Town of Sherborn

Community Resilience Building Workshop

Summary of Findings

May, 2018

FUSS & O'NEILL

Project No. 20170390.C10

Town of Sherborn

Community Resilience Building Workshop

Summary of Findings

Overview

Extreme weather and natural and climate-related hazards are an increasing concern for the communities of Massachusetts, and there is a clear need to involve municipalities, corporations, organizations, and the State in increasing resilience at all levels. Recent storm events affecting the region have highlighted many of the vulnerabilities that towns and cities face. Hurricane Irene and Superstorm Sandy brought intense flooding to many municipalities and threatened (or destroyed) infrastructure across the state. Extreme temperatures at both ends of the spectrum have pushed the limits of communities' preparedness to protect both infrastructure and people. In coastal communities, the impacts of sea level rise are felt daily and further exacerbate the impacts of other extreme events. Current climate modeling indicates that all of these hazards are expected to increase in frequency and scale over the coming decades. The Municipal Vulnerability Preparedness (MVP) program provides support and a prescribed process for cities and towns in Massachusetts to plan proactively for resiliency and implement key climate change adaptation actions.

In 2017, the Town of Sherborn was awarded a $15,000 MVP grant to fund the planning stage of this process. The Town partnered with Fuss & O'Neill, a state certified MVP Provider, to complete a comprehensive, baseline climate change and natural hazard vulnerability assessment and develop a list of priority actions for the Town. This process involved the development of an MVP Core Team, which met on February 12, 2018 to determine initial concerns and worked to identify stakeholders within the municipality and set goals for the process. Those stakeholders were then invited to participate in a Community Resilience Building (CRB) workshop on April 10, 2018, engaging in a day-long, tried and tested process developed by The Nature Conservancy. The CRB methodology is an "anywhere at any scale" format that draws on stakeholders' wealth of information and experience to foster dialogue about the strengths and vulnerabilities within the Town. Workshop participants interacted at both large and small group levels, using an iterative process to gather input, synthesize ideas across groups, and ultimately develop a set of priority resilience and adaptation actions.

The CRB workshop's central objectives were to:

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

Top Hazards and Vulnerable Areas

During the Community Resilience Building workshop, participants were asked to identify the top four natural hazards of concern for the Town of Sherborn. Discussion of the top hazards built on earlier conversations that took place at the MVP Core Team Meeting, as well as ongoing Town conversations that have formed the basis for the Town's Hazard Mitigation Plan. Flooding and intensification of precipitation events were identified as one of the Town's top hazards. Storm events and associated wind were identified as a second hazard. Impacts of extended drought, such as those seen during summer 2016 were identified as a third hazard. Finally, heat effects, particularly the increase in extremely hot days (over 90 degrees F) predicted over the next several decades, were seen as a fourth major hazard. These four hazards have already had demonstrated impacts on the Town, and as climate change progresses, these hazards are expected to have ever greater consequences for infrastructure and environment, as well as for various societal elements. Specific areas of concern are identified below.

Top Hazards

- Flooding and Precipitation
- Storm Events/Wind
- Drought
- Extreme Temperatures

Areas of Concern

While many impacts are expected to be felt Town-wide, certain elements, locations, or community groups present particular concerns.

Neighborhoods/Communities
Senior community and Woodhaven housing complex, agricultural community, private well owners

Ecosystems
Indian and Sewall Brooks, Charles River, Broadmoor Forest, Rocky Narrows, Farm Pond watershed, and contributing aquifers and wetland complexes, Barber Reservation, remaining large open space parcels

Infrastructure
Private wells, bridge at North Meadows Road, culverts Town-wide (especially Everett Street, Coolidge Street, and Eliot Street) electrical infrastructure, freight railroad line, municipal campus

Current Concerns and Challenges Presented by Hazards

Major storm events have been a recurring threat to Sherborn throughout its history, from hurricanes bringing wind, intense precipitation, and localized flooding to the inland community, to winter storms delivering ice and snow. Notable historic events include the Hurricane of 1938. More recently, Town officials note that storm intensity is increasing. In a typical winter, Sherborn experiences several severe winter storms. Recently, March 2018 brought major storms and heavy snow and caused power outages to much of the town.

There have been no dam failures recorded in Sherborn, however there is concern that climate change could exacerbate flooding to such an extent over the coming decades that culverts and dams might be adversely affected. Similarly, more intense storms delivering higher volumes of precipitation in a single event are expected to put significant pressure on culverts and other drainage infrastructure that were designed to handle smaller storms with more consistent distributions of precipitation.

While excess water is an obvious problem, too little water is equally concerning. Drought conditions, most recently in 2016, can contribute to increased forest fire risk and decreased water supply in shallow private drinking water wells. Though most of the Town draws water from deeper bedrock wells, shallow wells remain at risk.

Extreme temperatures at both ends of the spectrum pose occasional challenges for Sherborn. Extreme cold has been an issue for the Town several times in recent years. Regional warming shelters were opened during the 'polar vortex' activity of 2014 and 2015. Periods of extreme cold in 2016 and January 2018 brought frozen pipes and other impacts to the Town. At the opposite extreme, heat conditions typically trigger the opening of regional shelters at some point each year.

Meanwhile the town population has increased 25% since 1970, and continues to face pressure to develop further. Many of the issues identified as potential concerns or hazards will be further exacerbated by population growth. At present, some 80% of Sherborn remains undeveloped[1], but conversion to residential use will impact stormwater flows and flooding.

[1] Town of Sherborn Housing Production Plan, 2017.

Specific Categories of Concerns and Challenges

Infrastructural

Culverts and Bridges

Culverts are recognized as a potential concern town-wide. Because Sherborn is surrounded by low-lying wetland areas, flooding can restrict emergency access from outside the town. Workshop participants noted that road crossings at Course Brook at Coolidge Street and Davis Brook at Eliot Street were points of concern, as the culverts may be undersized and cause blockages and restrict flow. Culverts are known by the Community Maintenance and Development department to be undersized in many locations, though no detailed inventory has cataloged the size and condition of culverts town-wide. Regardless of condition, culvert and bridge structures were designed to accommodate historic patterns of precipitation and runoff, which are rapidly transforming as a result of climate change. As precipitation events become more intense and less predictable, undersized culverts are expected to pose a greater threat of failure and flooding.

Beavers

Concerns about beavers were discussed as an environmental issue, but also, and more critically, as an infrastructure problem. Whereas the town generally has some record of and control over man-made stream crossings or impoundments, beaver activity is often known only anecdotally, if at all, and can cause unpredictable problems during heavy precipitation, when flooding occurs in unexpected locations. The Indian Brook wetland complex is known to be an area particularly influenced by beavers, although there are additional areas of beaver activity throughout the town. Participants expressed that they felt both creative engineering solutions and legislative action might be required to address the impacts of beavers, especially as flooding is expected to worsen with climate change.

Drinking Water Supply

Sherborn's entire resident population depends on private and public drinking water wells, with 99% of wells drilled into bedrock. At this time, this is sufficient groundwater capacity for the town, but participants expressed substantial concern over the need to increase water supply resiliency to ensure adequate supply and manage demand during longer droughts, which are expected to increase as a result of climate change. A primary concern of multiple participants was ensuring the supply of drinking water under expected development patterns and zoning regulations.

Septic Systems

Septic systems in Sherborn are a concern due to increasing flooding and the potential for high groundwater to lead to septic failures and discharges of sanitary waste to the environment, posing a threat to both human health and the environment. Lack of septic capacity has also led to problems in the Town center, with businesses unable to expand due to insufficient wastewater services.

Municipal Campus

At the center of Sherborn, the Town Hall, Police Station, Community Center, and Library are located in close proximity at the intersection of Washington Street and Sanger Street. In particular, the Town Hall, Police Station and Library share water and septic facilities. The campus is located in an area densely populated with private and public wells and septic systems. In the past, sewering or a public water supply have been proposed in this area, but not pursued due to cost concerns. Because the municipal campus is an emergency shelter, the quality and quantity of its drinking water supply is a concern.

Roads

Sherborn's roads are subject to washouts and erosions due to flooded culverts during storm events. Road buckling, potholes, and plow damage are increasingly concerning as climate change brings storm events that often deliver more than one precipitation type (ice, rain, snow) in a single storm, and temperature fluctuations become more rapid and more extreme. Maintaining clear roads for emergency access was of particular concern to workshop participants.

Hazardous Materials Transport

A major freight rail line runs north/south through the Town, passing in close proximity to one fire station, and the pharmacy, as well as several sensitive environmental areas (Charles River and Rocky Narrows). Trains passing through the Town are known to carry a variety of hazardous materials that could pose a significant threat to people or the environment in the event of a spill. It is unknown specifically what the risk could be to this rail line due to climate change, but it is known that both flooding and extreme temperatures can affect the safe operation of trains.

Environmental

Water Conservation

Sherborn has historically been accustomed to ample water supply, so education, outreach, and better conservation practices are needed to address the growing potential for extended drought. This concern applies at all levels of society, from residences, to commercial/institutional facilities, to agricultural practices. Pressure to further develop the town would increase the demand on existing groundwater supplies.

Trees and Forests

Forests provide critical ecosystem services that help buffer the effects of climate change, from sequestering carbon, to increasing groundwater recharge, to modulating local temperature. Street trees are likewise critical for infiltration of rainwater and provision of shade. However, trees and forests are also threatened by climate change. Wind and storms cause blowdowns, drought can contribute to die-off and fire risk, new invasive pests (e.g. Emerald Ash Borer, Asian Longhorned Beetle) are eliminating certain tree species, and others are in decline due to shifting temperature and precipitation regimes that favor more southerly species. In Sherborn, trees and forests face other threats as well, including conversion to higher density residential land use. Workshop participants feel there is a need to review existing bylaws, including those for residential development, to incorporate guidelines that reflect the rural character of the town.

Open Space

Open space provides many of the same resilience benefits and threats described above for forests. Open space is also critical in floodplains for providing a buffer and increased flood storage, near public water supplies to maintain high water quality and promote recharge, and to maintain overall habitat connectivity that will be vital to allowing ecosystems and individual species to adapt to a changing climate. The Charles River basin and its tributaries provide critical flood storage that mitigates downstream flooding. Workshop participants expressed concern that there are a number of large (greater than 20 acre) properties in town that need to be protected from development. Preservation of a corridor near Prospect Street on the Bay Circuit Trail was a specific priority.

Invasive Species

Invasive plants and animals are already a source of concern in Sherborn, as they are throughout the Commonwealth. Forest and upland ecosystems are threatened by a variety of invasive plants, including plants such as oriental bittersweet, multiflora rose, two types of swallowwort, and several non-native

honeysuckles. Riparian and aquatic habitats are severely threatened by common reed, Japanese knotweed, invasive water chestnut, hydrilla, purple loosestrife, and Eurasian milfoil. Critical invasive insect pests already in the area include the Asian Longhorned Beetle and Emerald Ash Borer, both of which have the potential to do serious damage (both environmental and economic) to Massachusetts' forests and trees. These and other species already pose a significant challenge and have serious consequences for ecosystem health and resilience, and these impacts are likely to increase in response to climate change. Warming temperatures will also bring new invasives to the area, and these will have an easier time gaining a foothold if the Town's natural ecosystems are simultaneously weakened due to changes in climatic conditions.

Societal

Pests and Disease Control

Climate change is affecting pests and disease vectors both through changing precipitation conditions and changing temperature conditions. Warmer, wetter conditions lead to increased mosquito populations, while the absence of sufficient periods of cold means that pest populations that would historically have been killed off or reduced are able to survive the winter and emerge in greater numbers the following season. Further, as the Massachusetts climate begins to look more like the climate of the mid-Atlantic and southern states, we are seeing new types of diseases show up in existing pests (e.g. mosquitoes carrying West Nile Virus or Zika and ticks carrying Rocky Mountain Spotted Fever). These changes present a major public and animal health challenge in terms of education, prevention, and treatment.

Transportation and Commuting

Transportation was seen as a major infrastructure vulnerability, where flooding may limit emergency access to the Town via state highways and Town roads. In addition, Sherborn is primarily a bedroom community, with many of its residents commuting into Boston for work. If a storm or flooding event were to cut off access to major roadways, this could leave residents either stranded away from home or unable to get to work, with potentially substantial economic impacts. Ensuring continued access to food and medications during such events was also noted as a concern.

Vulnerable Populations

Workshop participants acknowledged the challenges of identifying and reaching vulnerable individuals, especially those who may no longer have a land-line telephone, or who may not self-identify as vulnerable. Certain populations, especially seniors, are known to be at higher risk during hazard events and may require support beyond emergency notifications. Workshop participants expressed concerns about these populations' ability to obtain food and medical supplies during hazard events, as well as the challenges involved in getting seniors to leave their homes (and sometimes their pets) in order to seek shelter elsewhere. The 55 and over housing at Sherborn Meadows was mentioned as a specific concern, as the complex lacks evacuation plans or robust services to address hazard events. The Town-owned Woodhaven elderly housing facility was mentioned as a concern due to potential loss of water during hazard events. Better understanding what these needs are and how the Town can best prepare to proactively support its entire population are areas that require more exploration.

Agriculture

Although farming is not as central to the community today as it once was, Sherborn still has a variety of agricultural activity, from hobby farms and individual horse-ownership, to larger organic farm operations. Drought, excessive rain, and changing temperatures may affect agriculture and livestock at all scales. For instance, maple sugaring may no longer be economically viable at some point in the future, and some agricultural producers may be forced to consider alternate crops or altogether different sources of income.

Current Strengths and Assets

While the Town recognized a number of vulnerabilities, workshop participants identified key strengths as well. Sherborn's identity as a small-town community is in itself a strength, as it fosters participation, cooperation, and support for and among local residents and businesses. The Town's existing open space and facilities are also strengths that they can continue to build upon.

- Barber Reservation is an important 196-acre town-owned forest reservation that is part of a larger network of conserved land and open space.
- The Town already has a strong base of open space and recreation land to build on for climate resiliency and nature-based solutions.
- The Town has an existing Farm Pond Management Plan which serves to provide guidance and data on the water body and assist in tracking trends in water quality.
- Small-town identity produces high level of communication and cooperation.
- Sherborn has a strong base of volunteers willing to contribute time and effort to the Town.
- Sherborn already has a robust emergency communications system.
- The Town has conducted modeling to evaluate the existing water supply and capacity.
- The Town has an immense amount of accumulated staff knowledge about the Town, its systems, needs, and strengths, all of which is attributable to many accumulated years of dedicated service.

- The existing Community Center is a resource that provides support for one of the Town's potentially vulnerable populations.
- Sherborn's schools, library, and religious institutions are resources that can potentially be used to provide cooling or heating stations or develop emergency shelters in times of need.
- The Town's Council on Aging maintains a list of vulnerable elderly residents to ensure their safety during emergencies
- The Town benefits from the efforts of Eversource which has invested time and money into clearing hazard trees and improving the robustness of the electrical system.

Top Recommendations to Improve Resilience in Sherborn

Participants at the CRB workshop identified a number of recommendations to address vulnerabilities and increase resiliency in three main topic areas: infrastructure, environment, and society. Management of water, both dealing with excesses of water due to flooding, and maintaining sufficient, safe water supply during drought or other hazards, was a key theme that emerged in the small and large group discussions. Likewise, the need to bolster nature-based mitigation solutions by preserving open space, managing for resilient landscapes, and incorporating green infrastructure was an element that came up many times in the context of discussions on all three topic areas.

Highest Priority

- Conduct comprehensive study of water resources, including an Integrated Water Resources Management Plan and a field inventory of culverts and bridges to rank and prioritize projects for increased flooding resiliency and storm-hardening, followed by design and implementation of priority re-sizing or replacement projects. Green infrastructure, Low-Impact Design, and other nature-based solutions will be integrated with hard-infrastructure improvements to establish approaches that will be robust in the face of natural hazards and climate-change scenarios. Known problem areas, such as the Coolidge Street culvert, and beaver impacts to Washington Street, should be areas of focus. Similarly, Bogastow Brook should be considered as a priority groundwater recharge area. Management plan will consider how to address water supply and wastewater issues, particularly in the Town center, and may evaluate options like connecting to the Massachusetts Water Resources Authority supply via Natick. The study should build off of existing data and information already existing in the Town.
- Develop comprehensive plan for beaver management to mitigate unpredictable flooding or impoundment impacts.
- Continue to implement existing forest management plans using existing plans (especially the model at Barber Reservation) as a basis for actions Town-wide. Priority actions include ensuring clear access paths for emergency and fire response. Other important actions are to identify, remove, and replace problem trees, preserve intact forests and street tree cover, provide guidance and resources for gradually moving toward more climate-resilient trees and forest

communities (e.g. species that will tolerate warmer temperatures), and develop guidelines to manage conversion of forest land.

- Review eligibility for MassDOT Municipal Small Bridge Program, with particular focus on Coolidge Street.

- Review and revise Town regulations pertaining to groundwater recharge, open space and well protection in order to determine how the Town can best monitor and regulate high density development, increase resiliency, ensure that regulations accommodate and encourage nature-based solutions, and provide legal authority to enforce protective measures.

Moderate Priority

- Conduct transportation resiliency planning to ensure that access is maintained in and out of town during hazard events, with focuses on 1) facilitating emergency operations, 2) ensuring access to food and medications, and 3) preventing a largely commuter-based population from becoming stranded, either unable to get home or unable to reach their jobs.

- Acquire open space consistent with Town planning priorities, analysis by the Land Acquisition Committee, and Mapping and Prioritizing Parcels for Resilience (MAPPR) priorities. Focus on areas that will create flood resiliency through increasing storage capacity in floodplains and/or infiltration capacity in uplands. Priority should also be given to larger parcels that can provide connectivity between existing conserved parcels to maintain habitat corridors.

- Assess green infrastructure opportunities to develop a list of specific priorities, assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. Focus in particular on maintaining flow in the Charles River watershed.

- Develop comprehensive invasive species management from inventory stage through management planning and implementation to address existing invasive populations that threaten features such as open space or forests, both of which contribute to resiliency, as well as anticipate new invasives that are likely to move into the area as climates shift.

- Analyze hazardous materials risk to develop an understanding of how climate-change induced hazards could potentially increase the risk of accidents or spills involving the major freight railroad line that runs north-south through Town and quantify the potential risks to the Town that could result from accidents involving various classes and types of materials.

- Develop a more robust communications system to inform the public prior to hazard events and disperse updates during hazards. Communications should include issues related to water supply, road closures, evacuation routes, and shelter information.

Lower Priority

- Develop Farm Pond Management Plan to develop a high-yield emergency water supply. Protection of this water supply should involve an aquifer overlay district as well as education and outreach to abutters to protect water quality.

- Develop communications and outreach strategy for vulnerable populations, particularly seniors and the homeless, who may be more vulnerable to climate-induced risks, such as extreme temperatures, may lack appropriate shelter during increasingly intense storms, or that may be unprepared if stranded or cut off from supplies due to flooding or storm events. Ensure COA's list of frail residents is up-to-date. In particular, focus on Sherborn Meadows, a 55+ housing development without an evacuation plan.

- Expand support for community center to build on existing strengths that serve a potentially vulnerable population.

- Conduct strategic planning to support agricultural community in the face of climate change. All of the identified hazards (flooding, drought, extreme temperatures, storm events) have the potential to significantly impact agricultural production, with corresponding threats to livelihoods. Planning should address hazard resiliency.

- Maintain small-town culture that supports communication and cooperation among neighbors and is an asset during hazard events.

- Conduct public education and outreach focused on the impacts of climate change on water quality, as well as preparedness for various hazard events, including drought, temperature extremes, and flooding.

CRB Workshop Participants

All workshop invitees are listed below; attendees are indicated with an asterisk.

Name	Position/Organization
Alycia Goody*	Member/ Energy Committee
Gino Carlucci*	Town Planner/ Planning Board
Elisabeth Cianciola*	Scientist/ Watershed Association
John Higley*	Chairman/ Planning Board
Elissa Landre*	Director of Broadmoor/ Mass Audubon
Ellen Hartnett*	Administrator/ Board of Health
Allary Braitsch*	Administrator/ Conservation Commission
Addie Mae Weiss*	Member/ Planning Board
Mariam Neutra*	Member/ Planning Board
Julie Wood*	Director of Projects/ CRWA
Roger Demler*	Water Commissioner
Juliette Bench	Member/Climate Action Group
Karen Juhl	Director/ Council on Aging
Katherine Sturgis	Elder Housing Committee
Martin Pillsbury	Environmental Planning Director/ MAPC
Rich Thompson	Police Chief
Elizabeth Comcast	Resident
Emma Schnur	MAPC
Grace Shepard	Member/ Planning Board
Jeanne Guthrie	Administrative Assistant/ Selectmen's Office
Alex Dowse	Member/ Conservation Commission
Andrew Keough	Superintendent/ School Dept.
Barbara Brown	Principal at Pine Hill Elementary School
Chris Owen	Member/ planning board
David Williams	Town Administrator
Diane Moores	Assistant Town Administrator
Sean Killeen	Director/ DPW
Will Dunham	Member/ planning Board

* indicates attendees

Citation

Fuss & O'Neill (2018). Community Resilience Building Workshop Summary of Findings. Town of Sherborn, Fuss & O'Neill, Inc. Sherborn, Massachusetts.

CRB Workshop Project Team: Organization, Name, Role

Name	Organization	Role
Gino Carlucci	Town Planner	Project Coordinator/Core Team Member
Allary Braitsch	Conservation Administrator	Core Team Member
Rick Thompson	Police Chief	Core Team Member
Sean Killeen	CMD Director	Core Team Member
Erron Kinney	Fire Chief, EMD	Core Team Member
Mary Monahan	Fuss & O'Neill	MVP Lead Facilitator
Stefan Bengtson	Fuss & O'Neill	Facilitator/Scribe

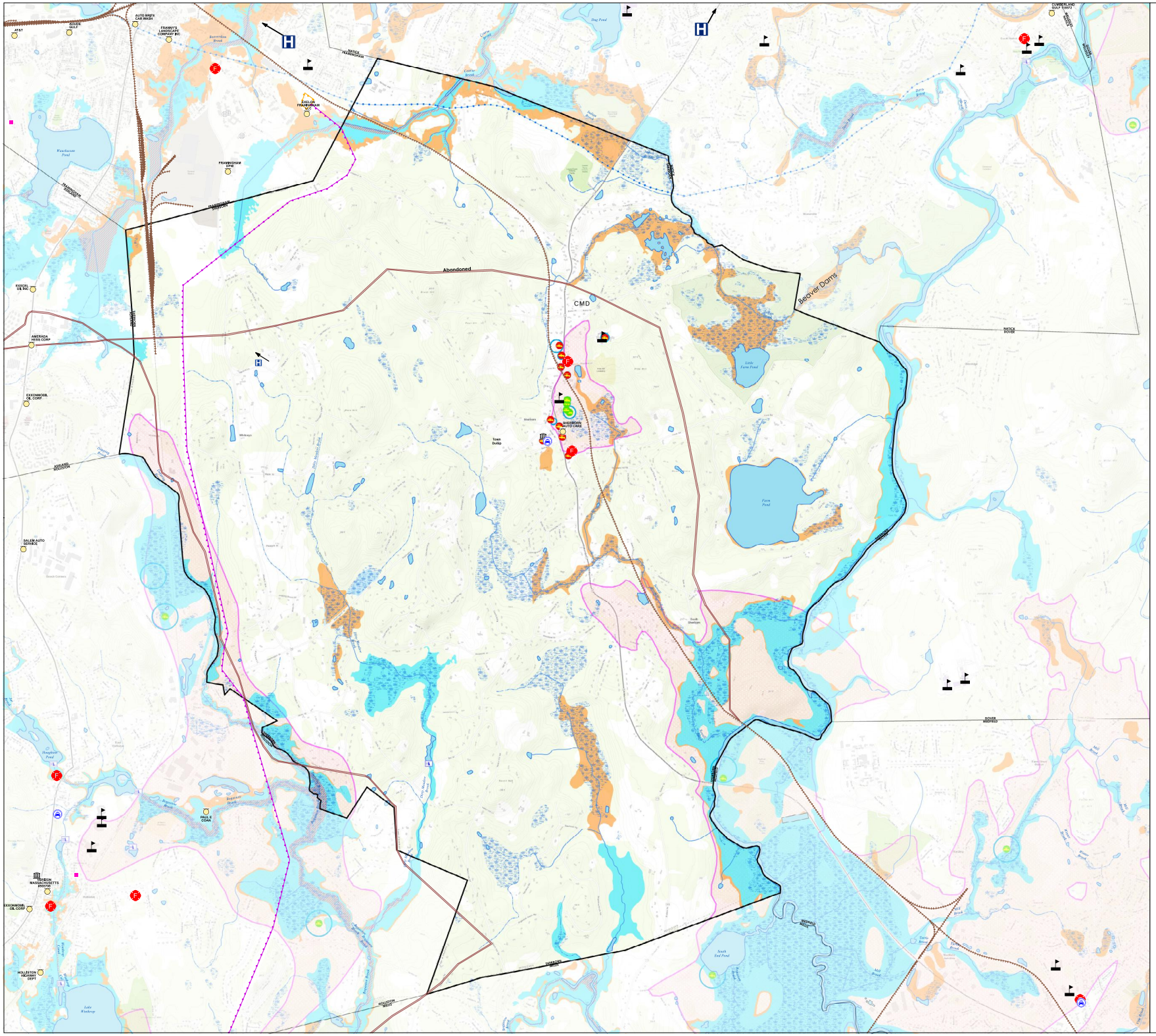
Acknowledgements

Many thanks to the MVP Core Team members, CRB workshop participants. and to Town Planner Gino Carlucci who acted as the local Project Coordinator. Thanks to the Town of Sherborn for providing a meeting space for the Core Team Meeting and refreshments for the CRB Workshop.

Funding for the CRB Workshop was provided through a Massachusetts MVP grant.

Appendix A

CRB Workshop Base Map



SHERBORN, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

- Town Hall
- School
- Police Station
- Fire Station
- Hospital
- Community Groundwater Source
- Non-Community Groundwater Source
- Dams
- Underground Storage Tanks
- Prisons
- Nursing Home
- Pipeline
- Powerline
- Substation
- Railroads - Active Service
- Perennial Stream
- Intermittent Stream
- Shoreline
- Manmade Shoreline
- Aqueduct
- Pond, Lake, Ocean
- Wetland
- Wellhead Protection Zone I
- Wellhead Protection Zone II

Flood Zone Designations

- 1% Annual Chance of Flooding
- Regulatory Floodway
- 0.2% Annual Chance of Flooding

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0 0.25 0.5 1
Miles

Data sources:
MassGIS - Infrastructure, Hydrology, and Administrative Data
ESRI - World Topographic Map - Base Map

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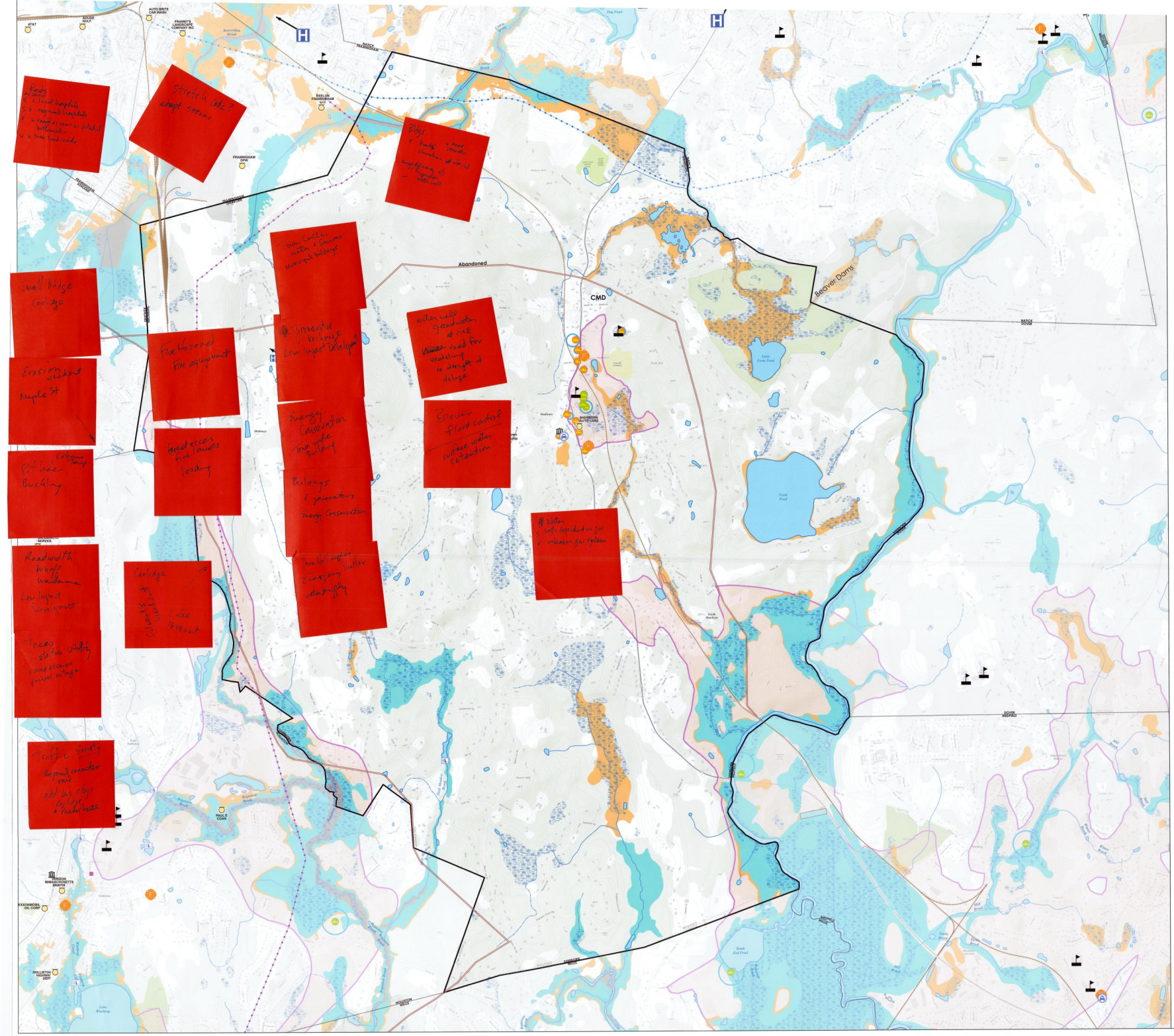
Appendix B

CRB Workshop Outputs:
Participatory Mapping Exercise & Risk Matrices



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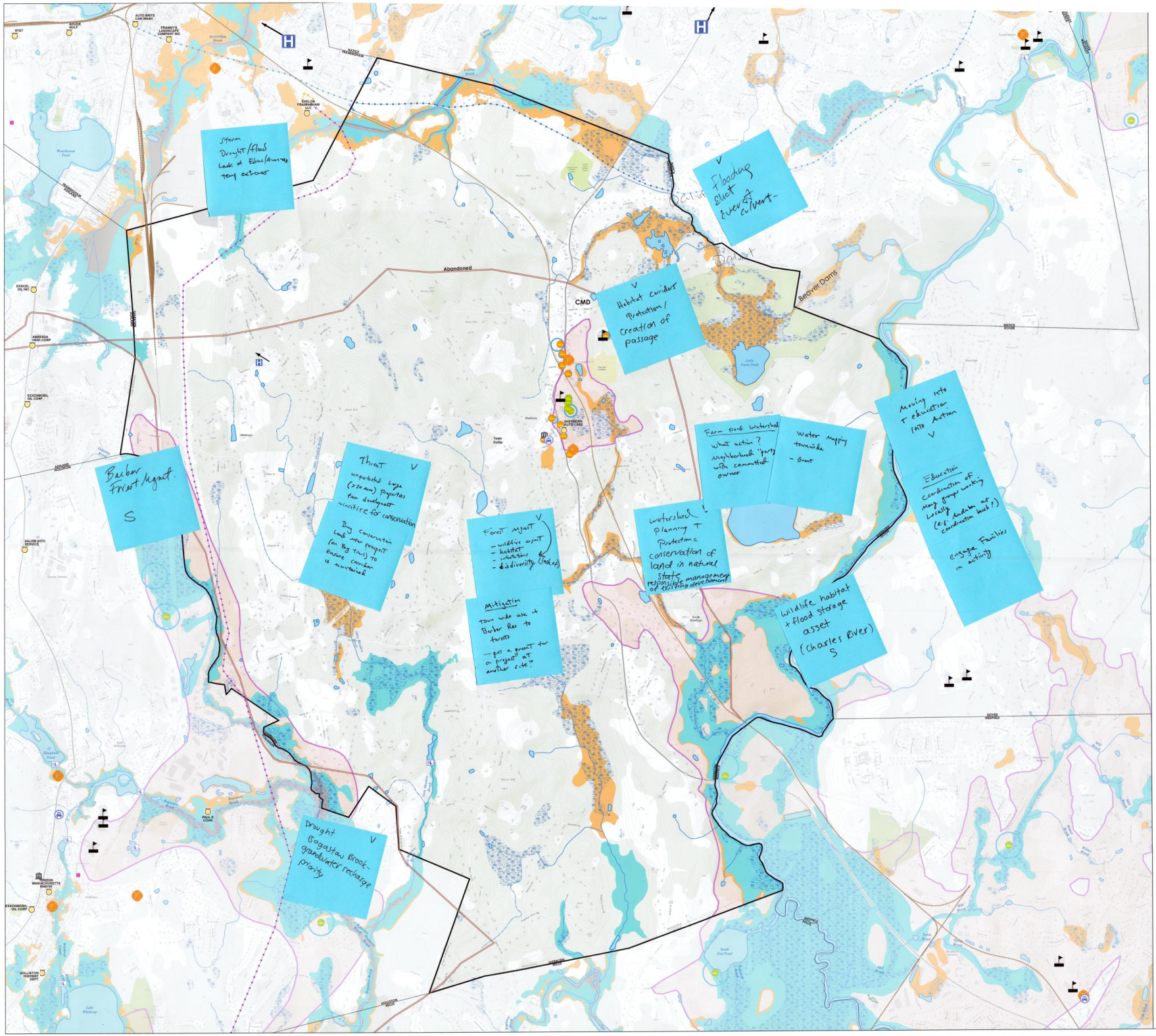
Storm
Drought / flood
Lack of Education/Awareness
Flooding
Elliot
Culvert
Habitat corridor
Protection /
Creation of
passage
Abandoned
CMD
Beaver Dams
Barber
Forest Mgmt.
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Threat
unprotected Large
(>20 Ac) Properties
for development
prioritize for conservation
Buy conservation
land near property
for Big Trail TO
ensure corridor
is maintained
Forest mgmt
- wildfire mgmt
- habitat
- invasives
- biodiversity (Ash)
Mitigation
town wide use of
Burke Res to
forests
- get a grant for
a project at
another site?
Farm Pond Watershed
what action?
neighborhood "party"
with committed
owner
Water mapping
townwide
- Grant
Moving into
Education
Action
V
Education
Coordination of
many groups working
locally (education and
coordination lead?)
Engage Families
in activity
watershed
Planning
Protection=
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land in natural
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of existing development
Wildlife habitat
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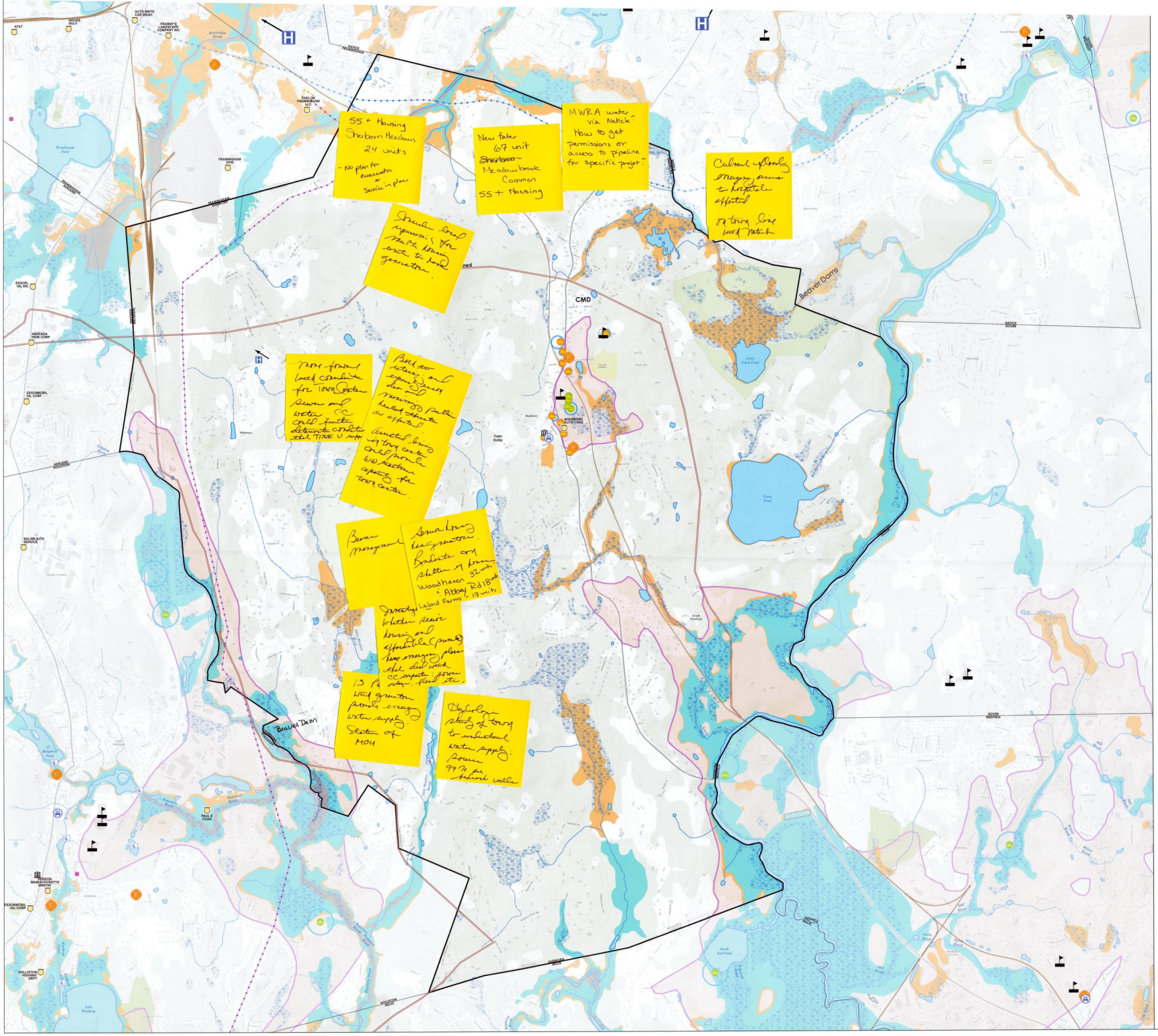

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TOWN OF SHERBORN SETTLED 1674

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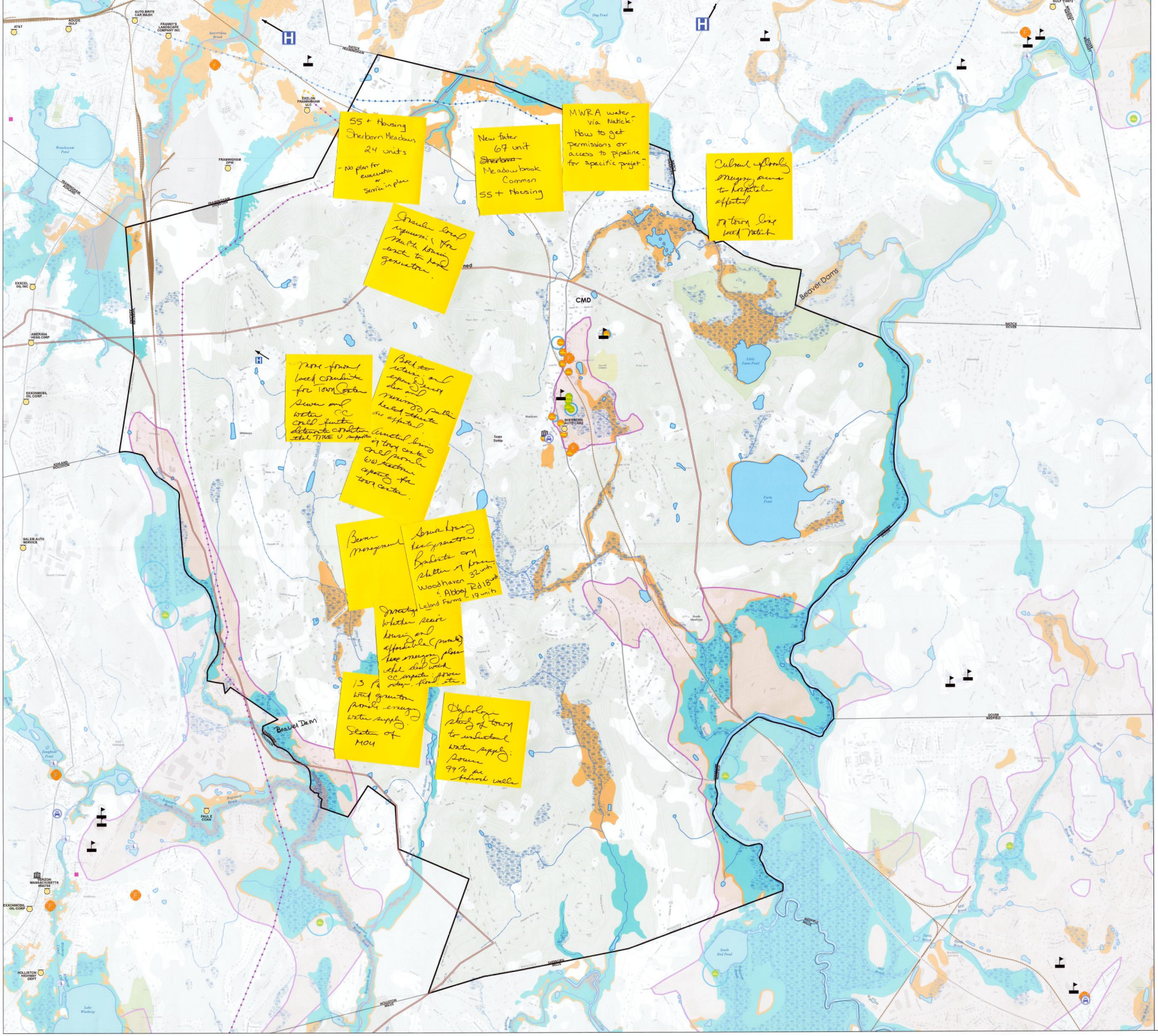

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Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

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

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

Features	Location	Ownership	V or S					Priority H-M-L	Time Short Long Ongoing
Infrastructural									
CONSIDER B for CC impacts CONFIRM PARTICIPATION IN REC									
TMP STUDY									
Strong Volunteer Base			S						
Churches - Emergency Shelters/Services	Town Center	Private	S						
Societal									
Woodhaven/Multifamily	Town Center/edge of Town	Public/Private	V	Loss of water				H	O
Culverts/Roads to Medical/Supplies	Edge of Town	Public	V					H	O
Unknown Water Sources/Quality	All over Town	Public/Private	V	Drought/Rainfall				H	S
Public Water Supply		Public/Private	S						
COA lists of frail	Town wide	Public	S						O
Beavers			V					L	O
Environmental									
Septic Systems	Townwide	Public/Private	V	Groundwater level				M	L

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

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

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

Features	Location	Ownership	V or S	Storms	Drought/ Flooding	Lack of Awareness	Temp. Extremes	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
Societal									
REVIEW BY LAW REVIEW LOCAL AUTHORITY/DEP REGS									
TO ASCERTAIN HOW TOWN CAN MONITORE/REGULATE MULTI-FAMILY HIGHER DENSITY DEVELOPMENT & INCLUDE CONSIDERATION FOR MONITORING WELLS AT 13 PWS FOR	RE: WATER SUPPLY								
PUBLIC ED/OUTREACH — RE WATER	QUALITY							H	
Environmental									
FOREST	TOWN WIDE	PUBLIC + PRIVATE	S+V	(LEVERAGE) APPLY MODEL MANAGEMENT PLAN	MANAGENT PLAN AT BARBER TO	(LACK OF AWARENESS) DEMONSTRATE ACTION	SCHOOLS SFTA Neighbrs	H	S
HIGH YIELD WATER SUPPLY	FARM PD INDIAN BRK	PRIVATE PRIVATE	S+V		AQUIFER OVERLAY DISTRICT →	ABUTTER EDUCATION ←	FARM POND MANAGEMENT PLA	L(→M)	L
HABITAT/WILDLIFE CORRIDORS	VARIABLE TOWN WIDE	PUBLIC PRIVATE	S+V		CREATING PASSAGE AT CULVERTS - EVERETT + RTE. 16 +	ID THREATENED HABITAT CORRIDORS		M	S
CHARLES RIVER + TRIBUTARIES		PUBLIC	S		GREEN INFRASTRUCTURE TO MAINTAIN FLOW			M&L	L
OPEN SPACE-LARGE PARCELS	TOWN WIDE	PUBLIC PRIVATE	S>V	USE LAND ACQUISITION COMMITTEE CREATE A PLAN	ANALYSIS + MAPPR PRIORITES TO PROTECT HIGH PRIORITY PARCELS		PASS CPA	H	S (ONGOING)
GROUND WATER WATER ECONOMY SUPPLIES	TOWN WIDE	PRIVATE	S? V		USE TO DEVELOP RECOMMENDATIONS ← EG. RESIDENCES	WELL-BASED MAPS OF DEEP WATER RESOURCES	←	H	S

IMP / CWMP

Infrastructure
Taxes

Community Resilience Building Risk Matrix

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L priority for action over the Short or Long term (and Ongoing)
ulnerability S = Strength

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

ures	Location	Ownership	V or S	Flooding / Drought	Extreme Weather Events	Wildfire		Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Municipal Buildings	Specific	Town	—	[illegible] w/ww/sw –	town center campus		FIRE AND CEILINGS	H	
Forest Management / ACCESS	Town	Town + Private		Stress to trees Alters the species present	Downed trees	Access/fire lanes Fire load - add'l equipment needs	EQUIPMENT TO MANAGE	emergency [illegible] H	[illegible]
Roads	Town	Town + State		Washouts/Erosion Culvert Flooding	ELEVATION Buckling / Potholes / Plow Damage	COOLIDGE ST WASHINGTON ST – MANAGE	NOTE: REVIEW FOR SMALL BRIDGE ELIGIBILITY	BEAVER H	
Groundwater	Town	Private		Monitoring needed	Sand/Salt Fluctuations unknown			H	
CULVERTS / BRIDGES								H	
Societal									
Traffic									
Environmental									
Regulations – [illegible] / new development pressure			V S						

Appendix C

CRB Workshop Presentation Materials

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Boston Firefighters, January 4, 2018 (Reuters)

Cambridge Reservoir, Lincoln, MA (Boston Globe)

Municipal Vulnerability Protection Program
Community Resilience Building Workshop
Town of Sherborn

April 10, 2018

Fuss & O'Neill Overview

At Fuss & O'Neill, we place great emphasis on collaboration; both within the company and with our clients. We are guided by what is best for the client and the project – in identifying client champions, naming project leaders, building project teams, and providing responsive service and quality deliverables.

We strive to partner with our clients to understand their businesses and to be stewards of their resources as if they were our own, and aim to develop services and solutions that anticipate evolution of their unique business needs.

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MVP Project Team

Mary Monahan

Mary is a municipal public works specialist well-versed in issues related to stormwater management; wastewater collection and treatment; drinking water supply, treatment, and distribution; solid waste management; and sustainable operations. Mary serves as a liaison between the public works project owner and the design team.

Stefan Bengtson

Stefan is an Environmental Scientist in Fuss & O'Neill's Water and Natural Resource Planning Department. His principal areas of expertise include watershed management, water quality monitoring, GIS analysis, and statistical modeling. He has also led field crews in wetland monitoring and ecological research.

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Community Resilience Building Workshop

Agenda

- CRB Team and participant introductions
- Introduction to Massachusetts Municipal Vulnerability Preparedness Program (MVP)
- Introduction to Climate Change and the Town of Sherborn
- Discussion by Sherborn representatives on status of current planning
- Introduction to CRB Workshop process
- Large group
  - Determine top four hazards
- Small work groups (Using Risk Matrix)
  - Identify Sherborn's vulnerabilities and strengths
  - Prioritize response actions
- Lunch
- Large group
  - Report out from small groups
  - Determine overall priority actions for the Town
- Discussion on next steps
- Conclusion

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Sherborn MVP Program - $15,000

- Grant Supports Climate Change Vulnerability Assessments and Resiliency planning
  - Comprehensive Approach
    - o Infrastructure
    - o Society
    - o Environment
  - Scope and Process Use the Guidance in the Community Resilience Building Workshop Guide
  - Municipalities That Complete This Process Will Be Designated Municipal Vulnerability Preparedness (MVP) Municipalities

MVP Designation May Lead to Enhanced Standing in Future Funding Opportunities

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MVP Action Grant NEW

- Grant supports priority actions identified at Community Resilience Building Workshop
- $10,000 - $400,000 available
- Local match of 25% - can be in-kind
- Request for Responses anticipated in a few weeks
- Application deadline projected for mid-May
- Project award early June
- Next funding round anticipated Fall 2018

Only those communities which have completed the CRB workshop are eligible to apply

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Terminology

Climate Change

The Change in Usual Climate Conditions

- Rising Temperature
- Changing Precipitation/ Rainfall Amount and Intensity
- Sea Level Rise

Town of Sherborn – Charles River Basin

Rising Temperature

Charles River Basin	Observed Baseline 1971-2000	Projected Change in 2030s	Projected Change in 2050s	Projected Change in 2070s	Projected Change in 2090s
Average Annual Temperature (°F)	49.38	2.05 to 4.02	2.67 to 6.07	3.23 to 8.79	3.49 to 10.72
Annual Days with Maximum Temperature over 90°F (Days)	8.95	7.08 to 19.58	10.01 to 35.04	12.74 to 56.79	15.17 to 75.87
Annual Days with Minimum Temperature below 0°F (Days)	4.7	-1.23 to -2.57	-1.48 to -3.17	-1.71 to -3.42	-1.76 to -3.59

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Town of Sherborn – Charles River Basin

Changing Precipitation

Charles River Basin	Observed Baseline 1971-2000	Projected Change in 2030s	Projected Change in 2050s	Projected Change in 2070s	Projected Change in 2090s
Total Annual Precipitation (Inches)	46.55	-0.04 to 4.77	0.23 to 6.13	1.24 to 7.47	0.74 to 8.18
Annual Consecutive Dry Days (Days)	16.92	-0.47 to 1.46	-0.65 to 2.35	-1 to 2.97	-0.77 to 2.71

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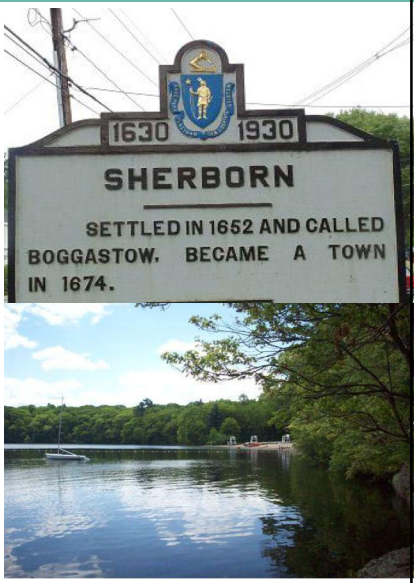
Climate Change Impacts - Temperature

- Economic
  - Winter Recreation
  - Snow and Ice
- Agricultural
  - Longer Growing Season
- Health
  - Increased Pests
  - Heat Stroke
- Infrastructure
  - Road Buckling
  - More Potholes
  - Power Outages
- Environment
  - Change in Habitat



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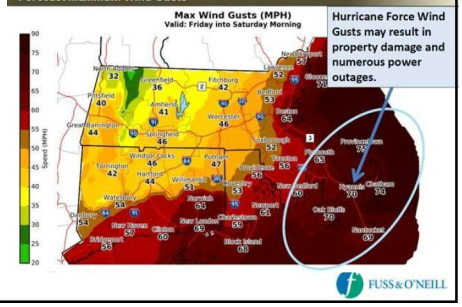
Climate Change Impacts - Precipitation

- Economic
  - Dangerous Floods
  - Lost work time
- Agricultural
  - Excessively Wet Spring
  - Drought
- Health
  - Flood/High Water-related Deaths
  - Emergency Response Delays
- Infrastructure
  - Road Washout
  - Environment
  - Sewer System Overflows
  - Compromised Bridges
- Changes in Habitat



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Stakeholder Updates

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MVP Program

- Identify Top Four Hazards
  - Review MVP Sectors
  - Maps as tool
  - List infrastructure, societal, environmental feature
  - Determine whether a vulnerability or strength
  - Identify actions to reduce vulnerability or reinforce strength
  - Prioritize actions
  - Report Out
- Finalize Prioritization Plan

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Climate Change Hazards

- Flooding
- Extreme Precipitation Events
- Heat Waves
- Drought
- Snow/Ice
- Wildfire
- Tornadoes
- Hurricanes
- Nor'easters
- Other

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MVP Sectors

- Infrastructure
  - Evacuation routes
  - Schools
  - Roads, bridges, dams
  - Water and wastewater
  - Septic systems
  - Hospitals
  - Commercial Buildings, churches
  - Utilities: electric, gas
  - Factories
  - Emergency management facilities

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MVP Sectors

- Societal
  - Emergency shelters
  - Senior housing
  - Schools and campuses
  - Economically challenged populations
  - Evacuation plans
  - Animal shelters
  - Hospitals, pharmacies
  - Grocery stores
  - Utilities: electric, gas
  - Homeless
  - Other

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MVP Sectors

- Environmental
  - Drinking water supply
  - Rivers and streams
  - Parklands
  - Agriculture
  - Title V systems
  - Stormwater management
  - Open spaces
  - Flood plains
  - Forest
  - Other

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Community Resilience Building Workshop

Next Steps:

Public Review of Priorities
Monitor and Update
Annual Review

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Questions?