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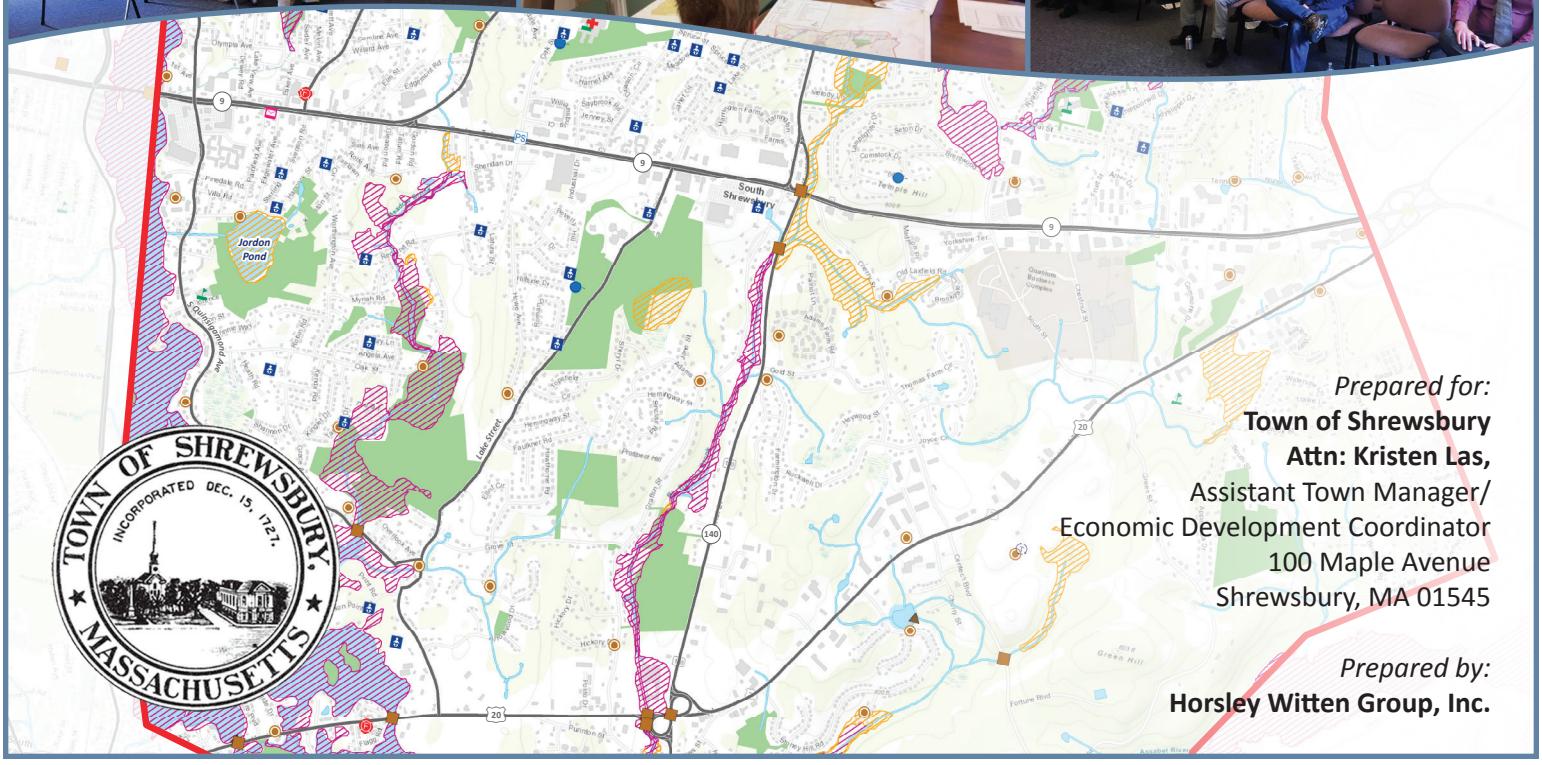
Summary of Findings

Shrewsbury Municipal Vulnerability Preparedness Workshop

Shrewsbury, Massachusetts

June 26, 2018



Prepared for:
Town of Shrewsbury
Attn: Kristen Las,
Assistant Town Manager/
Economic Development Coordinator
100 Maple Avenue
Shrewsbury, MA 01545

Prepared by:
Horsley Witten Group, Inc.

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Shrewsbury Municipal Vulnerability Preparedness Workshop
Summary of Findings

Acknowledgements:

Funding to support the Shrewsbury Municipal Vulnerability Preparedness (MVP) Workshop was provided by the Massachusetts Executive Office of Energy and Environmental Affairs through an MVP Planning Grant, issued to the Town of Shrewsbury during the fiscal year of July 2017 through June 2018.

The Town of Shrewsbury contracted with the Horsley Witten Group, Inc., to provide MVP certified staff to support the Town in planning and facilitating the workshop.

Suggested Citation:

Town of Shrewsbury. 2018. Shrewsbury Municipal Vulnerability Preparedness Workshop Summary of Findings. Prepared by the Horsley Witten Group, Inc. Providence, RI.

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Shrewsbury Municipal Vulnerability Preparedness Workshop
Summary of Findings

Executive Summary

On May 9 and 14, 2018, the Town of Shrewsbury held a Municipal Vulnerabilities Preparedness (MVP) workshop (the core team elected to complete the workshop over two half-days). The workshop's goal was to identify hazards that Shrewsbury faces that are being exacerbated by climate change, and to prioritize actions the Town can take to prepare for identified hazards. This workshop, planned by a core team of organizers and the Horsley Witten Group, Inc. was a step towards MVP certification, which allows certified communities access to additional state grants for projects related to climate change resiliency. Forty-two community members attended part one of the workshop on May 9, 2018, and forty-two attended part two on May 14, 2018, representing a wide cross section of regional, state, and municipal officials, response partners, and other interested parties. Honored guests in attendance on part one (May 9, 2018) included Secretary Matthew A. Beaton, Massachusetts Executive Office of Energy and Environmental Affairs who provided an overview of the Commonwealth's MVP Initiative, and Senator Michael Moore, Second Worcester District who participated in the identification of the top four primary hazards impacting the town.

During the initial large-group discussion, participants concluded that the four categories of hazards most relevant to Shrewsbury were intense rain and flooding; drought; increasing/extreme temperatures; and severe storms. In four small discussion groups, participants identified features of Shrewsbury that are either vulnerable to climate change or could help strengthen the community's ability to cope with climate related hazards. Small groups then listed actions that could be taken to protect or mitigate the impact of prioritized hazards on the features they had identified. Following small and large group discussions and voting, participants prioritized the following seven action items:

- Evaluate and revise as necessary the Town's policies/procedures around emergency management and vulnerable populations. Specifically, consider adjusting academic calendars/schedules (based on projected temperature extremes), public education opportunities, and best management practices around effective communication (development of registries/distribution lists and language barriers that may affect Code Red).
- Evaluate and assess existing (and projected) municipal staff levels and equipment (based on population projections) necessary for a range of emergency response procedures. Evaluate need and review municipal policies for mutual aid/memorandums of understanding, specifically related to Police and Fire.
- Evaluate and assess the Town's existing water supply (source, quality, and quantity). Identify/evaluate water conservation/efficiencies (Low Impact Development

bylaw/regulations), secure alternate sources of water to mitigate water supply impacts, and review the Town's Water Supply Protection Plan.

- Host an annual 'Emergency Preparedness Day' to raise awareness about the Town's vulnerabilities and existing policies/procedures in the event of an emergency situation.
- Improve emergency preparedness by evaluating/identifying alternative shelter locations with sustainable systems, planning for shelter upgrades, increasing education and outreach efforts, and planning for pets.
- As the primary power source in town, ensure continuity of services for Shrewsbury Electric Light and Cable Operations (SELCO) by assessing the need for backup fuel/alternate interconnections.
- In light of increasing storm frequency and severity (as projected), and to ensure readiness, develop a plan that responds to a Category 4 hurricane event.

These action items will be incorporated into ongoing municipal planning efforts and will inform the MVP core team and the town as a whole as it works to take action to improve the Town's resilience. In particular, these actions will be incorporated into the update to the Hazard Mitigation Plan (currently underway by the Central Massachusetts Regional Planning Commission (CMRPC). Actions identified in this process are eligible for future grant funding under the MVP Action Grants program administered by the MA Executive Office of Energy and Environmental Affairs (EEA). By undertaking the MVP workshop and preparing this report, the Town is also initiating its certification as an MVP Certified Community, which enables the Town to apply for future MVP Program grants and elevates the scoring profile for related project proposals to other state grant programs.

Forty-two community members participated across two half-day workshops in May 2018 to develop and prioritize actions to make Shrewsbury more resilient to climate change.

Table of Contents

1. Introduction

The Municipal Vulnerabilities Preparedness (MVP) Program is a Massachusetts state program designed to increase municipality-level resilience to natural hazards being exacerbated by climate change. This program is designed to help municipalities identify their vulnerabilities and strengths along with opportunities to take action to reduce risk and build resilience. Workshops utilize the Community Resilience Building (CRB) Framework, a system of discussions and note taking developed by The Nature Conservancy and prescribed by the MVP Program. Shrewsbury received a grant to participate in the MVP program in order to expand its prior resiliency planning efforts and develop a list of priority actions to focus on in the immediate future.

Workshop Planning and Core Team

Following the award of the technical assistance grant, several town employees were identified to serve as a core organizing team. Team members included the following individuals, and were assisted by Craig Pereira, of the Horsley Witten Group (HW), Shrewsbury's MVP Provider:

- Kristen Las, Assistant Town Manager/Economic Development Coordinator
- Bernie Cahill, Town Planner
- Steve Rocco, Emergency Management Director
- Jeff Howland, Town Engineer
- Brad Stone, Engineer/Conservation-Stormwater Coordinator
- Vincent Thai, Civil Engineer/Compliance

Core team members met on March 6, March 27, and again on April 17, 2018 and communicated via email and telephone as needed. Responsibilities of the core team included planning workshop logistics; reviewing 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 diversity of representative stakeholders to invite to the workshop; reaching out to invitees to encourage attendance; and participating in the workshop as discussion facilitators, note takers and stakeholders.

Workshop Attendees and Materials

The core team elected to complete the MVP workshop over two half-days. Part one of Shrewsbury's MVP workshop was held on May 9, 2018 and part two followed on May 14, 2018, both were morning workshops held at Shrewsbury Town Hall. A total of 79 stakeholders were invited to the workshop with 42 attending both sessions. Participants represented a wide cross section of the Town's stakeholders and decision-makers, including Town Manager Kevin Mizikar, representatives from the Shrewsbury Board of Selectmen, representatives from the Planning Board and Town Meeting, representatives from CMRPC, representatives from SELCO, a local weather specialist, representatives from Worcester Department of Public Health, several local watershed authorities, local business owners, and a wide variety of municipal department staff and volunteers from local boards and commissions, among others. Honored guests included Secretary Matthew A. Beaton, Massachusetts Executive Office of Energy and

Environmental Affairs who provided an overview of the Commonwealth's MVP Initiative, and Senator Michael Moore, Worcester 2nd District who participated in the identification of the top four primary hazards impacting the town. See Attachment A for a full list of invited stakeholders, including their organizational affiliation and whether they attended part one, part two, or both days.

Kevin Mizikar, Shrewsbury Town Administrator welcomes stakeholders to the MVP Workshop.

On the day of each workshop, participants were provided with a copy of the agenda for the morning (see Attachment B) and a handout summarizing climate change resiliency measures that have been previously identified and recommended in recent municipal plans, including the Shrewsbury 2012 Hazard Mitigation Plan (see Attachment B). The following additional informational materials were located on each small group's table to be shared in order to encourage communication and collaboration throughout the workshop:

- Summary of climate projections for both the Blackstone and Sudbury/Assabet/Concord Basins provided by EEA and prepared by the Northeast Climate Science Center (see Attachment B). Shrewsbury is essentially split in half and located within both basins.
- Example vulnerabilities and strengths excerpted from the CRB guidance document (see Attachment B).
- Summary of Shrewsbury demographic data (see Attachment B).
- Shrewsbury base map showing critical infrastructure and FEMA floodplain data (see Attachment C).

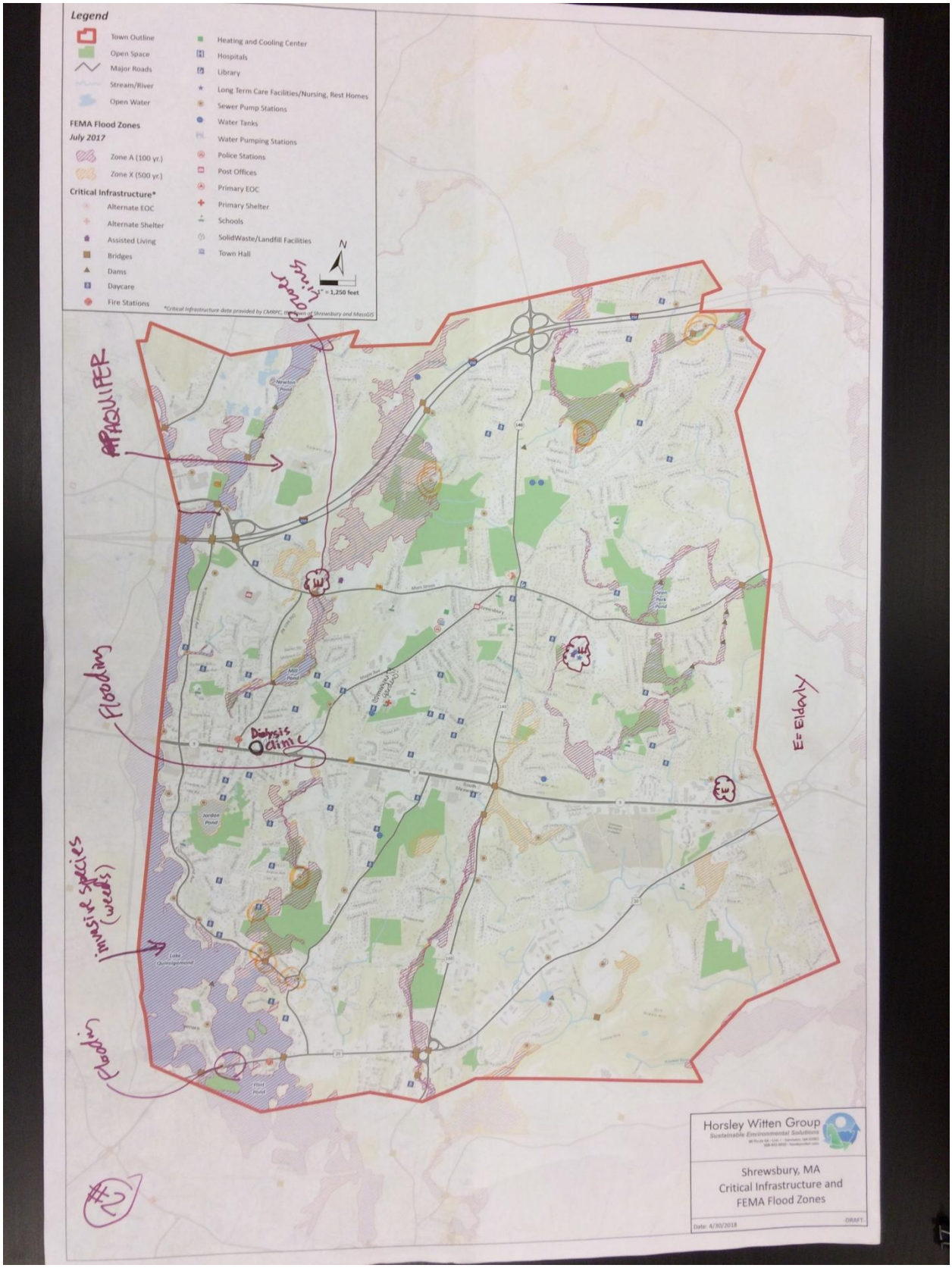
The Workshop Process

Part One – May 9, 2018

Following introductions and an overview of the MVP Program and workshop agenda, workshop participants listened to a presentation by MVP-Certified facilitator Craig Pereira, HW, about climate change projections and their current and potential future impacts on Shrewsbury. The presentation discussed specific infrastructural and environmental challenges facing the Town in light of climate change. Challenges discussed included the flooding that occurs after severe rain events, variations in temperature extremes, and the potential for increasing drought severity. Following this introduction, HW led a large group discussion in which participants focused in on four primary climate change hazards to frame the discussions for the remainder of the workshops.

The remainder of the morning workshop included small discussion groups. Groups were made up of a facilitator (either a HW staff member or member of the core planning team), a note taker, and approximately 10 workshop participants. Small group discussions began by listing infrastructural, societal, and environmental features that represent either vulnerabilities or strengths of the community in the face of anticipated climate change hazards. Features were marked on the base maps and listed on the risk matrix, a framework for note taking developed as a part of the CRB framework. Each group listed between 10 and 15 features for each category, along with information about their location, ownership, and if they are a strength or vulnerability for the Town. They also marked specific locations on the base map provided at the table, as appropriate.

Participants worked in small groups to identify vulnerabilities and strengths associated with the four primary hazards impacting the community.



Small groups annotated maps to highlight vulnerable infrastructure, flood zones, and community resources.

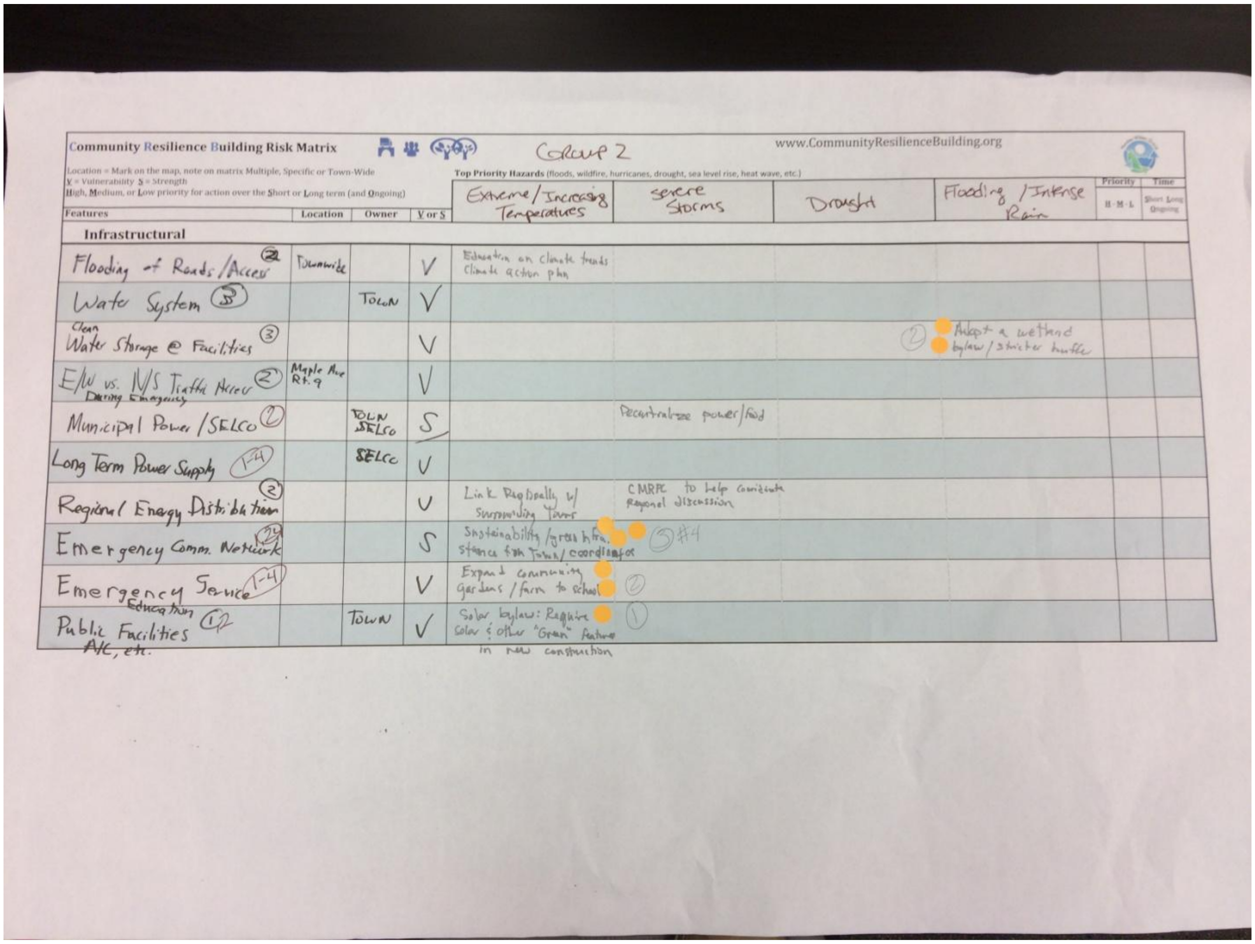
Part Two – May 14, 2018

Following a brief overview of part one, groups moved on to discussing action items that either mitigate the threats posed by the priority hazards or enhance the strengths identified. Action items could either be a way to protect a vulnerable feature from a negative impact or how to better utilize one of Shrewsbury's strengths. Common action items listed included ensuring Town staffing levels are appropriate for existing/projected population, developing a plan for vulnerable/elderly population (registry, education, and communications), and backup power for water/sewer pump stations and shelters. Throughout the small group discussions, the workshop's lead facilitator circulated between groups to ask questions and provide guidance.

Once complete lists of action items to address infrastructural, societal, and environmental vulnerabilities had been compiled, groups began the process of prioritizing actions. Groups completed this process in different ways, with some identifying the priority level for each suggested action item and others only determining which were of the highest priority. Groups prioritized items by discussion and/or by dot voting, in which each participant was given several dot stickers to place next to ideas they wished to prioritize.

After all groups had identified its top five-six priority action items, a representative of the group reported out to the full workshop, describing the prioritized items and presenting a brief summary of their group's discussion. Following the presentation of each group's priorities, workshop participants together with the workshop facilitator combined duplicative suggestions to create a final list of priority actions that the Town of Shrewsbury should work towards to increase the resilience of the community in the face of anticipated climate change impacts. Through this process, the group identified seven overall priority action items.

The results of each stage of the workshop discussions are presented in the subsequent sections of this report. Attachment D includes a transcription of the summary matrices produced by each of the four discussion groups. Attachment E includes a matrix presenting a compilation of the recommended high priority actions from the four discussion groups. Action items prioritized during small or large group discussion are indicated with bolded and underlined font. Attachment F includes the maps that contain notations from each of the discussion groups.



An example completed risk matrix. Colored dots indicate the small group participant voting to prioritize each action.

2. Top Hazards of Concern

The discussion of hazards tended to include both the hazard events as well as the impacts from those events, because the term hazard can be a bit confusing in its use; 'hazard' can refer to the cause and the impact. The presentation by HW included a list of hazards for consideration, as follows:

- Intense rain/flooding
- Wind events
- Hurricanes or Nor'Easters
- Winter Storms (snow, wind, cold)
- Extreme cold
- Heat waves, extreme heat
- Fire
- Drought

Following discussion among the full group of workshop participants, several hazards were combined together based on the common impacts expected from the hazards. Workshop participants came to consensus that the following climate change related hazards were the highest priority for Shrewsbury:

- Intense Rain and Flooding
- Drought
- Increasing/Extreme Temperatures
- Severe Storms

3. Current Concerns and Challenges Presented by Hazards

Shrewsbury has experienced a number of 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. Localized flooding is a concern for the Town of Shrewsbury, particularly at Oak, Lake, Fruit Streets, Maple Avenue and Route 9. Residents were reminded of flooding issues most recently during late winter/early spring of 2018 when back-to-back intense rainstorms, coupled by compromised (undersized, clogged) drainage structures resulted in significant flooding along Route 9. Severe winter storms continue to increase in frequency and severity in Shrewsbury, often accompanied by significant snow fall and high winds. In 2016 – 2017, Shrewsbury and the northeast in general experienced a severe drought that challenged the local water supplies. Shrewsbury was within the 'D-2 severe drought' area which was compounded by record breaking high temperatures.

Localized flooding late winter/early spring 2018 along Route 9 in Shrewsbury. Photo: Hillary King.

The biggest challenges, concerns and vulnerabilities that were raised in the breakout discussions at the MVP workshop included:

- *Localized flooding:* Several areas of Shrewsbury experience flooding caused by precipitation events. This issue is exacerbated by limited infiltration capacity resulting from an already-saturated ground combined with undersized, old, damaged or clogged drainage infrastructure. Participants also expressed concern for flooding of homes in and around the Lake Quinsigamond area, in addition to intermittent flooding caused by beaver activity. The need for additional flood storage and utilizing green infrastructure/low impact development best management practices for increased infiltration was also discussed in several small groups.
- *Evacuation/Traffic management:* The Town of Shrewsbury does not currently have an informal or state-approved evacuate route. Concerns over this include the safe, efficient evacuation of residents, compounded by localized flooding along major transportation routes.
- *Emergency preparedness, response and recovery after a storm event:* The flooding and weather extremes described above further raised concern about preparations and impacts to emergency response personnel and access to vulnerable populations. The increasing frequency and severity of storm events and the Town's level of preparedness, particularly in light of a Category 4 event, was expressed as a concern. The Town provides emergency response services, has a Code Red communications system, and staffs an emergency management operations center during emergency events. However, strengthening these systems and the town's ability to provide these services was a common concern.
- *Drought:* The state of Massachusetts experienced a severe drought in 2016-2017 that challenged the public water supply systems throughout the state. Participants expressed concern with the town's aquifer capacity, and in particular, strengthening the Aquifer Protection Overlay District, and the sustainability of their water supply.

4. Current Strengths and Assets

Among the discussion groups at the workshop, a number of strengths were also identified among the infrastructural, societal and environmental assets of the Town. These include:

Infrastructural:

- The facilities of Shrewsbury Electric Light and Cable Operations (SELCO) are of high quality and are highly resilient, and managed well by SELCO staff (specifically substations, communications procedures, and emergency response methods)
- Existing mutual aid agreements for municipal departments (Worcester water interconnection)
- The existing water supply system
- The location of core municipal buildings
- Municipal fuel depot with backup power

Societal:

- The existing Code Red communications system
- Shrewsbury Emergency Management Department/procedures
- Shrewsbury's history of strong, civic engagement
- The presence of the regional Board of Health (Central Massachusetts Regional Public Health Alliance)
- Various medical facilities located within/adjacent to town (Massachusetts Department of Public Health's Office of Preparedness and Emergency Management (OPEM) Worcester Medical Reserve Corps
- The Town's senior center
- High School Community Service programs
- Citizen Emergency Response Team (CERT)

Environmental:

- The Towns' inland geographic location
- Water supply/Aquifer Protection Overlay District
- Municipal Clear-Cutting Bylaw
- Shrewsbury Conservation Commission
- Existing parks and open space
- Lake Quinsigamond Watershed Association

5. Top Recommendations to Improve Resilience

Following the presentation of each group's priorities, workshop participants, along with the workshop facilitator, combined duplicative suggestions to create a final list of recommendations. These were then further prioritized using dot voting. Seven action items were chosen as the highest priority for the Town and are listed below.

- Evaluate and revise as necessary the Town's policies/procedures around emergency management and vulnerable populations. Specifically, consider adjusting academic calendars/schedules (based on projected temperature extremes), public education opportunities, and best management practices around effective communication (development of registries/distribution lists and language barriers that may affect Code Red).
- Evaluate and assess existing (and projected) municipal staff levels and equipment (based on population projections) necessary for a range of emergency response procedures. Evaluate need and review municipal policies for mutual aid/memorandums of understanding, specifically related to Police and Fire.
- Evaluate and assess the Town's existing water supply (source, quality, and quantity). Identify/evaluate water conservation/efficiencies (Low Impact Development bylaw/regulations), secure alternate sources of water to mitigate water supply impacts, and review the Town's Water Supply Protection Plan.

- Host an annual 'Emergency Preparedness Day' to raise awareness about the Town's vulnerabilities and existing policies/procedures in the event of an emergency situation.
- Improve emergency preparedness by evaluating/identifying alternative shelter locations with sustainable systems, planning for shelter upgrades, increasing education and outreach efforts, and planning for pets.
- As the primary power source in town, ensure continuity of services for Shrewsbury Electric Light and Cable Operations (SELCO) by assessing the need for backup fuel/alternate interconnections.
- In light of increasing storm frequency and severity (as projected), and to ensure readiness, develop a plan that responds to a Category 4 hurricane event.

Participants identify their top five highest priority actions the Town should move forward with.

6. Conclusion and Next Steps

Shrewsbury will continue the MVP certification process by presenting and distributing this report to the public at a formal public information and listening session before the Board of Selectmen scheduled for July 24, 2018 at 7 PM as part of the Board of Selectmen meeting. This session will provide an opportunity for any member of the interested public to learn, ask questions, and provide feedback about the MVP Workshop and the recommended highest priority actions that emerged from that workshop.

Priorities identified during the MVP Workshop will be integrated into existing municipal planning efforts, in particular, the update to the Hazard Mitigation Plan (currently underway by CMRPC). The Town will also continue to pursue grant funding to implement the priority actions identified through the MVP Workshop process to continue to improve the Town's resilience to climate change.

Attachment A: List of Invitees and Participants

Shrewsbury MVP Workshop – May 9 and 14, 2018
Invitees and Participants

May 9, 2018	May 14, 2018	FIRST	LAST	ROLE
		Melissa	Alvarado	Shrewsbury Nursing/Rehab., Director of Facilities
X	X	Jim	Arnold	Weather Specialist
X	X	Kristen	Bailey	Fresenius Medical care, Clinical Manager
X	X	Matthew	Beaton	Secretary, Executive Office of Energy/Environmental Affairs
		Kelly	Bergeron	Shrewsbury Housing Authority, Ex. Director
		Stephen	Boudet	UPS
X	X	Bob	Boulay	METSO Automation, Man. Operations/Engineering
		Kelly	Brissette	Rep. Jim McGovern's Office
X	X	Pat	Bruchman	Worcester Dept. of Public Health
X	X	Bernie	Cahill	Shrewsbury Town Planner
X	X	Bruce	Card	Shrewsbury Fire, Deputy Chief
X	X	Justine	Carroll	Tate and Howard, Consultant
X	X	Beth	Casavant	Shrewsbury BOS
		Karen	Chapman	Chamber of Commerce
		Karyn	Clark	Worcester Dept. of Public Health
		Seth	Colby	Shrewsbury Fire Dept.
X	X	Pat	Collins	Assist. Superintendent, Finance/Operations
		Peter	Collins	Lake Quinsigamond Association
X	X	Robert	Cox	Superintendent of Buildings
X	X	Steve	Cronin	Lake Quinsigamond Watershed Authority
		Rajiv	Dayal	India Society
		Maurice	DePalo	Shrewsbury BOS
X	X	Ellen	Dolan	Library Director
X	X	Sean	Flynn	Flynn's/Al's Oil
		Amy	Foreman	UMASS Medical School, Director of Property Services
		Mel	Gordon	Planning Board, Chair
X	X	Michael	Hale	SELCO, Gen. Manager
		Mark	Hebert	Lakeway Commons
		Jay	Hester	Shrewsbury Police Chief
X	X	Jeff	Howland	Shrewsbury Town Engineer
X	X	Ralph	Iaccariro	SELCO

May 9, 2018	May 14, 2018	FIRST	LAST	ROLE
		Thomas	Jenkins	GZA Environmental, Consultant
	X	Hannah	Kane	Rep. Worcester 11th District
	X	Jim	Kane	Shrewsbury BOS
X		Katherine	Keohane	Shrewsbury Planning Board
		Barbara	Kickham	DEP Water Program, Section Chief
		Hillary	King	Resident/Stantec, Consultant
X	X	John	Knipe	Shrewsbury Highway Superintendent
X		Hillary	Lacirignola	Resident/Weston and Sampson, Consultant
X	X	Kristen	Las	Assist. Town Manager/Economic Development Coordinator
X	X	Sean	Lawler	Shrewsbury Fire Dept.
		Phil	Leger	Worcester Dept. of Health
X	X	Maria	Lemieux	Lakeway Business District
	X	Dana	Leveson	Southgate Rehabilitation, President/CEO
X		Marybeth	Lynch	Real Estate Agent
		Derek	Mathieu	CMRPC
X	X	Chris	McGoldrick	Shrewsbury Assist. Town Planner
X		Paul	McNiff	Police/EM Deputy Director
X		Adam	Menard	CMRPC
X	X	Shashi	Menon	Shrewsbury Council on Aging, Vice Chair
	X	Moira	Miller	Shrewsbury BOS, Vice Chair
X		Kevin	Mizikar	Shrewsbury Town Manager
X		Michael	Moore	Senator, Worcester 2nd District
X	X	Bryan	Moss	Shrewsbury Town Meeting Member
	X	Christine	Mowry	Shrewsbury Youth/Family Services
		Don	Musial	Wheelabrator
		Denise	Olade	White City
X	X	John	Ostrosky	Shrewsbury Conservation Commission
		Kathleen	Polanowicz	Rep. Jim McGovern's Office
		Leona	Pease	Shrewsbury Animal Control Officer
X	X	Nick	Repekta	Shrewsbury Highway Dept.
	X	Eric	Ring	St. John's High School, Plant Manager
X		Steve	Rocco	Shrewsbury EMD
		Aaron	Roy	Shrewsbury Fire Dept.
		Louise	Russell	COA Board Member
	X	Stacey	Rutherford	Shrewsbury Nursing/Rehab., Ex. Director
X		Angela	Snell	Shrewsbury Parks and Recreation Dept./Cemetery Director
X	X	Brad	Stone	Shrewsbury Engineer/Compliance
X	X	Chris	Sturgis	Wheelabrator, Environmental Manager
		Martin	Suuberg	DEP, Commissioner

May 9, 2018	May 14, 2018	FIRST	LAST	ROLE
X	X	Vincent	Thai	Shrewsbury Engineer
X	X	Mary	Thompson	Shrewsbury Accountant
X	X	Adam	Towner	Shrewsbury Fire Captain
	X	Bob	Tozeski	Shrewsbury Water/Sewer Dept.
X		Jennifer	Trites	Shrewsbury Youth/Family Services
	X	Peter	Trocco	Charles River Labs, Sen. Manager of Facilities
		Jim	Vuona	Shrewsbury Fire Chief
	X	Mark	Wagner	Wagner Dealerships
	X	_____	Wallard	Shrewsbury Fire Dept.
X		Sharon	Yager	Shrewsbury Council on Aging Board, Director

Attachment B: Workshop Handouts

Agenda

Prior Recommendations

Climate Change Projections

Example Vulnerabilities and Strengths

Demographics

Horsley Witten Group
Sustainable Environmental Solutions

Shrewsbury Municipal Vulnerability Preparedness (MVP) Workshop

Wednesday, May 9, 2018 (Part 1) 8:30 am – 12:30 pm
Shrewsbury Town Hall
100 Maple Avenue

ANNOTATED AGENDA

TIME	ACTIVITIES	NOTES
8:00 AM	Registration and Refreshments – Old Selectmen's Meeting Room	
8:30 AM *(10 min)*	Welcome and Introductions	Kristen Las Assistant Town Manager/Econ. Development Coordinator
8:40 AM *(15 min)*	Workshop Purpose MVP Program	Matthew A. Beaton Secretary, Office of Energy and Environmental Affairs
8:55 AM *(10 min)*	Workshop Overview Purpose, desired outcomes, expectations Review agenda	Craig Pereira Horsley Witten Group (HWG)
9:05 AM *(30 min)*	Overview of Science and Data Resources Review recent climate related events. Present summary of anticipated climate changes. Present summary of recent/existing planning efforts.	(HWG)
9:35 AM *(30 min)*	Large Group Exercise #1 Develop list of hazards affecting the community Prioritize top 4 hazards	(HWG)
10:05 AM *(15 min)*	BREAK	
10:20 AM *(15 min)*	Small Group Exercise #1 Introduction to Hazard/Vulnerability Matrix and Instructions for Small Group Exercise #1	Small Group Facilitators
10:35 AM *(75 min) 25 mins. for each category*	Small Group Exercise #1 Confirm Hazards: Identify Vulnerabilities and Strengths, Location, Ownership	Small Group Facilitators
11:50 PM *(15 min)*	Mark-up Maps/Wrap Up/Questions	Small Group Facilitators
12:05 PM	Adjourn	

Horsley Witten Group
Sustainable Environmental Solutions

Shrewsbury Municipal Vulnerability Preparedness (MVP) Workshop

Monday, May 14, 2018 (Part 2) 8:30 am – 12:00 pm
Shrewsbury Town Hall
100 Maple Avenue

ANNOTATED AGENDA

TIME	ACTIVITIES	NOTES
8:15 AM	Registration and Refreshments – Old Selectmen's Meeting Room	
8:30 AM *(10 min)*	Welcome and Recap of Session #1	Craig Pereira Horsley Witten Group (HWG)
8:40 AM *(5 min)*	Small Group Exercise #2 Instructions for Small Group Exercise #2	(HWG)
8:45 AM *(80 min)* *20 mins. for each category/prioritize*	Small Group Exercise #2 Identify/Prioritize Community Actions	Small Group Facilitators
10:05 AM *(15 min)*	BREAK	
10:20 AM *(20 min)*	Large Group Exercise #2 Task 1 Report Out from Small Group Exercise #2	Small Group Spokesperson
10:40 AM *(60 min)*	Large Group Exercise #2 Task 2 Determine Overall Priority Actions	(HWG)
11:40 PM *(20 min)*	Wrap Up/Closing Remarks	Kristen Las Assistant Town Manager/Econ. Development Coordinator
12:00 PM	Adjourn	

Horsley Witten Group
Sustainable Environmental Solutions

Shrewsbury Municipal Vulnerability Preparedness (MVP) Grant Project:

KEY RECOMMENDATIONS FROM 2012 HAZARD MITIGATION PLAN

RECOMMENDATION	HAZARD	PRIORITY
Capital/Structural Development		
• Identify/prioritize capital/structural mitigation projects that are cost-effective and technically feasible (stormwater drainage, dam repairs, vegetative debris management)	All hazards	High
• Implement a vegetative debris management program to reduce debris and thereby mitigate risks of stormwater flooding, riverine flooding, and winter storm damage	All hazards	Medium
• Implement improvements as recommended at the Newton Pond Dam to decrease risk of breach and flood-related damage	Flood-related hazards	Medium
• Analyze the need to replace culverts (increase size) to mitigate flooding in town at the following locations: - Municipal Drive - Grove Street - Dean Park - South Street - Brook Street	Flood, Winter, Wind-related hazards	Medium
• Clean the downstream drainage channels to further mitigate flooding that occurs at: - Dean Park - South Street - Brook Street	Flood, Winter, Wind-related hazards	Medium
• Increase the amount of vegetative debris that is cleared from fire roads to include a ten-foot area on each side in order to mitigate the risk of wildland fires	Fire-related hazards	High
• Sweep streets at least once per year to increase stormwater management capacity; capture and dispose of appropriately	Flood-related hazards	High
• Properly clean all stormwater structures and basins (at least annually, or more often as may be required)	Flood-related hazards	High
Administration/Enforcement/Coordination		
• Pursue funding that build local capacity and supports grant-writing for mitigation actions in the regional and local PDM plans	All hazards	Low
• Increase communication/coordination between federal/state/regional/county/municipal/private/non-profits in the area of pre-disaster mitigation	All hazards	High

RECOMMENDATION	HAZARD	PRIORITY
Administration/Enforcement/Coordination continued		
• Help communities develop and enhance working relationships with the utility companies to improve mitigation of threats, and improve communication during events; ensure satellite spaces within each community for temporary emergency headquarters	All hazards	High
• Implement (or improve) hazard warning systems and notification to vulnerable populations	All hazards	Medium
• Amend zoning bylaws to reflect new flood maps in order to mitigate the flood risk in new developments	Flood-related hazards	High
• Implement NPDES requirements which will improve the function of drainage infrastructure and mitigate flood risks	Flood-related hazards	Medium
• Increase the number of dam inspectors in the region so that dams with serious problems are repaired before they are breached by flood waters that cause serious damage or casualties	Flood-related hazards	Medium
• Continue to actively enforce and comply with State Building Code requirements	Wind and Winter-related hazards	High
• Continue to actively enforce and comply with the Massachusetts Wetlands protection Act	Flood-related hazards	High
• Continue to enforce seismic standards in the State's Building Code	Geologic-related hazards	High
Education		
• Continue to expand the Emergency Management Director's active public outreach plan, which currently includes regular broadcasts on the Local Cable Access station, and booths at the annual Spirit of Shrewsbury Festival each fall (to educate residents/business owners on the measures they can implement to mitigate disaster impacts to themselves and others).	All hazards	Medium
• Promote use of full range of federal and state resources related to disaster mitigation such as educational materials, training, and National Weather Service forecasts	All hazards	Medium
• Develop a means for sharing information on a regional basis about successful disaster mitigation planning and programs. Create a feedback loop to improve pre-disaster planning by establishing a formal post-disaster assessment process	All hazards	Low
• Develop educational and outreach tools to reach typically marginalized populations, particularly in designated environmental justice areas	All hazards	High
Planning		
• Find funding to review and update the regional and local disaster mitigation plans on a five-year cycle	All hazards	Low
• Incorporate disaster mitigation actions into appropriate local and regional plans on a five-year cycle	All hazards	High
• Integrate disaster mitigation concerns into transportation projects (drainage improvements, underground utilities)	Flood and Geologic-related hazards	High

RECOMMENDATION	HAZARD	PRIORITY
Planning continued • Expand the role and use of the annual Capital Improvement Program	Flood, Drought, and Fire-related hazards	Low
• Identify PDM actions that are consistent with the objectives of other interest groups. Collaborate with others to undertake initiatives and achieve success (conservation/environmental groups that support wetlands protection, river corridor acquisition, or reducing runoff).	Flood, Winter, Wind, and Extreme Temperature-related hazards	High
• Improve the information available on at-risk properties and repetitive loss structures in order to refine strategies	Flood-related hazards	Medium
• Work with CMRPC's Transportation Department on computer modeling for evacuation planning and re-routing post-disaster	Flood, Wind, Fire, and Geologic-related hazards	Low
• Update the Open Space and Recreation Plan to mitigate the flood risk in town	Flood-related hazards	Low
Regulatory Actions • Encourage the adoption of underground utility requirements on local subdivision regulations, and retro-fitting of existing infrastructure	Flood and Wind-related hazards	Low
• Incorporate disaster mitigation concerns into the MEPA review process	Flood, Winter, and Geologic-related hazards	High
• Integrate disaster mitigation concerns into subdivision, site plan review, 40-B reviews, and other zoning reviews. In particular, require the consideration of downstream flooding impacts caused by new projects – even if the impacts cross town lines – and urban/wildland interface concerns in high-risk areas. Work on model bylaw language for urban/wildland interface and model parking standards to reduce the amount of impervious coverage	Flood and Fire-related hazards	High
• Adopt regulations in accordance with the Stormwater bylaw to mitigate the frequency of flooding	Flood-related hazards	High
Emergency Response/Preparedness • Implement a Unified Incident Command program in place	All hazards	Medium
• Inventory shelter/emergency resources. Identify what services are available at the different shelters (food preparation, potable water, back-up electrical power, heat, showers, etc.) and whether the location of different shelters will be impacted by different hazards (flooding would make the shelter inaccessible). This would help ensure that suitable shelters are available for different types of natural hazards	All hazards	Medium

SOURCE: Central Massachusetts Regional Planning Council, 2012. *Town of Shrewsbury Annex - Hazard Mitigation Plan, 2012 Update.*

Horsley Witten Group
Sustainable Environmental Solutions

Shrewsbury Municipal Vulnerability Preparedness (MVP) Grant Project:

CLIMATE CHANGE PROJECTIONS[1]

TEMPERATURE

HIGHLIGHTS:

- ✓ By 2050, we could have more than 5 times as many very hot days (over 90°F) than we do today. By 2100, we could have more than 10 times as many.
- ✓ 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 will increase by almost half by 2050 and could almost double by the end of the century.

Table 1: TEMPERATURE PROJECTIONS

Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Average Annual Temperature (°F)			
Blackstone Basin	48.2	51.1 – 54.9	52.0 – 59.3
Sudbury/Assabet/Concord	48.7	51.6 – 55.0	52.5 – 59.6
Maximum Annual Temperature (°F)	58.7	61.4 – 64.9	62.2 – 69.8
Blackstone Basin	59.6	62.3 – 65.9	63.0 – 70.5
Sudbury/Assabet/Concord			
Minimum Annual Temperature (°F)			
Blackstone Basin	37.7	40.8 – 44.2	41.8 – 48.8
Sudbury/Assabet/Concord	37.9	41.0 – 44.3	42.0 – 48.9
Annual Days with Max Temp over 90°F			
Blackstone Basin	5	13 – 34	17 – 75
Sudbury/Assabet/Concord	8	18 - 42	22 - 84
Annual Days with Min Temp below 32°F			
Blackstone Basin	143	104 – 125	77 – 120
Sudbury/Assabet/Concord	143	103 - 124	78 - 119
Annual Heating Degree-Days (Base 65°F)			
Blackstone Basin	6,651	5,052 – 5,906	4,136 – 5,660
Sudbury/Assabet/Concord	6,535	4,948 – 5,789	4,075 - 5551
Annual Cooling Degree-Days (Base 65°F)			
Blackstone Basin	499	794 – 1,257	897 – 2,047
Sudbury/Assabet/Concord	585	870 – 1,356	743 - 983
Annual Growing Degree-Days (Base 50°F)			
Blackstone Basin	2,451	3,033 – 3,738	3,200 – 4,943
Sudbury/Assabet/Concord	2,525	3,138 – 3,866	3,321 – 5,067

[1] Source: Northeast Climate Science Center, 2018. *Massachusetts Climate Change Projections*. University of MA Amherst. Published by MA Executive Office of Energy and Environmental Affairs. January. 213 p. Available at: http://www.massclimatechange.org/resources/resource::2152/massachusetts-climate-change-projections-statewide-and-for-major-river-basins. Data is for the Blackstone and Sudbury/Assabet/Concord Basin, which includes the land area of Shrewsbury.

PRECIPITATION

HIGHLIGHTS:

- ✓ Average annual precipitation in Shrewsbury will increase up to 13% - 14% by 2050 and up to 18% - 19% by 2100.
- ✓ The largest increases in precipitation will occur in winter.
- ✓ The greatest increase in consecutive dry days will occur in fall.

Table 2: PRECIPITATION PROJECTIONS

Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Total Precipitation (inches):			
Annual			
Blackstone Basin	47.1	48.5 – 53.9	48.7 – 55.8
Sudbury/Assabet/Concord	45.4	50.0 – 51.5	46.6 – 53.4
Winter			
Blackstone Basin	11.4	11.7 – 14.2	11.8 – 15.9
Sudbury/Assabet/Concord	11.2	11.3 – 13.8	11.6 – 15.3
Spring			
Blackstone Basin	12.0	12.1 – 14.3	12.3 – 14.8
Sudbury/Assabet/Concord	11.6	11.6 – 13.7	11.8 – 14.2
Summer			
Blackstone Basin	11.3	10.9 – 13.6	9.7 – 13.9
Sudbury/Assabet/Concord	10.8	10.3 – 13.0	9.7 – 14.0
Fall			
Blackstone Basin	12.4	11.10 – 14.5	10.6 – 14.1
Sudbury/Assabet/Concord	12.0	10.7 – 13.7	10.5 – 13.4
Annual Days with Precipitation over 1 inch			
Blackstone Basin	8	9 – 11	9 – 12
Sudbury/Assabet/Concord	7	8 - 10	8 - 11
Annual Days with Precipitation Over 2 inches			
Blackstone Basin	1	1 – 2	1 – 2
Sudbury/Assabet/Concord	1	1 - 2	1 - 2
Annual Days with Precipitation Over 4 inches			
Blackstone Basin	0	0 – 0	0 – 0
Sudbury/Assabet/Concord	0	0 - 0	0 - 0
Annual Consecutive Dry Days			
Blackstone Basin	17	17 – 19	16 – 20
Sudbury/Assabet/Concord	17	17 - 19	16 - 20

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Shrewsbury Municipal Vulnerability Preparedness (MVP) Grant Project:

EXAMPLES of VULNERABILITIES and STRENGTHS[1]

INFRASTRUCTURE

Examples of Vulnerabilities:

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

Examples of Strengths:

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

SOCIETAL

Examples of Vulnerabilities:

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

Examples of Strengths:

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

ENVIRONMENTAL

Examples of Vulnerabilities:

- Beachfront development reducing protection provided by dunes.
- Proliferation of subdivisions in wildfire and 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.

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

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Shrewsbury Municipal Vulnerability Preparedness (MVP) Grant Project:

SELECTED DEMOGRAPHIC DATA[1]

Demographic Parameter	Result
Population	35,608 people (U.S. Census 2010)
Age	0-19 = 14% 20-34= 14% 35-64 = 43% 65+ = 28%
Income	<$40K = 19% $40-60K = 12% $60K+ = 68%
% Below Poverty Line	5%
Race	White = 77% Black = 3% Asian = 16% Other = 4%
Ethnicity	Hispanic = 3% Not Hispanic = 97%
Environmental Justice	32.8% (U.S. Census 2010)
% Population Over 65 Living Alone	3.4%
Heart Attack Hospitalizations	42.6 (age-adjusted rate per 10,000 people)
Asthma Emergency Department Visits	32.0 (age-adjusted rate per 10,000 people)
Pediatric Asthma Prevalence	8.8% of all children enrolled in grades K-8
Heat Stress Emergency Department Visits	2.6 (age-adjusted rate per 10,000 people)

[1] Source: MA Dept of Public Health, 2018. MA Environmental Public Health Tracking Community Profile for Shrewsbury. Report Created on April 16, 2018.

Attachment C: Base Map

Legend

- Town Outline
- Open Space
- Major Roads
- Stream/River
- Open Water

FEMA Flood Zones

July 2017

- Zone A (100 yr.)
- Zone X (500 yr.)

Critical Infrastructure*

- Alternate EOC
- Alternate Shelter
- Assisted Living
- Bridges
- Dams
- Daycare
- Fire Stations
- Heating and Cooling Center
- Hospitals
- Library
- Long Term Care Facilities/Nursing, Rest Homes
- Sewer Pump Stations
- Water Tanks
- Water Pumping Stations
- Police Stations
- Post Offices
- Primary EOC
- Primary Shelter
- Schools
- SolidWaste/Landfill Facilities
- Town Hall

N

1" = 1,250 feet

*Critical Infrastructure data provided by CMRPC, the Town of Shrewsbury and MassGIS

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Shrewsbury, MA
Critical Infrastructure and FEMA Flood Zones

Date: 4/30/2018

-DRAFT-

Attachment D: Discussion Matrices from the Four Discussion Groups

Community Resilience Building Risk Matrix **Group 1** www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
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	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Shrewsbury Electric and Cable Operations (SELCO)	Town-wide	Public	S	Study what contributions SELCO can offer other than power: Cable					Ongoing
Flood Control Structures: Dams	Specific	Public	S						
Roadway Network - Evacuation	Town-wide		V						
Lack of Flood Control	Specific		V	**Feasibility Study of Pump Stations within Flood Zones/Subdivision Rules/regs., Zoning Bylaw, Low Impact Development**		**Feasibility Study of Pump Stations within Flood Zones/Subdivision Rules/regs., Zoning Bylaw, Low Impact Development**			
Electric Substations			S						
Backup Generators	Town-wide		V/S	Feasibility Study				H	S
Water Supply Aquifer	Specific	Public	S						
One Central Treatment Plant	Specific	Public	V	Strengthen Emergency Management Plan				H	S
Mutual Aid for Town Departments	Town-wide		S	Strengthen Mutual Aid				H	O
Dams Emergency Action Plans (EAPs)	Specific	Public	V	Develop Emergency Action Plans		Develop Emergency Action Plans		H	S

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

Features	Location	Owner	V or S	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time S hort L ong O ngoing
Societal									
Code Red	Town-wide	Public	S	Continue to use/strengthen policy, public education/Feasibility Study (alternate plan) if Code Red is down					
Town Co-op Departments			S	Continue to build/strengthen relationships, organizational assessment					
Emergency Management			S	More frequest team meetings, increase membership					
Strong Civic Engagement			S						
Oak Middle School Shelter	Specific	Public	S						
Additional Shelter Space			V	**Study to look into preparing additional shelter buildings/alternate facilities: plan for pets**					
School Calendar	Town-wide	Public	V				Study facilities and determine needsfor extreme hot/cold temperatures/Look into changing school year dates		
Increased Illness	Town-wide		V	Prevention Education/Sanitizing/Cleaning Supplies at schools					
Family Plan for Emergencies	Town-wide		V						
Senior Population	Town-wide		V	**Study/Plan to check on elderly population/Develop populstion list/mailing from Library and utility bill stuffers**					

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

Features	Location	Owner	V or S	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time Short Long Ongoing
Environmental									
Inland	Town-wide		S	Inland					
Tree Damage/Loss	Town-wide		V	Investigate Enforcement Mechanism for Tree-Clearing Bylaw/SELCO and Highway Dept. maintain program, species identification and replanting plan					
Wetlands Protection	Town-wide		V	Develop Wetlands Protection Bylaw					
Open Space	Town-wide		V	Strengthen Open Space and Recreation Plan by developing a prioritized list for acquisition		Strengthen Open Space and Recreation Plan by developing a prioritized list for acquisition			
Aquifer Capacity	Specific		V	Review Aquifer Protection regs. and strengthen if necessary/Recharge Study for municipal buildings					
Sewer Pump Stations	Town-wide	Public	V	Feasibility Study of Existing Stations					
Beaver Activity	Town-wide		V	Monitor areas prone to beaver activity where flooding occurs		Monitor areas prone to beaver activity where flooding occurs			
Mosquitos/Ticks	Town-wide		V	Public education and Best Management Practices, ie. Spraying					
Flood Storage Area	Specific		V	**Feasibility Study of Pump Stations within Flood Zones/Subdivision rules/regs., Zoning Bylaw, Low Impact Development**		**Feasibility Study of Pump Stations within Flood Zones/Subdivision rules/regs., Zoning Bylaw, Low Impact Development**			
Trucking Terminals/Cmmercial Fleets	Specific		V	Meet with companies, develop emergency evacuation plan					

Community Resilience Building Risk Matrix **Group 2** www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
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	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Flooding of Roads/Access			V				Education on climate trends/Climate Action Plan		
Water System		Public	V						
Clean Water Storage at Facilities			V			Adopt Wetland Bylaw/Stricter buffers			
E/W vs. N/S Traffic Access during emergencies	Maple Avenue/Route 9		V						
Municipal Power: SELCO		Public: SELCO	S	Decentralize power/food					
Long-Term Power Supply		SELCO	V						
Regional Energy Distribution			V	CMRPC to help coordinate regional discussion			Link regionally with surrounding towns		
Emergency Communication Network			S	**Hire Sustainability/Green Infrastructure Coordinator to formalize/coordinate**					
Emergency Education Service			V				Expand community gardens/Farm to School		
Public Facilities (A.C. , etc.)		Public	V				Solar Bylaw: Require solar and other 'green' features for new construction		

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

Features	Location	Owner	V or S	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time Short Long Ongoing
Societal									
Fuel Supply and Temperature Shifts	Town-wide		V			Get a commitment/identify corporate responses/Town needs to figure out gaps people can't fill	Plan for reaching 100% renewable energy and battery storage		
Home Flooding	Quinsigamond Area		V						
Mechanism of Balance: Economic Development/Environment			V						
Public Health: Dialysis water quality and supply	Hospital/Health care Facs.		V						
Critical Customer Notification		Public	S						
Assisted Living/Nursing Homes		Private	V			Need to enforce emergency Action Plans at Assisted Living Facs.			
Storm Ready NWS			S	**Annual Emergency Preparedness Day**			Education on what to include in an emergency kit		
Community Shelters			S	Advertising Plan to Center's TV, website, newsletters, Resource Fair			Signage with information on emergency shelters		
Implementing Operational Procedures			V	Program linking volunteers with vulnerable individuals	Fund and plan 'Table Top' Exercise emergency response training test	CERC Program, SEMA Coalition with MEMA/need better communication	**Hire an emergency response professional in Town/HUB for communications, education and resources**		
Identifying Vulnerable Populations (Elderly)			V	Identify critical care centers and vulnerable populations, medical centers, assisted Living facilities, and those at home					

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

Features	Location	Owner	V or S	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time Short Long Ongoing
Environmental									
Water Supply/APOD	APOD	Public	S	NWS: Post event reports for lessons learned (Texas, Puerto Rico)					
Deforestation	Pump Stations		V		Better enforcement of clear cutting Bylaw	Study options for compensating for development impacts			
Vulnerable Environments: Wetlands		Public	V				**Explore ways to partner with region on water and forest (regional grant opportunities)**		
Storm Type: Rain, Snow, Ice			V	Storm and Recovery Plan		**Develop Plan for Category 4 hurricane event**			
Clear-cutting Bylaw		Public	S						
Conservation Commission		Public	S			Revamp Erosion and Sediment Control Bylaws			
Erosion from Storms/stabilization			V						
Parks and Open Space	Town-wide	Public	V/S		Allow Cluster-by-Right, Conservation Subdivision by Special Permit				
Private Lawns manicured			V		Public Education on green lawn care				
Recreational Space		Public	V						

Community Resilience Building Risk Matrix **Group 3** www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
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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	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time S hort L ong O ngoing
Infrastructural									
Sewer Pump Stations	Town-wide		V/S	Capacity/Maintenance		Capacity/Maintenance			
Town Staffing Levels/Equipment			V/S	**Formal Policies for Contracting/Evaluate Staffing levels, Police/Fire (Evaluation of Need, Radio Communication)**					
Electric Infrastructure/Solar Power			V/S	Weakness of Broad Band					
Broadband	Town-wide								
Dams	Town-wide	Public/Private	V	Control/Operation, Coordination/Process, Technology, Water flow/quality		Control/Operation, Coordination/Process, Technology, Water flow/quality			
Water Supply				Evaluate efficiency of water supply					
Road Infrastructure/Culverts	Route 9/State Roads			**Transporting/Access Out, MassDOT Routes, Culverts**		**Transporting/Access Out, MassDOT Routes, Culverts**			
Lake Infrastructure				Flooding Issues (Green Infrastructure)		Flooding Issues (Green Infrastructure)			
Town Buildings	Town-wide	Public	S	Response to Hazards					
Gas/Fuels Lines			V/S						

Community Resilience Building Risk Matrix **Group 3** www.CommunityResilienceBuilding.org

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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	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time Short Long Ongoing
Societal									
Waterfront/Pollution/Upkeep		Public/Private	V						
Increased Cooling Costs							New Technologies/Government Funding/Assistance Programs		
Vulnerable Populations/Warming and Cooling Centers			S	**Adjust School Schedules (based on projected temperature extremes)/Public Education (Registry Sign-Up, Code Red Language Barrier, Effective Communications)**					
Storm Protocols		Public/Private	S/V	Pet Care/Staffing Concerns/Storm Predictions					
CERT Team			S						
Public Health Concerns			S/V	Plans/Protocols, Education					
Water Infrastructure (wells and lack of water)		Private							
Food Sources	Town-wide								

Community Resilience Building Risk Matrix **Group 3** www.CommunityResilienceBuilding.org

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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	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time S hort L ong O ngoing
Environmental									
Water Supply (Source, Quality, Quantity)		Public/Private		**Water Conservation/Efficiencies (Low Impact Development regs/bylaw), Alternate Sources, Review Water Supply Protection Plan**					
Water Quality of the Lake	Town-wide	Public/Private	V/ S	Open Space Studies, Green Infrastructure, Education, Worcester side?, Conservation Buffer Zone					
Tree Canopy		Public/Private	V/S	Planting Programs, Funding/Grants					
Open Space			V/S	Zoning, Acquisition, Flood Storage, Regulations		Zoning, Acquisition, Flood Storage, Regulations			
Insect Population			V						
Watershed			V	Maintenance of Catch Basins		Maintenance of Catch Basins			
Air Quality		Public/Private	V						
Changes in Wildlife	Town-wide		V						

Community Resilience Building Risk Matrix **Group 4** www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
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	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time S hort L ong O ngoing
Infrastructural									
Water Supply (Contamination, Quality)	NW Region	Public	V/S	**Well and Pump Stations with Backup Power**					
Backup Power (SELCO)		Public	V/S	**Backup fuel/uninterruptable power source**				H	
Worcester Water Interconnection	Route 20	Public	S	Maintain Infrastructure and Maintain Infrastructure regularly				M	O
Undersized Drainage	Oak/Lake St., Fruit/Maple St., Route 9	Public (State)	V	Make sure State Planners are aware of flooding issues on next infrastructure upgrade		Make sure State Planners are aware of flooding issues on next infrastructure upgrade		L	O
Capacity of Evacuation Routes	N/S (Route 140 one lane, E/W (Route 20 2-4 lanes)	Public (Town), Public (State)	V	**Regional Planning**		**Regional Planning**		H	S
Dams	Town-wide	Public/Private	V/S	Coordination of non-town owned dams for maintenance		Coordination of non-town owned dams for maintenance		L/M	O
Sewer Pump Stations (Generator Capacity)	Town-wide	Public	V					H	
Bridges	Town-wide		S						
Municipal Fuel Depot with Backup Power	South St.	Public	S						
SW Basin Maintenance	Town-wide	Public/Private	V					L	L

Community Resilience Building Risk Matrix **Group 4** www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
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	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time S Short L Long O Ongoing
Societal									
Urgent Care/Hospitals	Worcester	Private	V/S						
Long-Term Shelter	Senior Center	Public	V/S	**Ensure backup power, add schools as additional shelters**				H	O
LAPL Quaterly Meetings	Town-wide	Public	S						
Triage Facility	Fire Dept., USPS, School	Public	S						
Effective Communications for Emergencies (Language Barrier)			V	**Add a Town-wide siren, review of emergency alert procedures for community, prioritizing languages for translation**				H	O
Vulnerable Populations			S						
Code Red		Public	V/S	Prioritize where it should be used					
PHEP/HMCC Worcester Regional Medical Reserve Corps.			S						

Community Resilience Building Risk Matrix **Group 4** www.CommunityResilienceBuilding.org

Location = Mark on the map, note on matrix Multiple, Specific or Town-Wide
V = Vulnerability **S** = Strength
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	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Priority H - M - L	Time S hort L ong O ngoing
Environmental									
Beavers	Town-wide		V	Beaver deceivers (identify location for use), education to the community				M	O
Algae Blooms/Water Quality Issues			V/S	Maintenance, Education on proper fertilizing				M	O
Insects/Virsuses (West Nile Virus, EEE, ZIKA, Lyme)		Public/Private	V/S	Maintain stormwater basins (CMRPC strength)				M	O
Invasives (Poison Ivy)			V					M	)
Water Supply Demand/Sewer Intake (WWTP Capacity)			V	Regionalization of sewer system/capacity					
Septics									
Lake Quinsigamond Assoc. Bloom Watch			S						
Animal Health									

Attachment E: Master Matrix of High Priority Actions Reported out by Each Discussion Group

Community Resilience Building Risk Matrix

Recommended

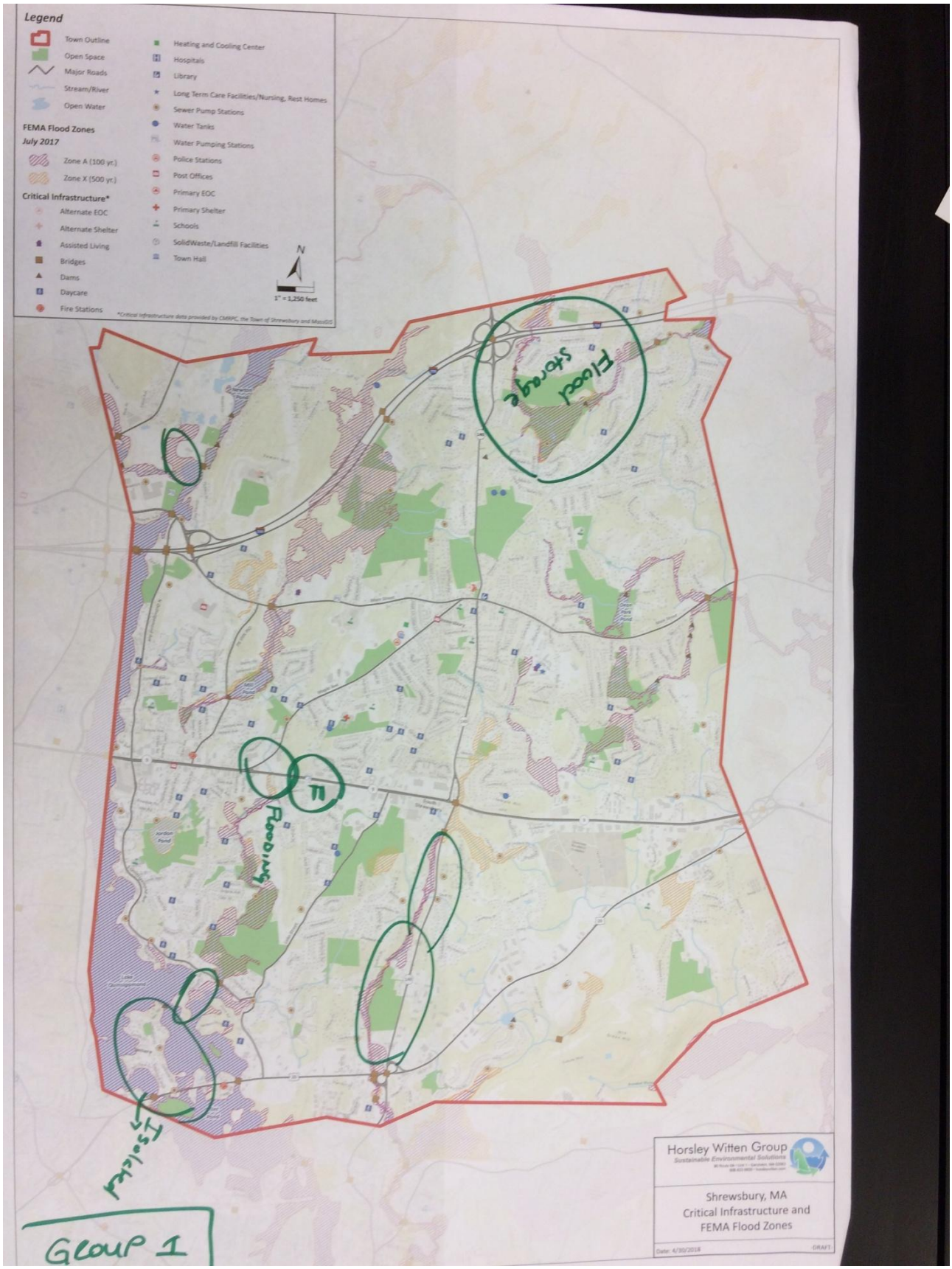
www.CommunityResilienceBuilding.org

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.)

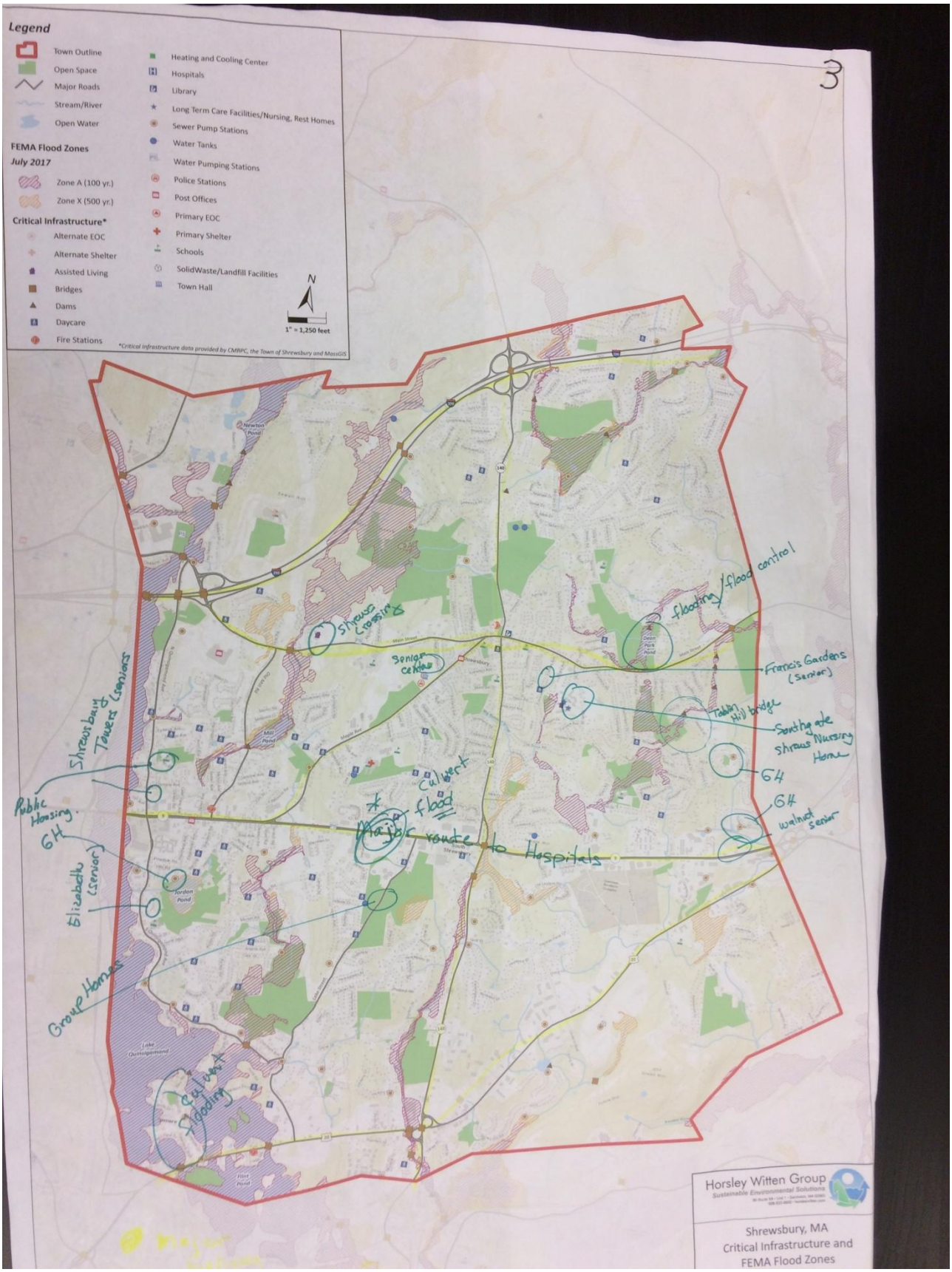
Features	Location	Owner	V or S	Severe Storms	Drought	Flooding/Intense Rain	Increasing/Extreme Temperatures	Group	Priority	Time
								1, 2, 3, or 4	H - M - L	Short Long Ongoing
Infrastructural										
Town Staffing Levels	Town-wide		V	Feasibility Study: population levels appropriate for Town Staff levels.				1	H	
Traffic Management	Town-wide		V	Evacuation Plan Study				1	H	
Emergency Communication Network			S	Hire Sustainability/Green Infrastructure Coordinator to formalize/coordinate				2		
Town Staffing Levels/Equipment			V/S	Formal Policies for Contracting/Evaluate Staffing levels, Police/Fire (Evaluation of Need, Radio Communication)				3		
Road Infrastructure/Culverts	Route 9/State Roads			Transporting/Access Out, MassDOT Routes, Culverts		Transporting/Access Out, MassDOT Routes, Culverts		3		
Backup Power (SELCO)		Public	V/S	Backup fuel/uninterruptable power source				4	H	
Capacity of Evacuation Routes	N/S (Route 140 one lane, E/W (Route 20 2-4 lanes)	Public (Town), Public (State)	V	Regional Planning		Regional Planning		4	H	S
Backup Power (SELCO)		Public	V/S	Backup fuel/uninterruptable power source				4	H	
Societal										
Senior Population	Town-wide		V	Study/Plan to check on elderly population/Develop populstion list/mailing from Library and utility Bill stuffers				1		
Additional Shelter Space			V	Study to look into preparing additional shelter buildings/alternate facilities: plan for pets				1		
Implementing Operational Procedures			V				Hire an emergency response professional in Town/HUB for communications, education and resources	2		
Storm Ready NWS			S	Annual Emergency Preparedness Day				2		
Vulnerable Populations/Warming and Cooling Centers			S	Adjust School Schedules (based on projected temperature extremes)/Public Education (Registry Sign-Up, Code Red Language Barrier, Effective Communications)				3		
Long-Term Shelter	Senior Center	Public	V/S	Ensure backup power, add schools as additional shelters				4	H	O
Effective Communications for Emergencies (Language Barrier)			V	Add a Town-wide siren, review of emergency alert procedures for community, prioritizing languages for translation				4	H	O
Environmental										
Flood Storage Area	Specific		V	Feasibility Study of Pump Stations within Flood Zones/Subdivision rules/regs., Zoning Bylaw, Low Impact Development		Feasibility Study of Pump Stations within Flood Zones/Subdivision rules/regs., Zoning Bylaw, Low Impact Development		1		
Vulnerable Environments: Wetlands		Public	V				Explore ways to partner with region on water and forest (regional grant opportunities)	2		
Storm Type: Rain, Snow, Ice			V			Develop Plan for Category 4 hurricane event		2		
Water Supply (Source, Quality, Quantity)		Public/Private		Water Conservation/Efficiencies (Low Impact Development regs./bylaw), Alternate Sources, Review Water Supply Protection Plan				3		

Attachment F. Annotated Maps from Discussion Groups

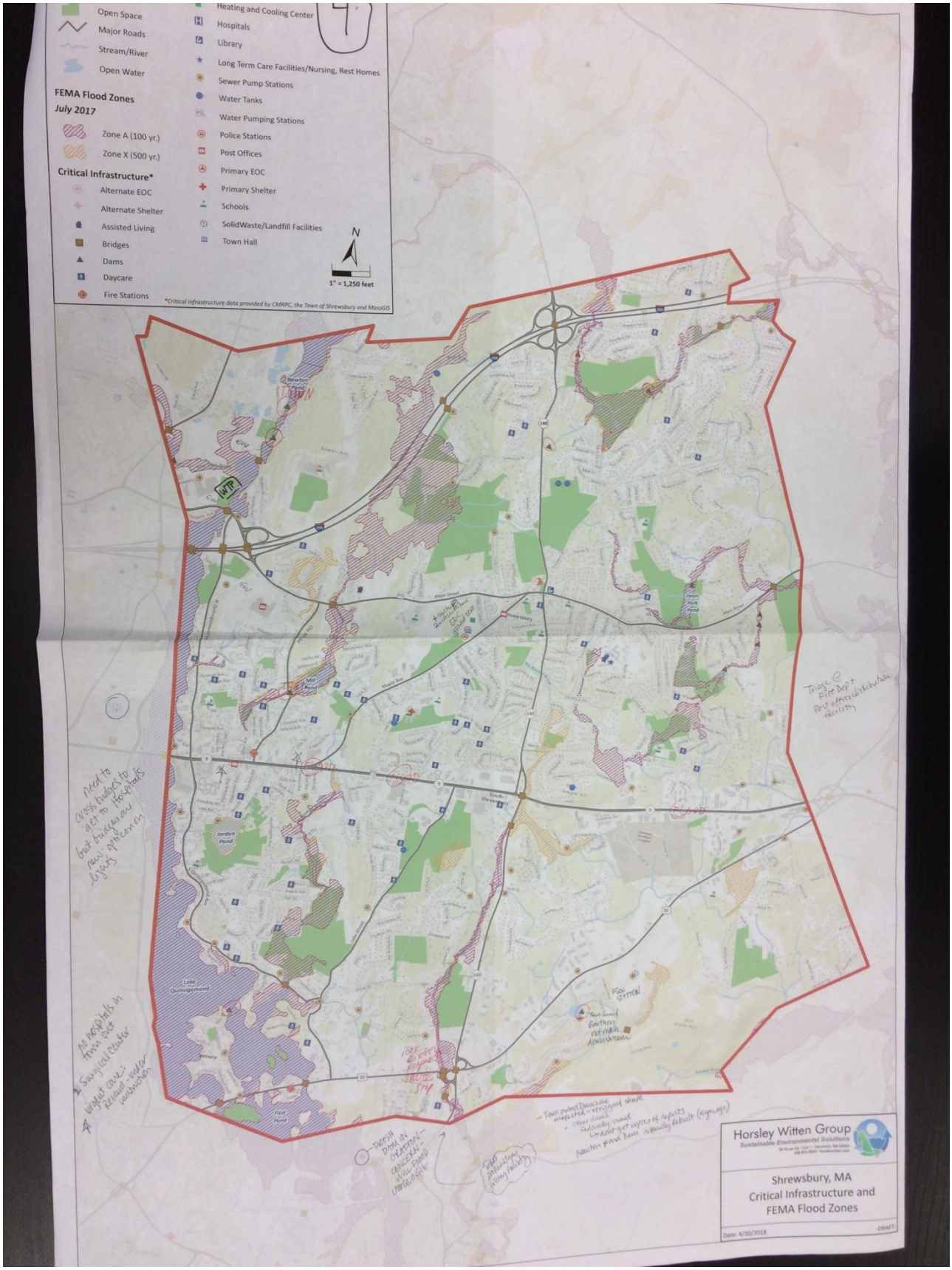


Group 1: Map annotated highlighting vulnerable infrastructure, flood zones, reservoirs, and other community resources.

Group 2: Map annotated highlighting vulnerable infrastructure, flood zones, reservoirs, and other community resources.



Group 3: Map annotated highlighting vulnerable infrastructure, flood zones, reservoirs, and other community resources.



Group 4: Map annotated highlighting vulnerable infrastructure, flood zones, reservoirs, and other community resources.