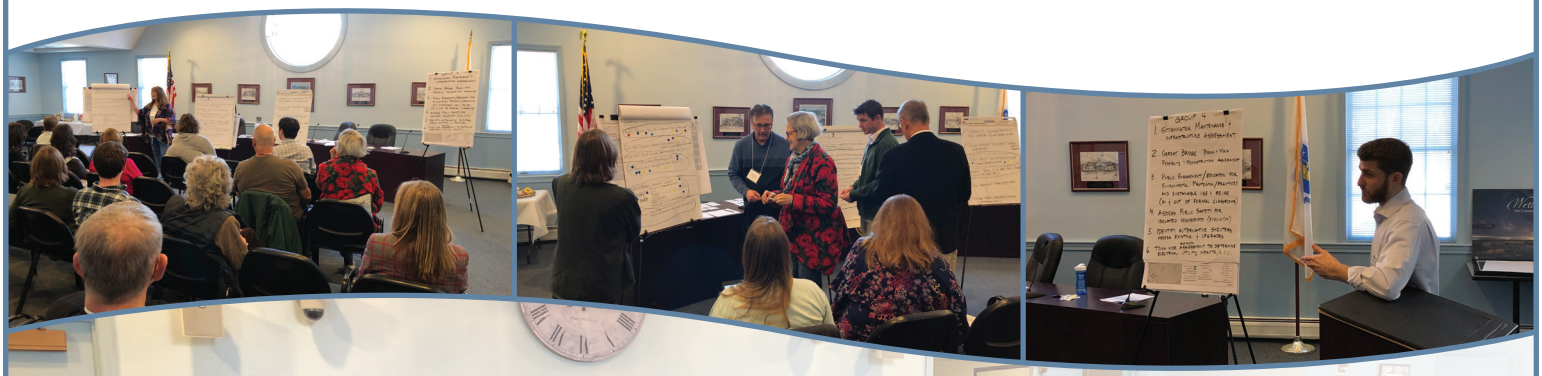
Summary of Findings

Kingston Municipal Vulnerability Preparedness Workshop

Kingston, Massachusetts

March 11 & 14, 2019



Prepared for:
Town of Kingston
Attn: Mary Guiney, Conservation Agent
Kingston Town House
26 Evergreen Street
Kingston, MA 02364

Prepared by:
Horsley Witten Group, Inc.

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Kingston Municipal Vulnerability Preparedness (MVP) Workshop *Summary of Findings*

Acknowledgements:

Funding to support the Kingston Municipal Vulnerability Preparedness (MVP) workshop was provided by the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) through an MVP Planning Grant, issued to the Town of Kingston during the fiscal year of July 2018 through June 2019. The Town of Kingston contracted with the Horsley Witten Group, Inc. to provide MVP-certified staff to support the Town in planning and facilitating the workshop.

The core planning team would like to thank the Town of Kingston for providing a workshop facility and refreshments for both days of the workshop.

Suggested Citation:

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Executive Summary

On March 11 and 14, 2019, the Town of Kingston, Massachusetts held a Municipal Vulnerability Preparedness (MVP) workshop. The goals of the workshop were to identify hazards Kingston faces that are being exacerbated by climate change, and to prioritize actions the Town can take to prepare for these hazards. This workshop, planned by a core team of organizers and the Horsley Witten Group, Inc., (HW) was a step towards MVP certification, which allows certified communities access to additional state grants for projects related to climate change resiliency. Thirty-three community members and four HW facilitators attended the workshop, representing a wide cross section of town departments, boards, associations, organizations and other interested parties.

During discussion, participants concluded that the most relevant climate change hazards to Kingston were: hurricanes and Nor'easters, winter storms, coastal flooding and storm surge, and sea level rise. Working in four small groups, participants listed features of Kingston that may be impacted by climate change (referred to as vulnerabilities) or may help the community cope with climate-related hazards (referred to as strengths). The groups then recommended actions that could be taken to protect Kingston's infrastructure, society and environment from the impacts of climate-related hazards. Following small and large group discussions, the workshop participants selected the following seven high priority action items, listed in no particular order:

1. Evaluate the current stormwater management plan, and identify and implement projects (e.g., increased catch basin maintenance, culvert replacement, outfall retrofits) to reduce flooding in town.
2. Develop a comprehensive tree management strategy that utilizes a public/private partnership to identify priority areas for tree management and maintenance to increase the resiliency of the electrical system and to maintain fire roads on open space lands.
3. Conduct a vulnerability assessment of coastal neighborhoods (e.g., Rocky Nook, Ah Dee Nah, Landing Road) to prepare for and identify ways to mitigate projected climate change impacts (e.g., increased coastal flooding, sea level rise).
4. Conduct a town-wide emergency communications system study to identify potential upgrades and alternative communication options.
5. Develop a Preparedness Campaign for the general public and private sector that includes guidance, checklists and recommendations to increase community resilience to climate change (e.g., extreme weather, repetitive flooding, health impacts).
6. Review and update the emergency shelter plan to incorporate extreme heat events and determine if alternate shelters are necessary.
7. Develop a comprehensive strategy to promote drinking water supply conservation through a public education campaign, planning, investment and development.

These high priority action items will be incorporated into ongoing municipal planning efforts. High priority action items identified in this process are also eligible for future grant funding under the MVP Action Grants program administered by the Massachusetts Executive Office of Energy and Environmental Affairs (EEA). By undertaking the MVP workshop and preparing this report, Kingston is also initiating its certification as an MVP Certified Community, which elevates the scoring profile for corresponding project proposals within other state grant programs.

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1. Introduction

The Municipal Vulnerability Preparedness (MVP) program is a Massachusetts state program designed to increase municipality-level resilience to natural hazards being exacerbated by climate change. This program helps municipalities identify their vulnerabilities, strengths and opportunities to take action to reduce risk and build resilience. MVP workshops use the Community Resilience Building (CRB) Framework, a system of discussion and note-taking developed by The Nature Conservancy and prescribed by the MVP Program. The Town of Kingston (the Town) received a grant to participate in the MVP program in order to build on its prior resiliency planning efforts and to develop a list of high priority actions for the immediate future.

Workshop Planning and Core Team

Following the award of the technical assistance grant, representatives from several town departments and a local association formed a core planning team. Team members included the following individuals, who were assisted by Will Keefer of the Horsley Witten Group, Inc. (HW), Kingston's MVP Provider:

- Paul Basler, Highway Department
- Arthur Boyle, Health Department
- Tom Calter, Town Administration
- Matt Darsch, Water Department
- Mark Douglass, Fire Department
- Robert Downey, Planning Board
- Pine duBois, Jones River Watershed Association
- Mary Guiney, Conservation Department
- Robert Monaghan, Sewer Department
- Paula Rossi-Clapp, Council on Aging
- Maurice Splaine, Police Department

Team members met five times between November 2018 and February 2019, and communicated via email and telephone as needed. Responsibilities of the core team included:

- Confirming workshop logistics (e.g., date, location).
- Reviewing the workshop agenda.
- Providing reference material, context and background for the MVP effort.
- Reviewing maps and reference materials for use in workshop discussion groups.
- Identifying a group of representative stakeholders to invite to the workshop.
- Reaching out to invitees to encourage attendance.

Nearly all core team members also participated in the workshop as discussion facilitators, note takers and stakeholders.

Workshop Attendees and Materials

Kingston's MVP workshop was held over two days on March 11 and March 14, 2019 at the Kingston Town House, 26 Evergreen Street, Kingston, Massachusetts. A total of 66 stakeholders were invited to the workshop and, over the course of the two-day event, 33 stakeholders attended. Participants represented a cross section of town departments, as well as representatives from the Jones River Watershed Association, MassBays, Conifer Green (a resident-owned community), a local business, Plymouth Area Coalition for the Homeless, Kingston Business Association, state government, the Old Colony Planning Council and volunteers from local boards and commissions. **Attachment A** includes a full list of participants, including their organizational affiliation. On the first day of the workshop, participants were provided with the following materials:

- Workshop agenda.
- Overview presentation PowerPoint slides with note taking space.
- Summary of climate projections for the South Coastal Basin provided by EEA and prepared by the Northeast Climate Science Center.
- Summary of Kingston demographic data.
- Handout summarizing Kingston's recommended actions and existing protection measures, as well as regional mitigation goals, previously identified in the 2015 Natural Hazard Mitigation Plan for the Old Colony Region.
- Example vulnerabilities and strengths excerpted from the CRB guidance document.

Attachment B provides a copy of the participant workshop materials. Participants were also provided with Kingston base maps showing critical infrastructure along with Federal Emergency Management Agency (FEMA) floodplain data, hurricane surge inundation data, and sea level rise inundation data (**Attachment C**).

Workshop Overview

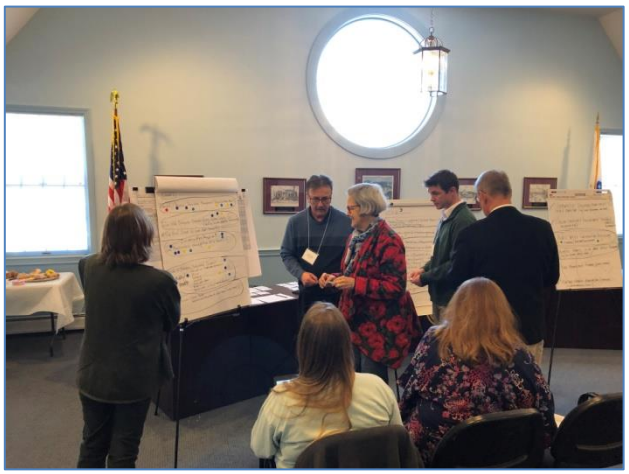
The Town Administrator, Tom Calter, provided opening remarks, welcomed everyone to each day of the two-day workshop and reiterated the important role that the invited stakeholders had in determining a way forward in the community with regards to preparing for future climate change. On the first day of the workshop following introductions, the MVP-certified facilitator Will Keefer provided an overview of the MVP program, workshop agenda and an overview presentation that included climate change projections and their current and potential future impacts on Kingston. Additionally, the presentation highlighted severe weather events that have disrupted the community in the past. Finally, Mr. Keefer shared the following central objectives of the workshop:

- Define top local natural and climate-related hazards of concern.
- Identify existing and future strengths and vulnerabilities.
- Develop prioritized actions for Kingston.
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

Following this introduction, HW led a large group conversation to confirm the four primary climate change hazards chosen by stakeholders through an online poll prior to the event. These were used to frame the rest of the workshop. Further information regarding this topic is provided in Section 2.

The next phase of the workshop was conducted in four small discussion groups. Groups were made up of an HW staff member as facilitator, a note taker from the community and approximately seven community stakeholders. The small groups began their discussions by listing infrastructural, societal and environmental features that represent either a vulnerability or a strength of the community with regards to anticipated climate change hazards. The note taker in each group listed these items within the CRB Risk Matrix, a system for note taking developed as a part of the CRB Framework. Groups listed multiple features for each category, along with information about their location, ownership, and if the feature is a strength or vulnerability for the Town. This concluded the first day of the workshop.

The small groups discussed action items for each feature to start the second day of the workshop. Action items could either be a way to protect a vulnerable feature from a negative impact, or a way to promote Kingston's strengths. Common action items suggested by participants included: assessing existing programs and systems, increasing public awareness and protecting critical infrastructure. **Attachment D** includes transcribed copies of each groups' risk matrix. When appropriate, the groups also marked these features on the base maps provided at each table (**Attachment E**).



Each small group then came to an agreement on six action items that they felt would most effectively address infrastructural, societal and environmental vulnerabilities in the Town or build on existing strengths. Then, a representative from each group reported out their recommended action items, along with a brief summary of their group's discussion. Duplicative responses between groups were merged to generate a combined list of recommended action items from all groups (**Attachment F**). From this list of recommended action items, workshop participants voted to generate a final list of seven high priority action items that the town of Kingston should embark upon to increase the resilience of the community in the face of anticipated climate change hazards.

These high priority action items are provided in **Attachment G** and are listed below, in no particular order:

1. Evaluate the current stormwater management plan, and identify and implement projects (e.g., increased catch basin maintenance, culvert replacement, outfall retrofits) to reduce flooding in town.
2. Develop a comprehensive tree management strategy that utilizes a public/private partnership to identify priority areas for tree management and maintenance to increase the resiliency of the electrical system and to maintain fire roads on open space lands.
3. Conduct a vulnerability assessment of coastal neighborhoods (e.g., Rocky Nook, Ah Dee Nah, Landing Road) to prepare for and identify ways to mitigate projected climate change impacts (e.g., increased coastal flooding, sea level rise).
4. Conduct a town-wide emergency communications system study to identify potential upgrades and alternative communication options.

5. Develop a Preparedness Campaign for the general public and private sector that includes guidance, checklists and recommendations to increase community resilience to climate change (e.g., extreme weather, repetitive flooding, health impacts).
6. Review and update the emergency shelter plan to incorporate extreme heat events and determine if alternate shelters are necessary.
7. Develop a comprehensive strategy to promote drinking water supply conservation through a public education campaign, planning, investment and development.

The results of each stage of the workshop are presented in the subsequent sections of this report and its attachments.

2. Top Climate Change Hazards of Concern

Prior to the March 11 and 14, 2019 workshop, the core planning team decided to provide an opportunity for stakeholders to choose the top four climate change hazards of concern through an online poll. This was done to build consensus prior to the workshop and to allow more time for small group discussion during the event. The following list presents the potential climate change hazards proposed to the stakeholder in the online poll:

- Intense rain/flooding
- Wind events
- Hurricanes or Nor'easters
- Winter storms
- Extreme cold
- Extreme heat/heat waves
- Fire
- Drought
- Coastal flooding/storm surge
- Sea level rise

Approximately half of the attendees answered the poll and based on the survey results (**Figure 1**), the participants chose the following climate change-related hazards as the most significant to Kingston:

- Hurricanes or Nor'easters
- Winter storms
- Coastal flooding/storm surge
- Sea level rise

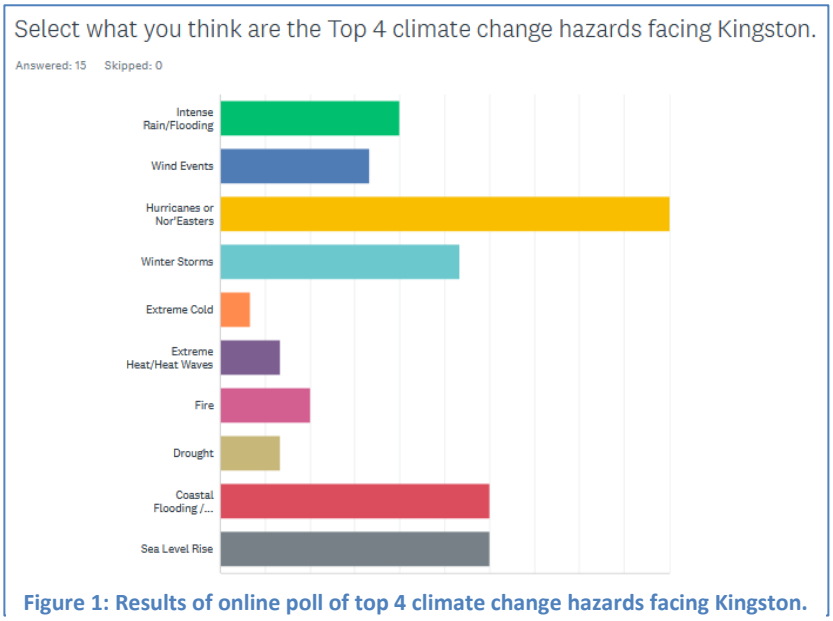


Figure 1: Results of online poll of top 4 climate change hazards facing Kingston.

HW led a large group discussion to confirm the four climate change hazards prior to the start of the small group discussion on the first day of the workshop. The participants agreed that the workshop should focus on these hazards; however, each small group had the option to discuss other climate change hazards (e.g., fire, extreme heat) as well.

3. Current Concerns and Challenges Presented by Climate Change Hazards

Kingston has experienced several climate and weather-related challenges in recent years and can expect to experience more severe events in the years to come due to climate change. For example, intense rain storms in 2017 and 2018 caused street flooding that limited the ability of people to get around. In March 2018 there were four Nor'easters that led to coastal flooding, power outages and major travel disruptions. In addition, many roadways in the community have been flooded due to storm surge and surcharged stormwater drainage systems, or in some cases, both.

During the small group discussions at the MVP workshop, many challenges, concerns and vulnerabilities for Kingston were identified and are listed in the CRB matrices in **Attachment D**. The most commonly cited vulnerabilities are summarized below:

- *Emergency preparedness and communications:* Severe weather can impact the communications systems used to reach out to residents in an emergency. In addition, participants noted the general lack of awareness in the community of what to do in cases of weather-related emergencies. Silver Lake High School, which acts as a regional shelter, was noted as an asset, but stakeholders indicated that other locations that could also shelter people (e.g., Council on Aging) may not be properly equipped for this purpose during an emergency. The police and fire departments will need to replace their current radio systems to have a reliable backup when the cellular network is down.
- *Isolated and vulnerable populations:* During significant storm events, stakeholders noted that public safety has been a major concern, especially for those living in communities along the coast (e.g., Rocky Nook, Ah Dee Nah) and for those who are more vulnerable, such as the elderly. Some neighborhoods only have one evacuation route. Participants noted that there may not be a full understanding of the number and location of elderly people who might need to be evacuated in a major incident.
- *High wind events:* Winter snow storms and wind events have in the past caused widespread power outages throughout the community and the outages have drawn attention to the backlog of tree trimming in the town and subsequent risks to the power grid from future severe weather events.
- *Droughts:* Recent periods of drought, such as that experienced from 2016-2017, have led to water use bans and other conservation measures. Future severe or sustained droughts could

impact the public water supply and participants identified a need to better plan for future droughts.

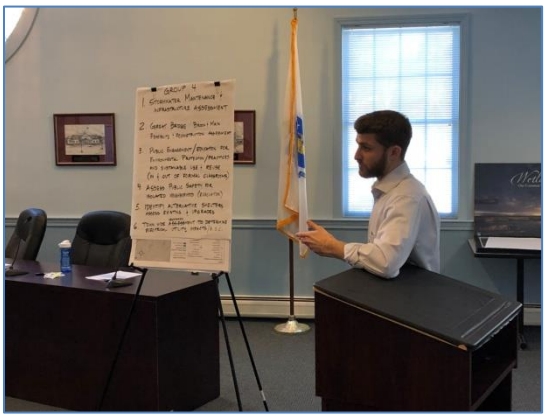
- *Inland flooding due to heavy rain and sea level rise:* The stormwater network in Kingston can back up during heavy rain events, causing isolated flooding. Runoff can also lead to contamination of coastal waters, which impacts the recreational opportunities and economic wellbeing of Kingston. Due to Kingston's proximity to the coast and low-lying topography, sea level rise contributes to flooding by limiting the ability for outfall pipes to discharge stormwater. Stakeholders identified the need for a comprehensive stormwater study to identify ways to increase retention time in higher areas, which would result in reduced flow to flood prone areas and less overflow to the coastal zone. A feasibility study for repairing the Great Bridge and relocating the Brook Street pump station were also suggested.
- *Coastal erosion:* The coastal neighborhoods in areas near Shore Drive, Rocky Nook, and the Ah Dee Nah have experienced erosion over the past several decades, putting homes and infrastructure at risk. Participants suggested replicating the living shoreline installed at Gray's Beach to address erosion, as well as conducting a regional erosion control study.

4. Current Strengths and Assets

A number of strengths were also identified among the infrastructural, societal and environmental assets of the Town. These strengths were noted on the CRB Risk Matrices (**Attachment D**) and include:

Infrastructural:

- The town has installed Vortechs® stormwater treatment at several outfalls. The system combines swirl concentration and flow controls into a shallow treatment unit that traps and retains trash, debris, sediment and hydrocarbons from stormwater runoff.
- Several culverts in town, including ones at Lake Street and Tussock Brook are in the planning process of being removed or retrofitted to improve flow and reduce flooding.
- The Elm Street dam has been scheduled for removal to restore streamflow and reduce flooding. Other dams are being examined to determine the need to remove them in the future.



- Many town buildings including the Town House, Council on Aging, Police Department and Fire Department have emergency generators; however, some are near the end of their usable lifespan and will need to be replaced.

Societal:

- Silver Lake Regional High School has been designated as a regional shelter.
- The Town uses Blackboard Connect, a mass notification system, to communicate with residents during an emergency. The system allows a user to send emergency alerts through emails, phone calls, text messages or social media channels.
- Kingston has established mutual aid agreements with neighboring communities.
- Town employees are regarded as a strong asset in preparing for and responding to emergencies.

- The Town has an up-to-date Emergency Response Plan.
- The Kingston Business Association, as well as other organizations and local groups have been strong partners working within the community.
- Kingston is designated as a Green Community and has established a Renewable Energy Grant and Loan Opportunity Committee (REGLO) Program to help residents fund their own improvements.

Environmental:

- The recent living shoreline installation and restoration of Gray's Beach has protected this important community resource.
- The Town has excellent drinking water and has taken steps to protect its source water and educate customers about water conservation.
- The Town has preserved a lot of open space and forested land through collaborative partnerships.
- The Town has robust fishery and aquaculture resources in Kingston Bay.
- The Jones River Watershed Association has been successful in engaging the community to protect the watershed through education and outreach.
- The Town's coastline is protected by the Duxbury and Plymouth barrier beaches.

The identified strengths and assets are examples of features that should be protected and replicated throughout the community to manage future impacts of climate change.

5. Top Recommendations to Improve Resilience

Following the presentation of each group's six recommended action items to address vulnerabilities and build on existing strengths, workshop participants, along with the workshop facilitator, combined duplicative action items between groups to generate a combined list of recommended action items (**Attachment F**). From this combined list of recommended action items, workshop participants then voted to create a final list of seven high priority action items that Kingston should embark upon to increase the resilience of the community in the face of anticipated climate change hazards.

These seven high priority action items are included in **Attachment G** and are listed below, in no particular order:

1. Evaluate the current stormwater management plan, and identify and implement projects (e.g., increased catch basin maintenance, culvert replacement, outfall retrofits) to reduce flooding in town.
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4. Conduct a town-wide emergency communications system study to identify potential upgrades and alternative communication options.

5. Develop a Preparedness Campaign for the general public and private sector that includes guidance, checklists and recommendations to increase community resilience to climate change (e.g., extreme weather, repetitive flooding, health impacts).
6. Review and update the emergency shelter plan to incorporate extreme heat events and determine if alternate shelters are necessary.
7. Develop a comprehensive strategy to promote drinking water supply conservation through a public education campaign, planning, investment and development.

6. Conclusion and Next Steps

Kingston held a formal public information and listening session on April 23, 2019 at 6:00 PM at the Kingston Senior Center located at 30 Evergreen Street. This session provided an opportunity for members of the public to learn, ask questions and provide feedback regarding the seven high priority action items that emerged from that March 11 and 14, 2019 MVP workshop. A summary of the public listening session is included in **Attachment H**.

High priority action items identified during the March 11 and 14, 2019 MVP workshop will be integrated into existing municipal planning efforts and the Town will also consider pursuing grant funding to implement the high priority action items identified through the MVP workshop process to continue to improve the Town's resilience to climate change.

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Attachment A: Kingston MVP Workshop Participants

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Attachment A: Kingston MVP Workshop Participants
March 11 and 14, 2019

COUNT	FIRST NAME	LAST NAME	AFFILIATION
1	Paul	Armstrong	Building Department
2	Paul	Basler	Streets, Trees and Parks Department
3	Arthur	Boyle	Health Department
4	Michael	Brophy	L. Knife & Son, Inc.
5	Mark	Douglass	Fire Department
6	Robert	Downey	Planning Department
7	Pine	duBois	Jones River Watershed Association
8	Bill	Eddy	Conifer Green Cooperative, Inc.
9	Elaine	Fiore	Board of Selectmen
10	Michael	Frenette	Kingston Business Association/No Fossil Fuel
11	Katherine	Gallerani	Kingston Reporter
12	Suzanne	Giovanetti	Plymouth Area Coalition for the Homeless, Inc.
13	Sara	Grady	MassBays
14	Mark	Guidoboni	Kingston Business Association
15	Mary	Guiney	Conservation Commission/Scribe
16	Beth	Harris	Planning Office/Scribe
17	Kathy	Ivers	Health/Conservation Department/Scribe
18	William	Keefer	Horsley Witten Group, Inc./Facilitator
19	Kathy	LaNatra	State Representative/Board of Selectmen
20	Brian	Laverriere	Horsley Witten Group, Inc./Facilitator
21	Bob	Monaghan	Wastewater Department
22	Monica	Mullin	District Director – Office of Senator Vinny deMacedo
23	Laurie	Muncy	Old Colony Planning Council
24	Tammy	Murray	Board of Selectmen
25	Brad	Norman	Facilities Department
26	Tara	Nye-Lewis	Horsley Witten Group, Inc./Facilitator
27	Carl	Pike	Finance Committee
28	Paula	Rossi-Clapp	Council on Aging
29	Jason	Silva	Building and Inspections Department
30	Carl	Simons	Horsley Witten Group, Inc./Facilitator

COUNT	FIRST NAME	LAST NAME	AFFILIATION
31	Maurice	Splaine	Police Department
32	Sia	Stewart	Library
33	Lisa	Sullivan	Old Colony Planning Council
34	Julie	Thompson	PACTV
35	Joan	Thompson-Stein	Conifer Green Cooperative, Inc.
36	Matthew	Wheble	Waterfront Committee
37	Susan	Woodworth	Recreation Department

Attachment B: Workshop Handouts

- Workshop Agenda
- Kingston MVP Workshop Overview Presentation Handout
- Climate Change Projections
- Selected Demographic Data
- Example Vulnerabilities and Strengths
- Key Recommendations from the 2015 Old Colony Region Natural Hazard Mitigation Plan

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Kingston Municipal Vulnerability Preparedness (MVP) Workshop Agenda

March 11, 2019

26 Evergreen Street · Kingston, MA 02364

Event Agenda:

Day 1:

TIME	ACTIVITIES
8:30 AM	**Arrival and Refreshments**
9:00 AM	**Welcoming Remarks** Tom Calter, Kingston Town Administrator
9:10 AM	**Introductions and Workshop Day 1 Overview** Will Keefer, Horsley Witten Group
9:20 AM	**Overview Presentation** on Science, Past Planning Efforts and Outcomes, and Data Resources Review recent climate related events. Present summary of anticipated climate changes. Present summary of recent/existing planning efforts
9:45 AM	**DISCUSSION #1: Large Group** Identify top 4 Climate Change Hazards facing Kingston
10:00 AM	15 MINUTE BREAK
10:15 AM	**DISCUSSION #2: Small Group** Identify Features that are Vulnerabilities and Strengths
11:45 AM	**Day 2 Overview**
12:00 PM	Day 1 Adjourns

Kingston Municipal Vulnerability Preparedness (MVP) Workshop Agenda

March 14, 2019

26 Evergreen Street · Kingston, MA 02364

Event Agenda:

Day 2:

TIME	ACTIVITIES
8:30 AM	**Arrival and Refreshments**
9:00 AM	**Welcome and Day 2 Overview** Tom Calter, Kingston Town Administrator Will Keefer, Horsley Witten Group
9:15 AM	**DISCUSSION #3: Small Group** Identify Actions to address Vulnerabilities or protect Strengths. Discuss timeframe, responsibility, funding, as time allows. Prioritize top 5-6 Actions
10:30 AM	15 MINUTE BREAK
10:45 AM	**DISCUSSION #4: Small Groups Report Out** Each group reports out top 5-6 Priority Actions
11:00 AM	**FINAL DISCUSSION: Large Group** Select top 5-6 Priority Actions for Municipal Climate Resilience Discuss timeframe, responsibility, funding
11:45 AM	**Wrap Up and Closing Remarks**
12:00 PM	Day 2 Adjourns

Horsley Witten Group
Sustainable Environmental Solutions

Kingston Municipal Vulnerability Preparedness (MVP) Grant Project:

CLIMATE CHANGE PROJECTIONS[1]

TEMPERATURE

HIGHLIGHTS:

- ✓ Temperature increases could make Kingston feel like present-day Maryland by 2050 and present-day North Carolina by 2100.[2]
- ✓ By 2050, we could have 2 to 5 times more very hot days (over 90°F) than we do today. By 2100, we could have 3 to 12 times more.
- ✓ We will have far fewer days with temperatures below freezing.
- ✓ We will have to expend less energy on heating in the winter, and far more on air conditioning in the summer.
- ✓ The growing season could increase by 45% by 2050 and could increase by 91% by the end of the century.

Table 1: TEMPERATURE PROJECTIONS

South Coastal Basin Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Average Annual Temperature (°F)	49.7	52.3 – 55.5	52.9 – 60.0
Maximum Annual Temperature (°F)	59.5	61.9 – 65.2	62.4 – 69.7
Minimum Annual Temperature (°F)	40.0	42.8 – 45.9	43.5 – 50.5
Annual Days with Max Temp over 90°F	5	10 – 28	14 – 63
Annual Days with Min Temp below 32°F	125	83 – 108	59 – 103
Annual Heating Degree-Days (Base 65°F)	6,147	4,709 – 5,465	3,836 – 5,290
Annual Cooling Degree-Days (Base 65°F)	543	782 – 1,217	877 – 1,943
Annual Growing Degree-Days (Base 50°F)	2,559	3,042 – 3,724	3,190 – 4,896

[1] Source: Northeast Climate Adaptation Science Center, 2018. *Massachusetts Climate Change Projections – Statewide and for Major Drainage Basins*. University of MA Amherst. Published by MA Executive Office of Energy and Environmental Affairs. March. 215 p. Available at: http://www.resilientma.org/resources/resource::2152/massachusetts-climate-change-projections-statewide-and-for-major-drainage-basins. Data is for the South Coastal Basin, which includes the majority of the land area of Kingston.

[2] NOAA National Centers for Environmental Information, Climate at a Glance: Statewide Mapping, Average Temperature Oct 2017 to Sept 2018, accessed November 16, 2018 at http://www.ncdc.noaa.gov/cag/.

PRECIPITATION

HIGHLIGHTS:

- ✓ Average annual precipitation in Kingston will increase up to 11% by 2050 and up to 13% by 2100.
- ✓ The largest increases in precipitation will occur in winter.
- ✓ The greatest increase in consecutive dry days will occur in the summer.

Table 2: PRECIPITATION PROJECTIONS

South Coastal Basin Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Total Precipitation (inches):			
Annual	47.5	47.5 – 52.5	47.3 – 53.9
Winter	12.5	12.6 – 14.4	12.6 – 16.2
Spring	12.1	12.0 – 14.3	12.2 – 14.9
Summer	10.4	9.7 – 12.2	8.3 – 12.7
Fall	12.5	11.4 – 13.9	10.7 – 13.6
Annual Days with Precipitation Over 1 Inch	9	10 – 12	10 – 13
Annual Days with Precipitation Over 2 Inches	1	1 – 2	1 – 2
Annual Days with Precipitation Over 4 Inches	<1	<1	<1
Annual Consecutive Dry Days	17	17 – 20	17 – 21

SEA LEVEL RISE

Table 3: SEA LEVEL RISE PROJECTIONS[3]

Tide Station	Emissions Scenario	2050 (in feet relative to mean sea level)	2100 (in feet relative to mean sea level)
Boston	Intermediate	1.4	4.0
	Intermediate – High	1.7	5.0
	High	2.4	7.6
	Extreme	3.1	10.2

[3] Projections relative to mean sea level for a 19-year reference time period centered on the year 2000.

Horsley Witten Group
Sustainable Environmental Solutions

Kingston Municipal Vulnerability Preparedness (MVP) Grant Project:

SELECTED DEMOGRAPHIC DATA[1]

Demographic Parameter	Result
Population	12,668 people
Age	0-19 = 26% 20-34= 16% 35-64 = 42% 65+ = 17%
Income	<$40K = 24% $40-60K = 11% $60K+ = 65%
% Below Poverty Line	7%
Race	White = 97% Black = 1% Asian = 1% Other = 2%
Ethnicity	Hispanic = 3% Not Hispanic = 97%
Percent of Population over 65 Living Alone	3.8
Environmental Justice	0.0%
Heart Attack Hospitalizations	26.6 (age-adjusted rate per 10,000 people)
Asthma Emergency Department Visits	31.8 (age-adjusted rate per 10,000 people)
Pediatric Asthma Prevalence	9.3% of all children enrolled in grades K-8
Heat Stress Emergency Department Visits	Minimal

[1] Source: MA Dept of Public Health, 2018. MA Environmental Public Health Tracking Community Profile for Kingston. Report Created on November 15, 2018. 10 pages.

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Risk Matrix: Examples of Features that may be identified in this process:

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.

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 severe weather.

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:

- Beachfront development reducing protection provided by dunes.
- Proliferation of subdivisions in flood prone areas.
- Lack of urban tree canopy increasing heat island effect.

Examples of Strengths:

- Oyster reefs and tidal wetlands help reduce wave damage to property.
- 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

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Horsley Witten Group
Sustainable Environmental Solutions

Kingston Municipal Vulnerability Preparedness (MVP) Grant Project:

RECOMMENDED ACTIONS LISTED IN THE 2015 NATURAL HAZARD MITIGATION PLAN

CATEGORY OF ACTION	RECOMMENDATION	HAZARD
Prevention, Structural Project	Develop and implement a local flood mitigation dam management program, including inspecting, maintaining and upgrading the dams for present functions and stormwater management potential.	Intense rain/flooding
Structural Project	Enlarge culvert on Main Street (Route 106) in front of St. Joseph's Church to eliminate flooding.	Intense rain/flooding
Emergency Services	Work with the towns of Halifax and Plympton to create a regional shelter at the Silver Lake Regional Middle/High School.	All hazards
Emergency Services	Install a backup generator for the Council on Aging, which is used as a cooling center.	All hazards
Emergency Services	Work with the owners of both mobile home parks in town – Conifer Green and Country Estates – to obtain generators for their community buildings, which can be used as storm shelters.	All hazards
Structural Project	Dredge the Jones River as needed to remove the natural build up of silt and sand that accumulates over time. This build up can cause the river to flood properties adjacent to the river.	Intense rain/flooding

SOURCE: Natural Hazard Mitigation Plan for the Old Colony Region, May 2015, Table 125.

EXISTING PROTECTION MEASURES LISTED IN THE 2015 NATURAL HAZARD MITIGATION PLAN

TYPE OF EXISTING PROTECTION	DESCRIPTION	HAZARD
Comprehensive Emergency Management Plan (CEMP)	The CEMP addresses mitigation, preparedness, response and recovery from a variety of natural and man-made emergencies.	All hazards
Emergency Power Generators	The town maintains emergency power generators in several important public facilities/shelters. Generators need to be maintained and replaced as needed.	All hazards
Regional & Local Emergency Planning Committees	The town regularly participates in local and regional emergency planning committees.	All hazards
Public Information & Outreach	The town provides residents with information about potential natural hazards with leaflets and brochures in municipal buildings throughout the town. Information could be updated and/or replaced on a regular basis.	All hazards
Natural Hazard Mitigation Plan	Update and adopt the Natural Hazard Mitigation Plan every five years.	All hazards
Participation in the National Flood Insurance Program (NFIP)	Provides flood insurance for structures located within a floodplain.	Intense rain/flooding
Conservancy District	This district provides for the conservation of water resources and water bodies and the preservation of open space.	Sea level rise, Intense rain/flooding, storm surge
Floodplain Overlay District	This district protects the public health, safety, and general welfare; protects human life and property from the hazards of periodic flooding; preserves the natural flood control characteristics and the flood storage capacity of the floodplain; preserves and maintains the groundwater table and water recharge areas within the floodplain.	Intense rain/flooding, sea level rise
Water Resource Overlay District	This district preserves the quality and quantity of the town's groundwater and surface water resources in order to insure a safe, clean and healthy public water supply.	All hazards
Catch Basin Maintenance	The town regularly cleans and maintains the catch basins throughout town.	Intense rain/flooding, storm surge
Street Sweeping	The town conducts street sweeping on an annual basis.	Intense rain/flooding, storm surge
Enforcement of State Building Code	The Building Inspector enforces the state building code.	All hazards
Tree Trimming	The town works with utility providers to trim trees that may impact utility lines.	Hurricanes and nor'easters

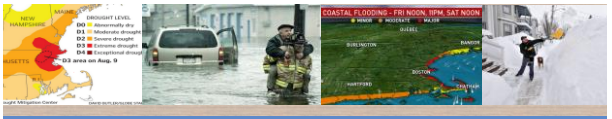
TYPE OF EXISTING PROTECTION	DESCRIPTION	HAZARD
Mobile Home Tie-Down Regulations	The town requires and inspects that all mobile homes in town are tied down to protect against high winds.	Hurricanes and nor'easters
Setback Minimums on Seawalls	The town has a minimum setback for all structures near seawalls.	Storm surge, sea level rise
Seawall System	The town has a system of seawalls to protect infrastructure and buildings near the coast. Replace and repair seawalls as needed.	Storm surge, sea level rise
Burn Permit	The town requires residents to obtain a burn permit from the Fire Department before conducting outdoor burns.	Fire
Fire Department Review of New Development	The Fire Department participates in the review of all new development in town.	Fire
Cooling Centers	The town opens cooling centers as weather conditions warrant.	Heat waves
Green Community Designation	The town has been designated by the DOER as a Green Community. With that designation the community is working towards improving energy efficiency and reducing greenhouse gas emissions, both of which mitigate impacts associated with climate change.	All hazards

SOURCE: Natural Hazard Mitigation Plan for the Old Colony Region, May 2015, Table 100.

REGIONAL MITIGATION GOALS LISTED IN THE 2015 NATURAL HAZARD MITIGATION PLAN

- Regional Goal: Reduce the loss of life, property, infrastructure, and environmental and cultural resources from natural disaster.
- In support of the regional goal, there are 5 additional goals:
    - Investigate, design and implement structural projects that will reduce and minimize the risks and impacts from riverine and coastal flooding.
    - Investigate, design and implement projects that will reduce and minimize the risks and impacts from non-flooding hazards, such as wildfires, earthquakes, tornadoes, etc.
    - Improve pre-disaster planning, communication and coordination between federal, state, county, community, private and non-profit entities so that they can plan for and mitigate natural hazards in a clear and comprehensive manner.
    - Increase the awareness of the public and communities to the risks presented by the multiple natural hazards that affect the region as well as to the mitigation activities and grant opportunities available to minimize the impacts of these hazards.
    - Improve existing policies and programs to further reduce or eliminate the impacts of natural hazards.

SOURCE: Natural Hazard Mitigation Plan for the Old Colony Region, May 2015, p. 308.



Municipal Vulnerability Preparedness Program Workshop - Kingston

Will Keefer, MVP Certified
Senior Environmental Planner

Horsley Witten Group
March 11 and 14, 2019

1

Administration and Housekeeping

- Sign-in sheet and name badges
- Location of emergency exits
- Location of restrooms
- Refreshments – Thank you Kingston!

2

Kingston Core Planning Team

Name	Representing
Paul Basler	Highway Department
Arthur Boyle	Health Department
Thomas Calter	Town Administrator
Matt Darsch	Water Department
Mark Douglass	Fire Department
Robert Downey	Planning Board
Pine duBois	Jones River Watershed Association
Mary Guiney	Conservation Department
Paula Rossi-Clapp	Council on Aging
Maurice Splaine	Police Department
Will Keefer	Horsley Witten Group (HW)

3

Introductions

- ✓Name
- ✓Organization

Horsley Witten Group

4

Handouts – handy reference info

- Agenda
- Overview Presentation Slides
- Climate Change Projections Data (Temp, Precipitation, Sea Level Rise)
- Examples of Vulnerabilities and Strengths
- Selected Demographic Data about Kingston
- Prior Recommendations from other plans
- Maps

Horsley Witten Group

5

Vulnerability, Resilience & Adaptation

Vulnerability:	the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes
Resilience:	the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions
Adaptation:	the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities

Horsley Witten Group (Source: IPCC Definitions)

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Governor Baker's Executive Order 569 & Recent Climate Change Legislation

- September 2016, directed the state to assist municipalities to reduce vulnerability and improve resilience to climate change
- March 15, 2018: *An Act Promoting Climate Change Adaptation, Environmental and Natural Resource Protection and Investment in Recreational Assets and Opportunity*
  - $1.4B to climate change preparedness, environmental protection and community investments

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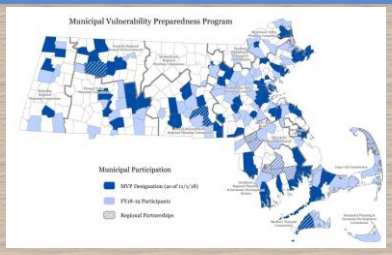
MVP Grantees



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Why Conduct an MVP Workshop?

- The Municipal Vulnerability Preparedness grant program (MVP) provides support for cities and towns in Massachusetts to begin the process of planning for climate change resiliency and implementing priority projects.
- Kingston received a $20,000 grant for this workshop.
- Communities who complete the MVP program become certified as an MVP community and are eligible for MVP Action grant funding and other opportunities.
- June 2018 – State awarded $5 million in funding with grants ranging from $8,000 - $400,000

- Examples of MVP Action Grant Funding:
  - Detailed Vulnerability and Risk Assessment
  - Public Education and Communication
  - Local Bylaws, Ordinances, Plans, and other Management Measures
  - Redesigns and retrofits
  - Nature-Based Storm-Damage Protection, Drought Prevention, Water Quality, and Water Infiltration Techniques
  - Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality
  - Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts
  - Ecological Restoration and Habitat Management to Increase Resiliency

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www.resilientma.org
resilient MA
Explore Sectors
Identify Changes
Take Action
Maps
Data
Documents
Climate Change Data
Maps
Data
Documents

10


Massachusetts State Hazard Mitigation and Climate Adaptation Plan
Completed in September 2018
Available at: https://www.mass.gov/service-details/massachusetts-integrated-state-hazard-mitigation-and-climate-adaptation-plan
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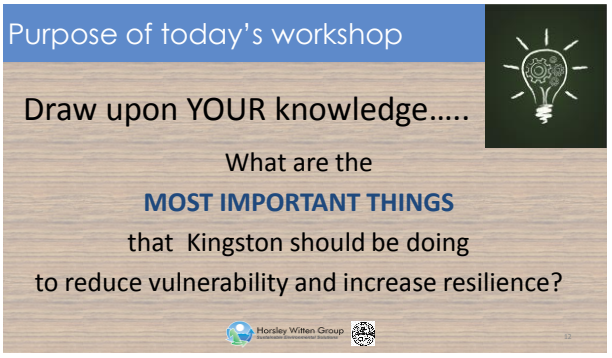
Purpose of today's workshop
Draw upon YOUR knowledge…..
What are the
MOST IMPORTANT THINGS
that Kingston should be doing
to reduce vulnerability and increase resilience?
Horsley Witten Group

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The Plan – vibrant small group discussions

- Presentation to **set the stage** for our discussion
- Determine which **climate change hazards** to focus on
- Identify the most **vulnerable features** in Kingston
- Identify the **features that provide strength**
- Develop **actions** – what can the Town do to address vulnerabilities and protect/enhance strengths?
- Prioritize the **most important actions** for Kingston

Horsley Witten Group

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Resilience & Adaptation

Goal for the Day

To identify the 5-6 Highest Priority actions
that the Town of Kingston should take
to increase ***resilience*** and ***adapt*** to climate change

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SO, who's in the room today? Who….

- Has had a conversation in the past week about weird weather?
- Has had to respond to a weather-related emergency on the job? At home?
- Has ever been diverted on their way to work/home by flooded roads?
- Is employed by the Town of Kingston?
- Volunteers your time on a Town board or committee?
- Participated in the development of the 2015 Natural Hazard Mitigation Plan for the Old Colony Region?

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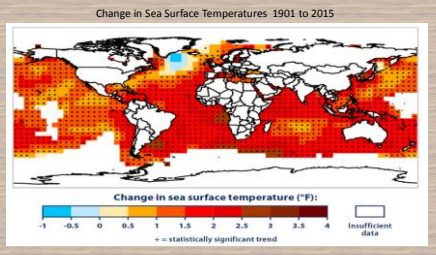
Climate Change - Global



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Local Impacts of Climate Change – Intense Rain

November 3, 2018 – Flooded Roadway in Kingston

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Local Impacts of Climate Change – Winter Storms

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Local Impacts of Climate Change – Sea Level Rise and Coastal Erosion

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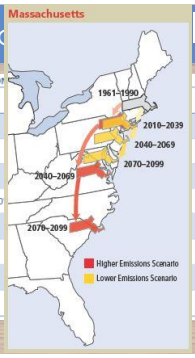
Climate Proje

Massachusetts



Similar to Maryland

Similar to North Carolina

Table 1: TEMPERATURE PROJECTIONS

South Coastal Basin Climate Parameter	End of Century (2090s)
Average Annual Temperature (°F)	52.9 – 60.0
Maximum Annual Temperature (°F)	62.4 – 69.7
Minimum Annual Temperature (°F)	43.5 – 50.5
Annual Days with Max Temp over 90	14 – 63
Annual Days with Min Temp below 32°F	59 – 103
Annual Heating Degree-Days (Base 65°F)	3,836 – 5,290
Annual Cooling Degree-Days (Base 65°F)	877 – 1,943
Annual Growing Degree-Days (Base 50°F)	3,190 – 4,896

20

Climate Projections

2-5X as many very hot days

3-12X as many very hot days

Table 1: TEMPERATURE PROJECTIONS

South Coastal Basin Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Average Annual Temperature (°F)	49.7	52.3 – 55.5	52.9 – 60.0
Maximum Annual Temperature (°F)	59.5	61.9 – 65.2	62.4 – 69.7
Minimum Annual Temperature (°F)	40.0	42.8 – 45.9	43.5 – 50.5
Annual Days with Max Temp over 90°F	5	10 – 28	14 – 63
Annual Days with Min Temp below 32°F	125	83 – 108	59 – 103
Annual Heating Degree-Days (Base 65°F)	6,147	4,709 – 5,465	3,836 – 5,290
Annual Cooling Degree-Days (Base 65°F)	543	782 – 1,217	877 – 1,943
Annual Growing Degree-Days (Base 50°F)	2,559	3,042 – 3,724	3,190 – 4,896

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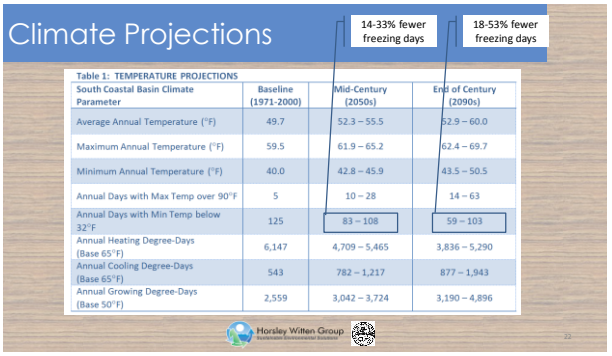
Climate Projections
14-33% fewer freezing days
18-53% fewer freezing days
Table 1: TEMPERATURE PROJECTIONS
South Coastal Basin Climate Parameter | Baseline (1971-2000) | Mid-Century (2050s) | End of Century (2090s)
Average Annual Temperature (°F) | 49.7 | 52.3 – 55.5 | 52.9 – 60.0
Maximum Annual Temperature (°F) | 59.5 | 61.9 – 65.2 | 62.4 – 69.7
Minimum Annual Temperature (°F) | 40.0 | 42.8 – 45.9 | 43.5 – 50.5
Annual Days with Max Temp over 90°F | 5 | 10 – 28 | 14 – 63
Annual Days with Min Temp below 32°F | 125 | 83 – 108 | 59 – 103
Annual Heating Degree-Days (Base 65°F) | 6,147 | 4,709 – 5,465 | 3,836 – 5,290
Annual Cooling Degree-Days (Base 65°F) | 543 | 782 – 1,217 | 877 – 1,943
Annual Growing Degree-Days (Base 50°F) | 2,559 | 3,042 – 3,724 | 3,190 – 4,896
Horsley Witten Group
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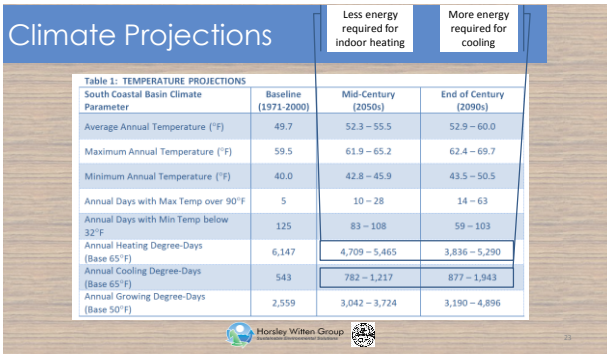
Climate Projections
Less energy required for indoor heating
More energy required for cooling
Table 1: TEMPERATURE PROJECTIONS
South Coastal Basin Climate Parameter | Baseline (1971-2000) | Mid-Century (2050s) | End of Century (2090s)
Average Annual Temperature (°F) | 49.7 | 52.3 – 55.5 | 52.9 – 60.0
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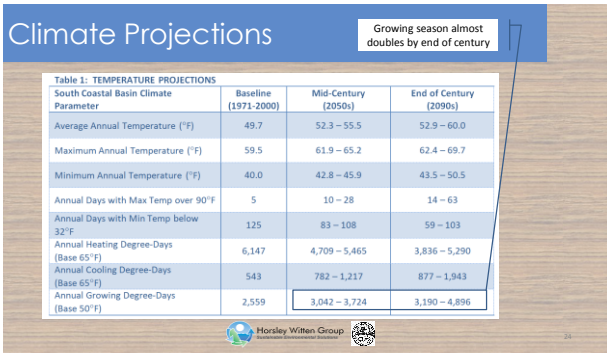
Climate Projections
Growing season almost doubles by end of century
Table 1: TEMPERATURE PROJECTIONS
South Coastal Basin Climate Parameter | Baseline (1971-2000) | Mid-Century (2050s) | End of Century (2090s)
Average Annual Temperature (°F) | 49.7 | 52.3 – 55.5 | 52.9 – 60.0
Maximum Annual Temperature (°F) | 59.5 | 61.9 – 65.2 | 62.4 – 69.7
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Annual Days with Max Temp over 90°F | 5 | 10 – 28 | 14 – 63
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Annual Growing Degree-Days (Base 50°F) | 2,559 | 3,042 – 3,724 | 3,190 – 4,896
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Climate Projections

Greater # of significant rain events and longer dry periods

Largest increase is expected in winter

Table 2: PRECIPITATION PROJECTIONS

South Coastal Basin Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Total Precipitation (inches):			
Annual	47.5	47.5 – 52.5	47.3 – 53.9
Winter	12.5	12.6 – 14.4	12.6 – 16.2
Spring	12.1	12.0 – 14.3	12.2 – 14.9
Summer	10.4	9.7 – 12.2	8.3 – 12.7
Fall	12.5	11.4 – 13.9	10.7 – 13.6
Annual Days with Precipitation Over 1 Inch	9	10 – 12	10 – 13
Annual Days with Precipitation Over 2 Inches	1	1 – 2	1 – 2
Annual Days with Precipitation Over 4 Inches	<1	<1	<1
Annual Consecutive Dry Days	17	17 – 20	17 – 21

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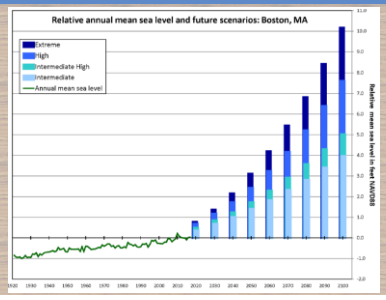
Climate Projections



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Demographics

Lower than statewide

Significantly lower than statewide

Demographic Parameter	Result
Population	12,668 people
Age	0-19 = 26%, 20-34= 16%, 35-64 = 42%, 65+ = 17%
Income	<$40K = 24%, $40-60K = 11%, $60K+ = 65%
% Below Poverty Line	7%
Race	White = 97%, Black = 1%, Asian = 1%, Other = 2%
Ethnicity	Hispanic = 3%, Not Hispanic = 97%
Percent of Population over 65 Living Alone	3.8
Environmental Justice	0.0%
Heart Attack Hospitalizations	26.6 (age-adjusted rate per 10,000 people)
Asthma Emergency Department Visits	31.8 (age-adjusted rate per 10,000 people)
Pediatric Asthma Prevalence	9.3% of all children enrolled in grades K-8
Heat Stress Emergency Department Visits	Minimal

Lower than statewide

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Health Impacts of Climate Change

Source: US Global Change Research Program, 2016. https://matracking.ehs.state.ma.us/Climate-Change/climate_and_health_profile.html

Extreme Heat	Rising temperatures will lead to an increase in heat-related deaths and illnesses
Outdoor Air Quality	Rising temperatures and wildfires and decreasing precipitation will lead to increases in ozone and particulate matter, elevating the risks of cardiovascular and respiratory illnesses and death.
Flooding	Increased coastal and inland flooding exposes populations to a range of negative health impacts before, during, and after events
Vector-Borne Infection (Lyme Disease)	Ticks will show earlier seasonal activity and a generally northward range expansion, increasing risk of human exposure to Lyme and disease-causing bacteria.
Water-Related Infection (Vibrio vulnificus)	Increases in water temperatures will alter timing and location of Vibrio vulnificus growth, increasing exposure and risk of water-borne illness.
Food-Related Infection (Salmonella)	Rising temperatures increase Salmonella prevalence in food, longer seasons and warming waters increase risk of exposure and infection.
Mental Health and Well-Being	Changes in exposure to climate- or weather-related disasters cause or exacerbate stress and mental health consequences, with greater risk for certain populations.

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Hazards Exacerbated by Climate Change

- Intense Rain/Flooding
- Wind Events
- Hurricanes or Nor'Easters
- Winter Storms (Snow/Wind/Cold)
- Extreme Cold
- Heat Waves/Extreme Heat
- Fire
- Drought
- Coastal Flooding/Storm Surge
- Sea Level Rise

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What Types of Actions Could We Take?

- Engineering/Construction
- Protection/Conservation
- Retreat/Avoidance
- Preparations/Planning
- Policy/Regulatory Changes
- *[Short-term, Long-term, ongoing]*

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Some Recommendations From Hazard Mitigation Plan for Kingston

- Develop and implement a local flood mitigation dam management program
- Enlarge culvert on Maine Street (Route 106) in front of St. Joseph's Church to eliminate flooding
- Work with the towns of Halifax and Plympton to create a regional shelter at the Silver Lake Regional Middle/High School
- Install a backup generator for the Council on Aging, which is used as a cooling center
- Work with the owners of both mobile home parks in town to obtain generators for their community buildings, which can be used as storm shelters
- Dredge the Jones River as needed to remove the natural build up of silt and sand that accumulates over time.

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Large Group Discussion #1:

Let's confirm the 4 natural hazards that are most important to Kingston to focus on today.

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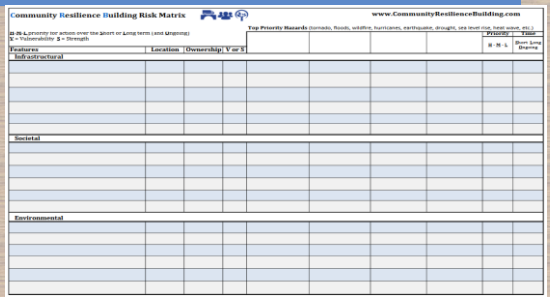
Discussion Matrix


Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

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

Priority — Time

Features | Location | Ownership | V or S | H - M - L | Short Long Ongoing

Infrastructural

Societal

Environmental

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Ground Rules for Small Group Discussions

Share the stage: Everyone should have an equal opportunity to talk.

Focus: Focus on the questions asked and your group's discussion.

Land the plane: Respect limited time.

Respect: Listen, be honest, and avoid criticizing others' ideas.

One mic: One person speaks at a time.

Phone etiquette: Phones are off or on vibrate, take calls in the hall.

Horsley Witten Group

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Horsley Witten Group Facilators

Will Keefer, Senior Planner

Carl Simons, Senior Emergency Response Manager

Tara Nye-Lewis, Senior Coastal Ecologist

Brian Laverriere, Landscape Designer

Horsley Witten Group

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Kingston Scribes

Paula Green, Assessors Department

Mary Guiney, Conservation Department

Beth Harris, Planning Office

Kathy Ivers, Health/Conservation Department

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Thank You!
Will Keefer, MVP Certified
Senior Environmental Planner
wkeefer@horsleywitten.com
Horsley Witten Group
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Attachment C: Kingston Base Maps

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Legend

Critical Infrastructure Category

- Fire Station
- Library
- Local Police
- Propane Station
- Pump Station
- Private School
- Public School
- Townhall
- Train Station
- Waste Water Treatment Plant
- Water Tank
- Well
- Commuter Rail Tracks
- Powerline

Long Term Care Residence

- Assisted Living Facility
- Nursing Home
- Rest Home

Dams

- High Hazard
- Significant Hazard
- Low Hazard
- N/A

Hydrography (USGS)

- Rivers and Streams
- Lakes and Ponds

FEMA Flood Zone

eff. 11/04/2016

- 100 Year Flood Area (VE Zone)
- 100 Year Flood Area (AE Zone)
- 100 Year Flood Area (AO Zone)
- 100 Year Flood Area (A Zone)
- 500 Year Flood Area (X Zone)

N W E S

PEMBROKE DUXBURY PLYMPTON PLYMOUTH CARVER Kingston Bay

Priest Reservoir West Brook North Hill Marsh Pond Round Pond Pine Lake Island Creek Pond Island Creek Mill Pond Mile Brook Pine Street Pond Reeds Millpond Jones River Pond Silver Lake Pembroke Street South Pond Happy Rings School Pond Blackwater Pond Tussock Brook Harrobs Corner Bog Pond Crossmans Pond Barrows Brook Jones River Brook Dennets Pond Russell Pond Smelt Pond Little Smelt Pond Indian Pond Muddy Pond Plympton Bog Pond South Brook Street Bend Pond North Triangle Pond Little Muddy Pond Ricketts Pond High Street Pond Darby Pond Little Clear Pond Doten Brook Pond Wrinkatuxet Brook Cole Mill Pond Fresh Meadow Pond

COUNTRY WAY WHITE PINE LANE STATION STREET BRENTWOOD ROAD SCHOOL STREET PARADISE LANE PINE STREET WINTER STREET LYDON LANE LAKE STREET PEMBROKE STREET CROWN HILL BIRCH DALE STREET MOUNTAIN ASH DRIVE GREEN HOLLY DRIVE SILVER BIRCH LANE TARKILN ROAD BAY PATH WINTHROP STREET SUMMER STREET GROVE STREET WEST STREET LONGWOOD CIRCLE QUAIL RUN CLIFTON DRIVE ELDRIDGE WAY PILGRIM STREET EVERGREEN STREET POTTER STREET MAPLE STREET LANDING ROAD RIVER STREET GREEN STREET ABRAMS HILL MAIN STREET SHERRY LANE NEWCOMBS MILL ROAD HIGGINS ROAD STEWART LANE NELSON STREET SHIRLEY AVENUE MAPLE AVENUE WILLOW STREET BROOK STREET BONNIE LANE ELDER AVENUE MAYFLOWER STREET PROSPECT STREET MAY AVENUE POST COURT STANDISH AVENUE COLE STREET WEST AVENUE EAST AVENUE SHORE DRIVE LEIGH ROAD OCEAN VIEW LANE COOB AVENUE HOWLAND LANE WAPPING ROAD ARBOR HILLS DRIVE HARVEST DRIVE MILLIKEN DRIVE ELM STREET COPPER BEECH DRIVE CRANBERRY ROAD OCEAN HILL DRIVE SMITHS LANE MAZZILL AVENUE RING ROAD MILLERS LANE ORIMSON HARVEST DRIVE PINE BROOK DRIVE AUTUMN LANE COUNTRY CLUB WAY BEER RUN ROAD TALL TIMBERS LANE INDIAN POND ROAD FOX DEN ROAD WOLF POND ROAD HIGH PINES DRIVE MEETING HOUSE ROAD MONKS HILL ROAD ROUTE 44 BISHOPS HIGHWAY PARTING WAYS ROAD BAVARIAN WAY ALPINE RUN ROAD CRYSTAL DRIVE

0 0.4 0.8 1.6 Miles

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Kingston, MA
Critical Infrastructure and FEMA Flood Zones

Date: 2/27/2019

Figure 1

Legend

Critical Infrastructure Category

- Fire Station
- Library
- Local Police
- Pump Station
- Private School
- Public School
- Townhall
- Train Station
- Waste Water Treatment Plant
- Water Tank
- Well
- Commuter Rail Tracks
- Powerline

Long Term Care Residence

- Assisted Living Facility
- Nursing Home
- Rest Home

Dams

- High Hazard
- Significant Hazard
- Low Hazard
- N/A

Hydrography (USGS)

- Rivers and Streams
- Lakes and Ponds

Worst-case Hurricane Surge Inundation Zones

Hurricane Category

- Category 1
- Category 2
- Category 3
- Category 4

N W E S

PEMBROKE DUXBURY PLYMPTON PLYMOUTH CARVER

Kingston Bay

0 0.4 0.8 1.6 Miles

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Kingston, MA
Critical Infrastructure and Hurricane Surge Inundation

Date: 2/27/2019 Figure 2

Legend

Critical Infrastructure Category

- Fire Station
- Library
- Local Police
- Propane Station
- Pump Station
- Private School
- Public School
- Townhall
- Train Station
- Waste Water Treatment Plant
- Water Tank
- Well
- Commuter Rail Tracks
- Powerline

Long Term Care Residence

- Assisted Living Facility
- Nursing Home
- Rest Home

Dams

- High Hazard
- Significant Hazard
- Low Hazard
- N/A

Hydrography (USGS)

- Rivers and Streams
- Lakes and Ponds

NOAA 3ft Sea Level Rise

Cause of Flooding

- Low-lying Areas
- Connected to Coast

N W E S

PEMBROKE DUXBURY PLYMPTON PLYMOUTH CARVER

Kingston Bay

0 0.4 0.8 1.6 Miles

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Kingston, MA
Critical Infrastructure and Sea Level Rise

Date: 2/27/2019

Figure 3

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Attachment D: All Groups – Completed Risk Matrices

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Community Resilience Building Risk Matrix

Group 1 - Action Items

www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
Type of Feature = **I**nfrastructural, **S**ocietal, or **E**nvironmental
High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Hurricane/Nor'easter	Winter Storms	Coastal Flooding/Storm Surge	Sea Level Rise	Priority H - M - L	Time S Long O ngoing
Infrastructural									
Stoney Brook culvert	Maple Street	Town	V	Culvert evaluation/vegetation removal				H	
Stormwater	Jones River, Kingston Bay	Town / MassDOT	V	Updating stormwater management plan / increase stormwater filtration				H	
Electrical lines	Town-wide	Private	V	Tree management, public involvement				H	
Waste water, sump pump	Town	Private	V	Public education and solutions			Relocating pump stations	H	
Landing Road	Town road	Town	V	Evaluation, flood mitigation				H	
River Street	Town roads	Town	V	Evaluation, flood mitigation					
Smelt Brook culvert	Marion Drive	MBTA	V	Culvert replacement in coordination with the MBTA					
Harbor Master's shack, parking lot, equipment storage	Town landing	Town	V	Shack on barge/securing equipment					
Vortechnics	Various	Town, D.O.T.	S	All outfall pipes					
Cell towers, generator	Various	Town, private	V	Coordinate with communication providers				H	
Town/green energy grant	Various	Town	S	Public outreach program					
Regional water use plan	Kingston, Pembroke, Hanson, Central Ply Water District	Brockton	V/S	Written regional plan					
Lake Street culvert plan	Lake Street	Town	S						
Tussock Brook Culvert plan	Under Route 3	MassDOT	S						
Elm Street Dam (Jones River) removal plan	Elm Street	Town	S						
Sylvia Place Pond Dam removal plan	Sylvia Place Road	Town	S						

Community Resilience Building Risk Matrix

Group 1 - Action Items

www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
Type of Feature = **I**nfrastructural, **S**ocietal, or **E**nvironmental
High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Hurricane/Nor'easter	Winter Storms	Coastal Flooding/Storm Surge	Sea Level Rise	Priority H - M - L	Time Short Long Ongoing
Societal									
Transformer station	Various	Eversource	V	Eversource coordination/public education					
Alternative communications	Various	Private, town	V/S	Development of written plan/update					
Sheltering	Silver Lake Regional High School	Town	S	Evaluate access and safety				H	
Citizen preparedness	Various	Private	V/S	Shelter in place guidance/check list				H	
Heating	Various	Private	V/S	Power outage preparedness					
Town Departmental Continuity of Operations Plan (COOP)	Various	Town	V	Alternate staffing plan					
Mutual aid	Various departments	Town	V	Confirm mutual aid				H	
Generators at various town buildings (e.g., Streets, Trees and Parks; Town House, Council on Aging, Police Department, Fire Department)	Town hall	Town	S	Promote private sectors - grocery store, gas station					
Environmental									
Dead trees - uprooted	Fire Road	Town, state	V	Tree management plan with a public-private partnership					
Invasive species, plants and animals	Various	Various	V	Public education					
Living shoreline management	Gray's Beach	Town	V	Coastal change evaluation, impacts to all systems				H	
Rain gardens	Gray's Beach	Town	S	Identify opportunities					
Water pollution	Streams, river, ponds	Various	V	Litter enforcement, public education, stormwater management					
Drinking water	Wells	Town	V/S	Water conservation education				H	
Septic systems, lawn care	Various	Private	V	Public education					
Open space/trees	Various	Town, private	V/S	Tree management					
Fisheries/aquaculture	Kingston Bay	Town, private	V/S						
Cranberry bogs, farming	Various	Private	V						
Insect borne illness	Town-wide	Various	V/S						
Town-wide emergency response plan	Town-wide	Town	S						
Kingston Emergency Management Agency (KEMA)	Town-wide	Town	S						

Community Resilience Building Risk Matrix

Group 2 - Action Items

www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
Type of Feature = **I**nfrastructural, **S**ocietal, or **E**nvironmental
High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Hurricane/Nor'easter	Winter Storms	Coastal Flooding/Storm Surge	Sea Level Rise	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Catch basin management	Town-wide	State, town, private	V	Identify existing plan, review stormwater/catch basin plan, improve designated catch basins					
Wastewater pump stations	Brook St, Landing Rd	Town	V	Flood proof Brook Street wastewater pump station					
Communications technology (phone lines, emergency services)	Town-wide	Private	V	Tree trimming along power lines - aggressive, ongoing; Elm St - shelters; update system/comprehensive town system study					
Tree maintenance	Town-wide	Town, private	V	Identify areas that need maintenance, review plan, maybe approach more aggressively, coordinate with utility services					
Alternative power	Town-wide	Town, private	S						
Regional sheltering	Town-wide	Town	S						
Flooded roads	Maple St, Landing Rd, Gray's Beach, Whale Lane	Town	V						
Societal									
Personal emergency communications	Town-wide	Private	V	Create an emergency preparedness campaign (PACTV, schools, town websites, annual water reports, senior center), "RING"					
Personal emergency preparedness by demographics (elderly, mobile homes)	Town-wide	Private	V						
Personal property preparedness	Town-wide	Private	V						
Identification of vulnerable people	Town-wide	Town, private	V	Self-identify					
Community leadership watch (neighborhood watch)	Town-wide	Private	V						
Volunteer organizations	Town-wide	Town, private	V						
Environmental									
Erosion along waterfront properties	Shore Dr., Rocky Nook, Ah dee nah	Town	V	Regional erosion control study					
Stretch code, building code standards	Town	Town	S						
Drinking water wells (power)	Town, private	Town, private	V	Education on alternative power					
Vegetation maintenance, Gray's Beach	Town, private	Town, private	S & V	Replicate what's happening in Gray's Beach area in other areas					
Conservation Watchdog	Town	Town	S						

Attachment D: All Groups - Completed Risk Matrices

Community Resilience Building Risk Matrix

Group 3 - Action Items

www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability S = Strength
Type of Feature = Infrastructural, Societal, or Environmental
High, Medium, or Low priority for action over the Short or Long term (and Ongoing)

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

Features	Location	Owner	V or S	Hurricane/Nor'easter	Winter Storms	Coastal Flooding/Storm Surge	Sea Level Rise	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Power outages (utilities)	Rocky Nook or Town-wide, post 1980		S & V	Tree trimming, update poles and infrastructure			Elevate ground level utilities		
Shelters with generators	Silver Lake Regional H.S.		S						O
Culverts	Multiple	Various	V	Clean and/or enlarge (O&M Plan)		Tussock Brook tide gate removal			S & O
Drainage and catch basins	Town-wide, Main St at St. Joseph's	Town, private	S & V	Develop operations, maintenance and management plan					
Low-lying roads	Landing Rd, Main St at St. Joseph's, Riverside Dr		V						
Flooding in coastal roads	Multiple	Various	V				Marsh Rd		
Dams (18)		Town, private	S & V	Russell Pond					
Wastewater pump station - locations			V				Elevate		
Stormwater system updated (stormwater systems data)			S	Update stormwater data					O
Howland's Lane bridge - one entrance and exit - Rocky Nook			V						
Grinder pumps back-up into structures (homes) due to power loss	Town-wide	Homeowner	V	Backup power source (consider putting in regulations)					
Fire breaker truck			S						
Societal									
Shelter plan (on-going)	Silver Lake Regional H.S.	Kingston	S	Shelter					
Mobile homes (55+)			S						
Blackboard Connect (Communication to residents via auto "call-out")			S	Blackboard Connect					
Neighbor-helping-neighbor "plan" (lack)			V	Education, outreach (PACTV, social media)					
Residents refusing assistance			V	Education, outreach (PACTV, social media)					O
Robust mutual aid capability (neighboring communities helping out)			S	Kingston-wide education outreach, Kingston Konnect					
South Shore Climate Network			S						
Power outages (grinder pumps and tree trimming)			V	Education and outreach to trim trees on private property and backup power source (generators)					
Environmental									
Wetlands, marsh		Kingston	S	Dissipation during storms					
Shoreline (minimal/small)		Kingston	S & V						
Inland wetlands (storing floodwaters)		Kingston	S						
Forested protected land (including collaborative partnerships)		Kingston	S						
Gray's Beach restoration project			S						
Dam removal (reduces flooding, promotes migration)			S						
Jones River - dredging (lack of)			V	Dredging beyond navigation channel					
Dredging of Kingston Bay			V						
Shellfish beds, Kingston Bay			S						

Community Resilience Building Risk Matrix

Group 4 - Action Items

www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
Type of Feature = **I**nfrastructural, **S**ocietal, or **E**nvironmental
High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Hurricane/Nor'Easter	Winter Storms	Coastal Flooding/Storm Surge	Sea Level Rise	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Electrical substations (none)	Town-wide		V						
Underground electrical	Town-wide		V						
Maintenance and assessment of stormwater BMPs	Town-wide		V	Initial maintenance assessment of individual systems and retrofit non-working BMPs, identify opportunities for green infrastructure (flooding in vicinity of Blair and Howland)					
Great Bridge (Jones River Bridge)	Main Street and Rte 3A, Rte 80	State	V	Analysis for bridge reconstruction					
Dam at Russell Pond	Sylvia Place, Indian Pond Rd	Private	V						
Evacuation Routes, Rocky Nook, Ah dee nah, 1 route out			V	Assess public safety for isolated community (Rocky Nook, Ah dee nah)					
Utility isolation (i.e., Rocky Nook, Ah dee nah)			V						
Dam removal	Elm Street		S						
Sewer expansion			V/S						
Water Treatment Department			S						
Manganese problem			V						
Societal									
Local history	Library		S						
Senior citizens	CCA		S						
Determine areas impacted by utility outage			V/S						
Library as shelter, warm/heat/AC (needs generator)			S	Upgrading facility, identify alternative locations (Kingston Collection, Kingsbury Club)					
SLRHS Shelter, regional (has generator)			S	Upgrading facility, identify alternative locations (Kingston Collection, Kingsbury Club)					
Transportation to shelters and shuttles			V	Upgrading facility, identify alternative locations (Kingston Collection, Kingsbury Club)					
Evacuation list, developing protocol, esp. Rocky Nook and Ah dee nah			V						
Town Hall as command center, generator old			V/S						
Really good Fire Chief			S						
Blackboard Connect communication system			S						
Town Board/elected officials, institutional knowledge			S						
T.A. connections			S						
Really good department heads and teamwork			S						
Environmental education center	Jones River Landing		S						
Develop taxes to mitigate impacts to roads and stormwater									
SLRHS Vocational Tech and students			S						
Jones River Bridge (Great Bridge)	Rt. 3A & Rt. 80	State		(see infrastructure)					

Community Resilience Building Risk Matrix

Group 4 - Action Items

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Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
Type of Feature = **I**nfrastructural, **S**ocietal, or **E**nvironmental
High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Hurricane/Nor'Easter	Winter Storms	Coastal Flooding/Storm Surge	Sea Level Rise	Priority H - M - L	Time Short Long Ongoing
Environmental									
Shared stormwater solution at Rocky Nook	Rocky Nook	Private	V	Abatement tax incentives, transfer of development rights for installation of BMPs on private property					
Roadway vegetation assessment	Town-wide	Coordinate with Eversource and Verizon	V						
Identify wetland resource areas impacted by stormwater	Town-wide		V						
Jones River Bridge (Great Bridge)	Rt. 3A & Rt. 80		V	(see infrastructure)					
Dam at Russell Mill Pond	Sylvia Place, Indian Pond Rd		V	Incentive to owner to rebuilt/repair or purchase, also explore possible development as affordable housing					
Kingston Bay Protection (shallow waters)			S						
Grey water reuse	Town-wide		V	Public engagement workshops, create school curriculum to improve environmental habits					
BMPs for drought and study of water sensitive areas									
Environmental education center	Jones River Landing		S						
Gray's Beach			S						
Open space protection			S						
Kingston Business Association			S						
Jones River Watershed Association			S						
Department head partnering with Kingston Business Association, Jones River Watershed Association, Kingston Youth Sports Organizations, and local groups, and regional education at SLRHS and boyscouts and senior			S						

Attachment E: All Groups - Annotated Kingston Base Maps

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Legend

Critical Infrastructure Category

- Fire Station
- Library
- Local Police
- Pump Station
- Private School
- Public School
- Townhall
- Train Station
- Waste Water Treatment Plant
- Water Tank
- Well
- Commuter Rail Tracks
- Powerline

Long Term Care Residence

- Assisted Living Facility
- Nursing Home
- Rest Home

Dams

- High Hazard
- Significant Hazard
- Low Hazard
- N/A

Hydrography (USGS)

- Rivers and Streams
- Lakes and Ponds

Worst-case Hurricane Surge Inundation Zones

Hurricane Category

- Category 1
- Category 2
- Category 3
- Category 4

PEMBROKE
DUXBURY
PLYMPTON
PLYMOUTH
CARVER
Cape Cod Bay
N
W
E
S
0
0.4
0.8
1.6
Miles

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Kingston, MA
Critical Infrastructure and Hurricane Surge Inundation

Date: 2/27/2019

Figure 2

G-2

Legend

Critical Infrastructure Category

- Fire Station
- Library
- Local Police
- Propane Station
- Pump Station
- Private School
- Public School
- Townhall
- Train Station
- Waste Water Treatment Plant
- Water Tank
- Well
- Commuter Rail Tracks
- Powerline

Long Term Care Residence

- Assisted Living Facility
- Nursing Home
- Rest Home

Dams

- High Hazard
- Significant Hazard
- Low Hazard
- N/A

Hydrography (USGS)

- Rivers and Streams
- Lakes and Ponds

NOAA 3ft Sea Level Rise

Cause of Flooding

- Low-lying Areas
- Connected to Coast

N
W
E
S

0 0.4 0.8 1.6 Miles

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Kingston, MA
Critical Infrastructure and Sea Level Rise

Date: 2/27/2019

Figure 3


Legend
Critical Infrastructure Category
Fire Station
Library
Local Police
Pump Station
Private School
Public School
Townhall
Train Station
Waste Water Treatment Plant
Water Tank
Well
Commuter Rail Tracks
Powerline
Long Term Care Residence
Assisted Living Facility
Nursing Home
Rest Home
Dams
High Hazard
Significant Hazard
Low Hazard
N/A
Hydrography (USGS)
Rivers and Streams
Lakes and Ponds
Worst-case Hurricane Surge Inundation Zones
Hurricane Category
Category 1
Category 2
Category 3
Category 4
N
W
E
S
PEMBROKE
DUXBURY
PLYMPTON
CARVER
PLYMOUTH
Cape Cod Bay
Regional Shelter
Town Hall
Local History Room
Jones River Landing Environ. Education Center
KBA = Kingston Business Assoc.
EVAC.
Manganese nutrient H2O issues
STABILITY & EVACUATION
ELM STREET existing issues
Plan to remove
THE GREAT BRIDGE HISTORIC BRIDGE EVACUATION ROUTE
private owner
JORDAN HOSPITAL
Silver Lake
Jones River Pond
Pembroke Street South Pond
Reeds Millpond
Happy Rines School Pond
Blackwater Pond
Crossmans Pond
Russell Pond
Smelt Pond
Little Smelt Pond
Indian Pond
Muddy Pond
Lorings Bog Pond
North Hill Marsh Pond
South Loring Bogs Pond
Round Pond
Pine Lake
Island Creek Pond
Mill Pond
Pine Street Pond
Harrobs Corner Bog Pond
Dennets Pond
Plympton Bog Pond South
Brook Street Bend Pond
Ricketts Pond
High Street Pond
Doten Brook Pond
Cole Mill Pond
Darby Pond
Little Clear Pond
Fresh Meadow Pond
North Triangle Pond
Little Muddy Pond
Priest Reservoir
Jones River
Jones River Brook
Halls Brook
Pine Brook
Furnace Brook
Barrows Brook
Mile Brook
Island Creek
Tussock Brook
Bassett Brook
West Brook
Winnetuxet Brook
ROUTE 44
0
0.4
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1.6
Miles
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Kingston, MA
Critical Infrastructure and Hurricane Surge Inundation
Date: 2/27/2019
Figure 2

Group 4

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Attachment F: All Groups - Recommended Action Items

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Community Resilience Building Risk Matrix

Recommended Action Items

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Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
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Type of Feature = **I**nfrastructural, **S**ocietal, or **E**nvironmental
High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Hurricane/Nor'Easter	Winter Storms	Coastal Flooding/Storm Surge	Sea Level Rise	Group 1-4	Priority H - M - L	Time Short Long Ongoing
Infrastructural										
Stormwater	Town-wide	State, town, private	V	Evaluate the community stormwater management plan and identify updates (e.g., increased catch basin maintenance, culvert replacement, outfall retrofits).				2	H	
Trees	Town-wide	Town, private	V	Conduct a town-wide vegetation tree assessment to identify areas to target to reduce tree related power outages. Promote tree management and maintenance.				2	H	
Utility Services	Town-wide	Town, private	V	Identify locations to move utility services above ground or below ground based on climate change hazards (e.g., sea level rise, flooding).				3	H	
Brook Street Pump Station	Brook Street	Town	V	Flood proof the Brook Street Pump Station.				2	H	
Great Bridge	Main St/Rte. 3A-Rte. 80	State	V	Conduct bridge reconstruction feasibility and assessment, include Brook Street pump station, "Brook and Main"				4	H	
Public Safety/evacuation routes	Rocky Nook, Ah Dee Nah	Town	V	Evaluate evacuation routes for isolated neighborhoods (e.g., Rocky Nook, Ah Dee Nah) to prepare for increased coastal flooding and sea level rise.				4	H	
Societal										
Communications	Town-wide	Town, private	V	Conduct town-wide emergency communications system study to evaluate needed upgrades and alternative communication options.				2	H	
Emergency Preparedness	Town-wide	Town, private	V	Create a Citizen Emergency Preparedness Campaign that includes guidance, checklists and recommendations. Incorporate and integrate currently available information (e.g., , PACTV, schools, websites, Annual Water Reports, "RING", self identified vulnerable populations).				2	H	
Private Sector Emergency Preparedness	Town-wide	Town, private	V	Promote private sector business power outage preparedness.				1	H	
Shelters	Various	Town	V	Review and update the emergency shelter plan to account for extreme heat events and determine if alternate shelters are necessary.				3	H	
Environmental										
Public water supply	Various	Town	V/S	Promote public water conservation through education, planning, investment, development.				1	H	
Coastal erosion	Shore Dr, Rock Nook, Ah Dee Nah	Town, State	V	Complete a town-wide erosion control study to evaluate options. Utilize lessons learned from completed projects (e.g., Grays's Beach).				2	H	
Jones River	Jones River	Town	V	Dredge the Jones River beyond the current navigation channel for purposes of expanding drainage capacity during extreme rainfall events.				3	H	
Environmental Public Education	Town-wide	Town	V/S	Develop an environmental education plan to promote sustainable use and reuse practices.				4	H	

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Attachment G: High Priority Action Items

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Community Resilience Building Risk Matrix

High Priority Action Items

www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
Type of Feature = **I**nfrastructural, **S**ocietal, or **E**nvironmental
High, **M**edium, or **L**ow priority for action over the **S**hort or **L**ong term (and **O**ngoing)

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

Features	Location	Owner	V or S	Hurricane/ Nor'easter	Winter Storms	Coastal Flooding/ Storm Surge	Sea Level Rise	Group	Priority	Time
								1-4	H - M - L	Short Long Ongoing
Infrastructural										
Stormwater	Town-wide	State, town, private	V	Evaluate the current stormwater management plan, and identify and implement projects (e.g., increased catch basin maintenance, culvert replacement, outfall retrofits) to reduce flooding in town.				2	H	
Trees	Town-wide	Town, private	V	Develop a comprehensive tree management strategy that utilizes a public/private partnership to identify priority areas for tree management and maintenance to increase the resiliency of the electrical system and to maintain fire roads on open space lands.				2	H	
Public Safety/evacuation routes	Rocky Nook, Ah Dee Nah	Town	V	Conduct a vulnerability assessment of coastal neighborhoods (e.g., Rocky Nook, Ah Dee Nah) to prepare for and identify ways to mitigate projected climate change impacts (e.g., increased coastal flooding, sea level rise).				4	H	
Societal										
Communications	Town-wide	Town, private	V	Conduct town-wide emergency communications system study to identify potential upgrades and alternative communication options.				2	H	
Emergency Preparedness	Town-wide	Town, private	V	Develop a Preparedness Campaign for the general public and private sector that includes guidance, checklists and recommendations to increase community resilience to climate change (e.g., extreme weather, repetitive flooding, health impacts).				2	H	
Shelters	Various	Town	V	Review and update the emergency shelter plan to incorporate extreme heat events and determine if alternate shelters are necessary.				4	H	
Environmental										
Public water supply	Various	Town	V/S	Develop a comprehensive strategy to promote drinking water supply conservation through a public education campaign, planning, investment and development.				1	H	

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Attachment H: April 23, 2019 Public Listening Session Summary

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Attachment H: April 23, 2019 Kingston Public Listening Session Summary

On April 23, 2019 the Town of Kingston held a public listening session from 6:00 p.m. – 7:00 p.m. at the Kingston Senior Center located at 30 Evergreen Street in Kingston, MA 02364. There were 9 people in attendance. Will Keefer, MVP certified facilitator from HW, gave a presentation that provided an overview of the MVP Program, the MVP Workshop development and facilitation process and introduced seven high priority action items developed as a result of the March 11 and 14, 2019 workshop.

The public listening session provided an opportunity for those that were involved in workshop, as well as the public in general to help refine the draft high priority action items developed as a result of the workshop. The general sentiment of the audience was that the action items should be fairly broad in scope so that the community could develop projects that best suited the town's needs into the next century. For example, an original action item focused on developing an emergency preparedness campaign for the general public and private sector focused on extreme weather impacts; however, several individuals pointed out that this campaign should inform the intended audience about health impacts brought on by climate change including an increased population of ticks and mosquitos as well. Additional suggestions that resulted from the listening session included, in no particular order:

- Ensure that the Jones River Watershed Association is listed as a strength in the community.
- The community should track the changes in biology (e.g., plants, animals, insects) due to climate change and sea level rise.
- Identify needed upgrades to the stormwater system to ensure that it can still function with anticipated sea level rise.
- Investigate the costs and benefits of large-scale Biochar production and desalination in the community.
- Continue to explore grant opportunities related to climate change resilience, including potential innovation grants to put buildings on floats in anticipation of sea level rise.
- Identify ways to address the increasing number of seals along the coastline.

In closing the public listening session, the MVP facilitator confirmed that the final March 11 and 14, 2019 Kingston MVP Workshop summary report would be available for the public to review upon completion.

As a result of the public listening session, the core planning team incorporated suggestions from the public and confirmed the following seven high priority action items, in no priority order:

1. Evaluate the current stormwater management plan, and identify and implement projects (e.g., increased catch basin maintenance, culvert replacement, outfall retrofits) to reduce flooding in town.
2. Develop a comprehensive tree management strategy that utilizes a public/private partnership to identify priority areas for tree management and maintenance to increase the resiliency of the electrical system and to maintain fire roads on open space lands.
3. Conduct a vulnerability assessment of coastal neighborhoods (e.g., Rocky Nook, Ah Dee Nah, Landing Road) to prepare for and identify ways to mitigate projected climate change impacts (e.g., increased coastal flooding, sea level rise).
4. Conduct a town-wide emergency communications system study to identify potential upgrades and alternative communication options.

5. Develop a Preparedness Campaign for the general public and private sector that includes guidance, checklists and recommendations to increase community resilience to climate change (e.g., extreme weather, repetitive flooding, health impacts).
6. Review and update the emergency shelter plan to incorporate extreme heat events and determine if alternate shelters are necessary.
7. Develop a comprehensive strategy to promote drinking water supply conservation through a public education campaign, planning, investment and development.