Town of Swansea

Community Resilience Building Workshop

Summary of Findings

May, 2018

FUSS & O'NEILL

Project No. 20170390.E10

Town of Swansea

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 Swansea was awarded a $16,000 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 March 15, 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 May 1, 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 Swansea;
- 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 Swansea. 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 Planning. The impacts of coastal storms were identified as one of the Town's top hazards. Nor'easters were identified as a second, distinct threat, as the two types of storms bring somewhat different patterns of impacts. The impacts of extremely hot days (over 90 degrees F) and/or extended drought were identified as a third hazard. Finally, as a coastal community, sea level rise was identified 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

- Coastal Storms
- Nor'easters
- Heat and Drought
- Sea Level Rise

Areas of Concern

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

Neighborhoods/Communities
Densely populated coastal neighborhoods along the south end of Town, area around Cove Street, Smoke Rise neighborhood, the Grove

Ecosystems
Beaches, shellfish beds

Infrastructure
Water supply wells, water tanks, desalination plant, Pearse Road, Rt 6 and Rt 44 culverts, Old Providence Road bridge, Marvel Street Culvert, Hortonville Road culvert, Hailes Hill Road culvert, Milford Dam, and dams on Child Street, Schoolhouse Road, and Reed Street

Facilities
Fire Station #3

Current Concerns and Challenges Presented by Hazards

Major storm events and related flooding have been a recurring threat to Swansea throughout its history. Notable historic events include impacts from the Great Hurricane of 1938 and the 1954 hurricane. During the latter, houses behind the sea wall in the southern end of town and along Cove Street were actually floating through the neighborhood. Despite these dramatic impacts, some worry that these catastrophic-level events have largely faded from memory, prompting questions as to whether the Town's residents have forgotten the extent of devastation that is possible from a direct hurricane hit.

In much more recent memory, the Town experienced extensive rain and flooding impacts during March 2010. In the words of the Chief of Police, "It rained all month; streams no one knew about were overflowing." Schools were closed and road flooding cut off access for police and emergency response across much of the community. The police department even lost a patrol car to flood waters and has since had to purchase government surplus Humvees for response in these kind of conditions. Swansea's conservation agent noted that everyone in town was impacted by the 2010 storm. A bridge on Wood Street was compromised during the flooding and remained closed for two years before it was rebuilt and reopened. Homes were stranded, and residents lost furnaces and water heaters to the floodwaters.

Since that point in 2010, there has continued to be an uptick in major wind, rain, and snow events. There were four Nor'easters in the past winter alone. Water builds up along Pearse Road, one of only two roads providing access to a group of close to 400 homes. A small Nor'easter in 2017 damaged three or four seawalls. Two of the Town's three 150 foot tall communication towers, which are rated for 150mph winds, have already been damaged by wind and microburst activity. Tree falls cause numerous road closures which limit emergency access.

The evidence of sea level rise is clear in Swansea as well. The Town boat ramp is regularly underwater about five times per year due to "normal" tide fluctuations, despite having been designed above sea level. This "sunny day flooding" driven by tides is an increasing concern at a number of sites in Swansea.

While excess water is an obvious problem in Swansea, too little water is equally concerning. Wells ran dry in the Town in the 1990's and 2000's. Since then, the desalination plant has been installed, but even it is vulnerable to drought because of operating range constraints. The extended drought during summer 2016 raised the salinity of the Palmer River to 3300mg/liter. At these salinity levels, the desalination plant could not remove sufficient salt to create potable water because the salt levels of the plant's discharge waters would have exceeded permitted discharge salinities. The superintendent of the Swansea water district is attempting to address this problem through permit modifications, but this occurrence emphasized for the Town the need to ensure the resiliency of the public water supply to ensure adequate access during longer droughts.

Specific Categories of Concerns and Challenges

Infrastructural

Culverts and Bridges

Culverts and bridges are recognized as a potential concern town-wide. Workshop participants noted, in particular, that the Miles Bridge on Old Providence Road, Marvel Street Culvert, Route 6 and Route 44 culverts, Stephen-French Road culvert, Hortonville Road culvert and Hailes Hill Road culverts were all structures of concern. No detailed inventory has cataloged the size and condition of culverts and bridges town-wide. Workshop participants noted that significant culvert infrastructure in Swansea (particularly on Route 6 and Route 44) dates to the WPA-era, and, regardless of condition, culvert and bridge structures of this age 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.

Drinking Water Supply

Swansea has a desalination plant that was built to establish a more secure water supply for the Town after wells ran dry in the 1990's and 2000's. However, the desalination plant is vulnerable to extended drought, as drought raises the salinity of intake water to the point that the plant cannot remove sufficient salt to generate potable water while still staying within the permitted salinity concentrations for its discharge. The intake of the desalination plant is also vulnerable to contamination. The intake is located in the vicinity of Miles Bridge on Old Providence Road which has known flooding problems; flooding on the bridge causes hydroplaning and increases the risk of accidents that could result in a spill or other contamination event.

Roads

Road flooding is a problem in Swansea, with workshop participants making particular note of problems on Pearse Road and Old Providence Road. One of the Swansea Police Lieutenants who was at the workshop described the dangerous scenario that has occurred in which vehicles suddenly encounter a wall of water on a major road in the dark while driving at 50mph. As noted above, the police department also lost a cruiser in flood waters.

Dams

The most notable dam of concern in Swansea is the Warren Reservoir Dam, which is currently operated by the Bristol County Water Authority as part of the Providence water supply. However, there are plans to abandon the reservoir, which would mean that water levels would no longer be controlled and the earthen dam would not be maintained. This poses a down-stream flooding risk for a number of neighborhoods in Swansea. Additional dams that were brought up as potential concerns include: the Milford Dam, and dams on Child Street, Schoolhouse Road, and Reed Street. Workshop participants also noted that numerous sea walls have been damaged by recent storms.

Environmental

Beaches

Beaches in Swansea are rapidly eroding, with hundreds of yards already lost. Beaches are also affected by closures due to high bacteria levels after heavy rains. Failing septic systems are a major contributor to the bacteria problem, particularly on the southern end of Town.

Shellfish Beds

Shellfishing beds in Swansea were recently reopened after being shut down for approximately 25 years. However flooding and heavy rains still result in frequent shut downs, as septic systems overwhelmed by heavy precipitation release high levels of bacteria, necessitating shellfishing closures to protect human health.

Sewage Non-compliance

The Town does not have public sewers but relies instead on private septic systems. As noted above, much of this septic infrastructure is non-compliant and failing, which results in risks to environment and public health, particularly when systems are overwhelmed by excessive precipitation or flood waters.

Societal

Vulnerable Neighborhoods

There are a number of neighborhoods in Swansea that are at risk from flooding, including the southern end, the Grove, Touisset, and Bushee Road areas. Smoke Rise is a neighborhood with approximately 500 homes that suffers from septic problems on poor soils. The Town also has a number of repetitive loss properties, and very few houses are flood resilient.

Council on Aging Facility

The Council on Aging Facility on Ocean Grove Avenue is a valuable resource and can serve as a rallying point in the Grove area as well as a location to disseminate information to potentially vulnerable elderly populations. However, the facility is also prone to flooding, which limits its functionality during hazard events.

Stress on Emergency Services

Swansea's Fire and Police departments bear much of the burden of responding to the increased human threats that result from climate-induced hazards. This responsibility is complicated by flooding and other impacts which restrict emergency access to various parts of Town.

Current Strengths and Assets

While the Town recognized a number of vulnerabilities, workshop participants identified key strengths as well. Swansea updated its Hazard Mitigation Plan in 2016 and has a new Police facility and independent communications infrastructure to form the base for emergency operations. The Town has also made some key repairs and has valuable protected open space.

- The Town updated its hazard mitigation plan in 2016.
- The Town utilizes the RAVE emergency communications system to reach all subscribed users with vital information.
- The Town has three independent communications towers, one at Sharps Lot Road, one at the Police Station, and one at the Fire Station headquarters. These towers free Swansea from reliance on Comcast or Verizon and help ensure uninterrupted emergency communications capacity.
- Swansea has key open space properties, including nearly 60 acres of land trust-owned property on the west side of Town near Warren River Pond, and approximately 45 acres of Town-owned land in the wetland area in the northernmost portion of Town.
- The Town benefits from strong support for Public Safety, as well as a new Police Station facility.
- The Town's desalination plant, while vulnerable, is also an important strength for the water supply system.

- In 2016, the Town utilized a $459,000 state grant to complete replacement of the Swansea Dam.

- The Town benefits from the availability of buses and drivers in Town that can be used for transportation in the case of a hazard event.

- The Town has purchased specialized vehicles and equipment for use in flood conditions or other situations where standard equipment is insufficient to provide emergency services.

Top Recommendations to Improve Resilience in Swansea

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, primarily dealing with excesses of water due to flooding, was a primary concern that emerged in both the small and large group discussions, as was maintaining sufficient, safe water supply during drought or other hazards. A second theme centered around providing emergency services to the Town's residents during hazard events, with particular attention to vulnerable neighborhoods that might be cut off or experience catastrophic flooding.

Highest Priority

- Perform a vulnerability assessment of the desalination plant and pump stations/intake, focusing on flooding on Old Providence Road and at the Miles Bridge and the potential threats to the desalination intake that would be associated with accidents at that location. Assessment should include risks such as spills from petroleum tankers, which are a real concern given traffic along that route and an established history of hydroplaning conditions. Consider the feasibility of raising the road, as well as additional climate change threats and options to protect the pump station, including planning for how to proceed during times of drought.

- Conduct field inventory of culverts, dams, 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 should be areas of focus, including: Pearse Road, Rt 6 and Rt 44 culverts, Old Providence Road bridge, Marvel Street Culvert, Hortonville Road culvert, Hailes Hill Road culvert, Warren Reservoir Dam, and Milford Dam.

- Assess options for improving 'sunny day flooding' conditions, particularly along Pearse Road. Examine the feasibility of raising or otherwise protecting the roadway and conduct a full vulnerability assessment.

- Develop and implement solutions to alleviate flooding at the Town boat ramp. Consider the possibility of channel dredging, as well as raising the parking lot and ramp to prevent regular inundation of the boat ramp that is currently occurring.

- Establish the Council on Aging facility as a rallying point where information can be disseminated and people can gather to access services during or in preparation of hazard events.

- Post and mark evacuation routes to clarify for residents where they are expected to go in case of a hurricane or other major storm event that requires evacuation of the Town.

- Establish a comprehensive emergency awareness plan, incorporating a robust education and outreach strategy to build awareness of town resources and make Town residents aware of the many planning efforts, agreements, shelters, etc. which are focused on making the Town more resilient to climate change impacts. Ensure that all residents know how to access these resources when they are needed. Focus special attention on vulnerable neighborhoods.

- Develop a plan to protect shellfishing areas from discharges of bacteria. Explore the feasibility of alternate wastewater handling that would alleviate pressure on the shellfishing beds from septic discharges. As one option, explore moving forward with the Towns of Somerset and/or Warren to accept wastewater flows from Swansea. Develop improved stormwater runoff management, including looking for opportunities to install new BMPs and green infrastructure. Conduct thorough watershed planning to assess pollutant loads and identify problem areas.

- Review and revise zoning regulations to ensure protection against inappropriate land uses and establish siting guidelines. The defunct Hess gas station is an example where tanks have now been removed, but past leaks allowed for contamination of the site; legislative action could prevent development of another gas station on the site, as well as establish siting guidelines that would consider likely climate hazards when determining safe siting for development with potential detriment to the environment.

Moderate Priority

- Develop dam operation plans for dams at Child Street, Schoolhouse Road, and Reed Street, and remain engaged in discussions about the abandonment of Warren Reservoir Dam. Consider the impacts to the Town if Rhode Island decides to remove the dam, and consider pursuing control of the dam via purchase or a memorandum of understanding to ensure that the dam is maintained in a safe condition.

- Educate owners of private septic systems about the importance of having systems pumped out and keeping them in good working condition in order to prevent risks to public health and the environment from systems that become overwhelmed during periods of heavy precipitation.

Lower Priority

- Consider relocating Fire Station #3 to protect valuable equipment and records from flooding and eliminate the risk that first responders will be unable to use this station's resources effectively during a hazard event or other emergency.

- Upgrade and expand the RAVE communication system to allow the system to access all cell phones within geographic range, rather than only those that are subscribed for notifications.

- Study the possibility of expanding the public water supply to establish a back-up in case the Town wells are inundated and the desalination plant is unable to operate.

CRB Workshop Participants

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

Name	Position/Organization
Carol Hyland*	Waterfront Revitalization
Chris Sampson	Waterfront Revitalization
Colleen Brown*	Conservation Agent
Steve Antinelli*	Town Planner
John McAuliffe	Town Administrator
Jordan Remy	Administrative Assistant/ Selectmen's Office
Eric S Hajder*	Chief/ Fire Department
Joseph Carvalho	Chairman/Board of Health
John Robidoux	Superintendent/ Swansea Public Schools
Bill Napolitano*	Environmental Program Director/ SRPEDD
Dave Janik*	South Coastal Regional Coordinator, Coastal Zone Management
Christopher Carreiro	Clerk/ Selectmen's Office
Steven Kitchin	Vice-Chairman/ Selectmen's Office
Derek Heim	Chairman/ Selectmen's Office
Marc Haslan*	Lieutenant, Swansea Police Department
Shane Mello*	Patrolmen, Harbor Master, Shellfish Warden Swansea Police Department
Joseph Martin*	Lieutenant, Swansea Police Department
George Arruda	Chief of Police
Jeff Sutherland*	Superintendent, Swansea Water District
Carl Sawejko*	Swansea Emergency Management Coordinator

Citation

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

CRB Workshop Project Team: Organization, Name, Role

Name	Organization	Role
Colleen Brown	Conservation Agent	Project Coordinator/Core Team Member
Eric S Hajder	Chief/ Fire Department	Core Team Member
Jeff Sutherland	Superintendent, Swansea Water District	Core Team Member
Steve Antinelli	Town Planner	Core Team Member
George Arruda	Chief of Police	Core Team Member
Bill Napolitano	Environmental Program Director/ SRPEDD	Core Team Member
Gregory Ryan	Lieutenant, Swansea Police Department	Core Team Member
Mary Monahan	Fuss & O'Neill	MVP Lead Facilitator
Julianne Busa	Fuss & O'Neill	Facilitator/Scribe
Shawn Martin	Fuss & O'Neill	Facilitator
Tom Collins	MTC OPS, LLC	Facilitator

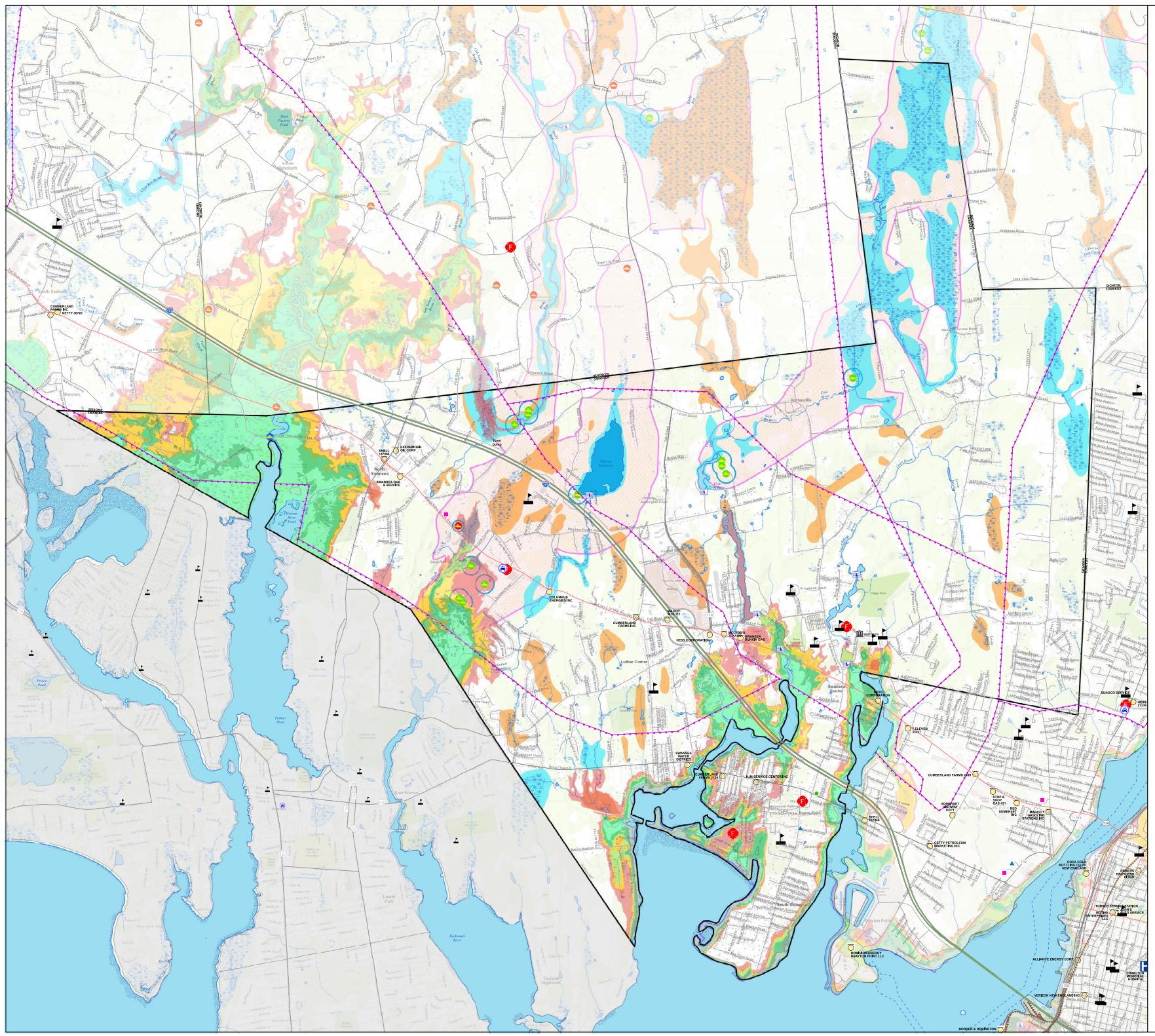
Acknowledgements

Many thanks to the MVP Core Team members, CRB workshop participants, and to Colleen Brown who acted as the local Project Coordinator. Thanks to the Town of Swansea and the Swansea Schools for providing a meeting space for the Core Team Meeting, and to the Swansea Police Department for providing a meeting space for the CRB.

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

Appendix A

CRB Workshop Base Map



SWANSEA, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

- Town Hall
- School
- Police Station
- Fire Station
- Hospital
- Community Groundwater Source
- Surface Water Intake
- Non-Community Groundwater Source
- Dams
- Underground Storage Tanks
- Assisted Living Facility
- Nursing Home
- Rest Home
- Powerline
- Railroads - Active Service

Worst-case Hurricane Surge Inundation Zones

- Category 1
- Category 2
- Category 3
- Category 4
- Perennial Stream
- Intermittent Stream
- Shoreline
- Ditch/Canal
- Channel in Water
- Pond, Lake, Ocean
- Reservoir
- Wetland
- Salt Wetland
- Tidal Flat
- Inundated Area
- Wellhead Protection Zone I
- Wellhead Protection Zone II

Flood Zone Designations

- 1% Annual Chance of Flooding
- Regulatory Floodway
- VE: High Risk Coastal Area
- 0.2% Annual Chance of Flooding

N
W E
S

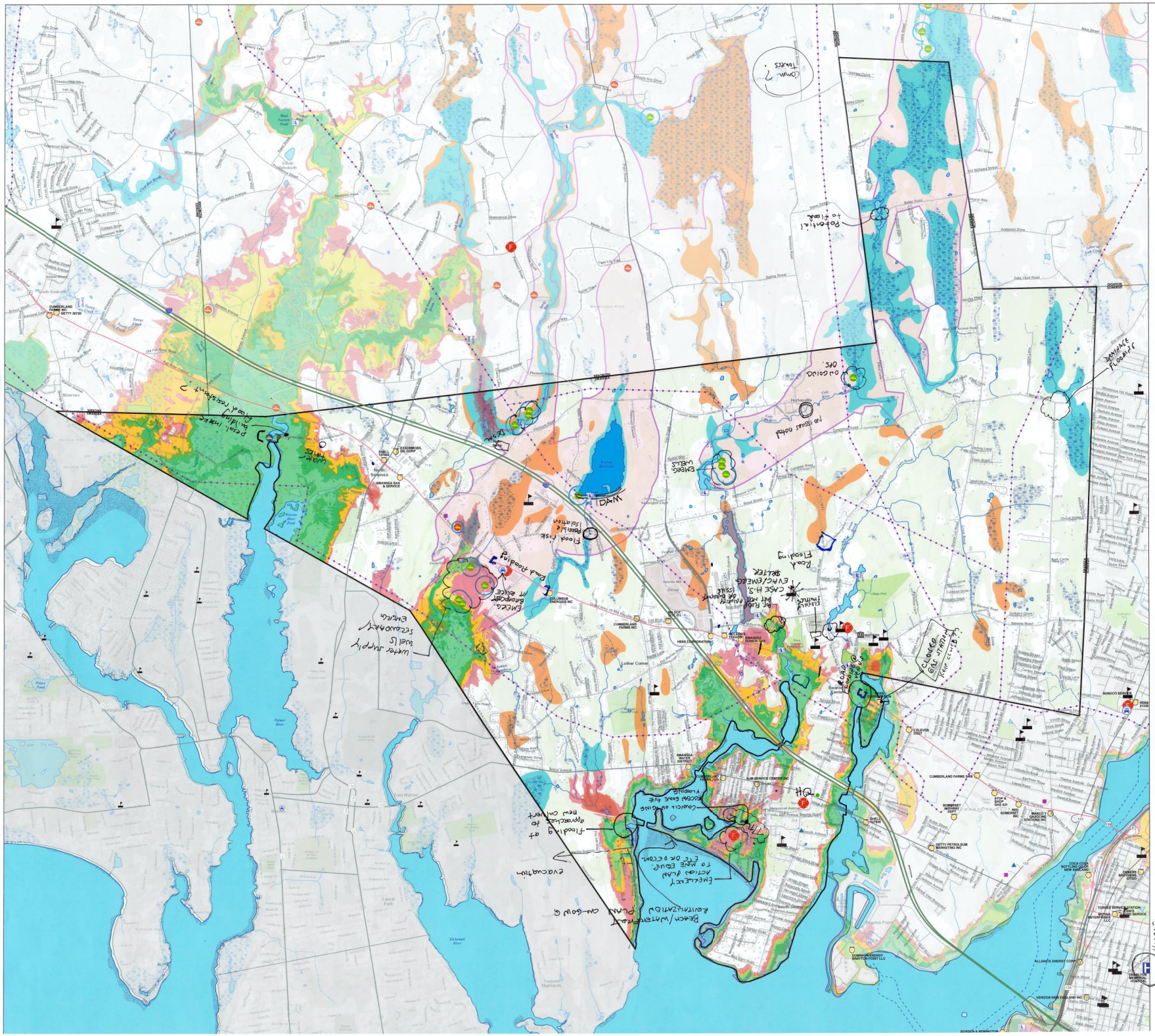
0 0.25 0.5 1 1.5
Miles

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

FUSS & O'NEILL

Appendix B

CRB Workshop Outputs:
Participatory Mapping Exercise & Risk Matrices



SWANSEA, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

- Town Hall
- School
- Police Station
- Fire Station
- Hospital
- Community Groundwater Source
- Surface Water Intake
- Non-Community Groundwater Source
- Dams
- Underground Storage Tanks
- Assisted Living Facility
- Nursing Home
- Rest Home
- Powerline
- Railroads - Active Service

Worst-case Hurricane Surge Inundation Zones

- Category 1
- Category 2
- Category 3
- Category 4
- Perennial Stream
- Intermittent Stream
- Shoreline
- Ditch/Canal
- Channel in Water
- Pond, Lake, Ocean
- Reservoir
- Wetland
- Salt Wetland
- Tidal Flat
- Inundated Area
- Wellhead Protection Zone I
- Wellhead Protection Zone II

Flood Zone Designations

- 1% Annual Chance of Flooding
- Regulatory Floodway
- VE: High Risk Coastal Area
- 0.2% Annual Chance of Flooding

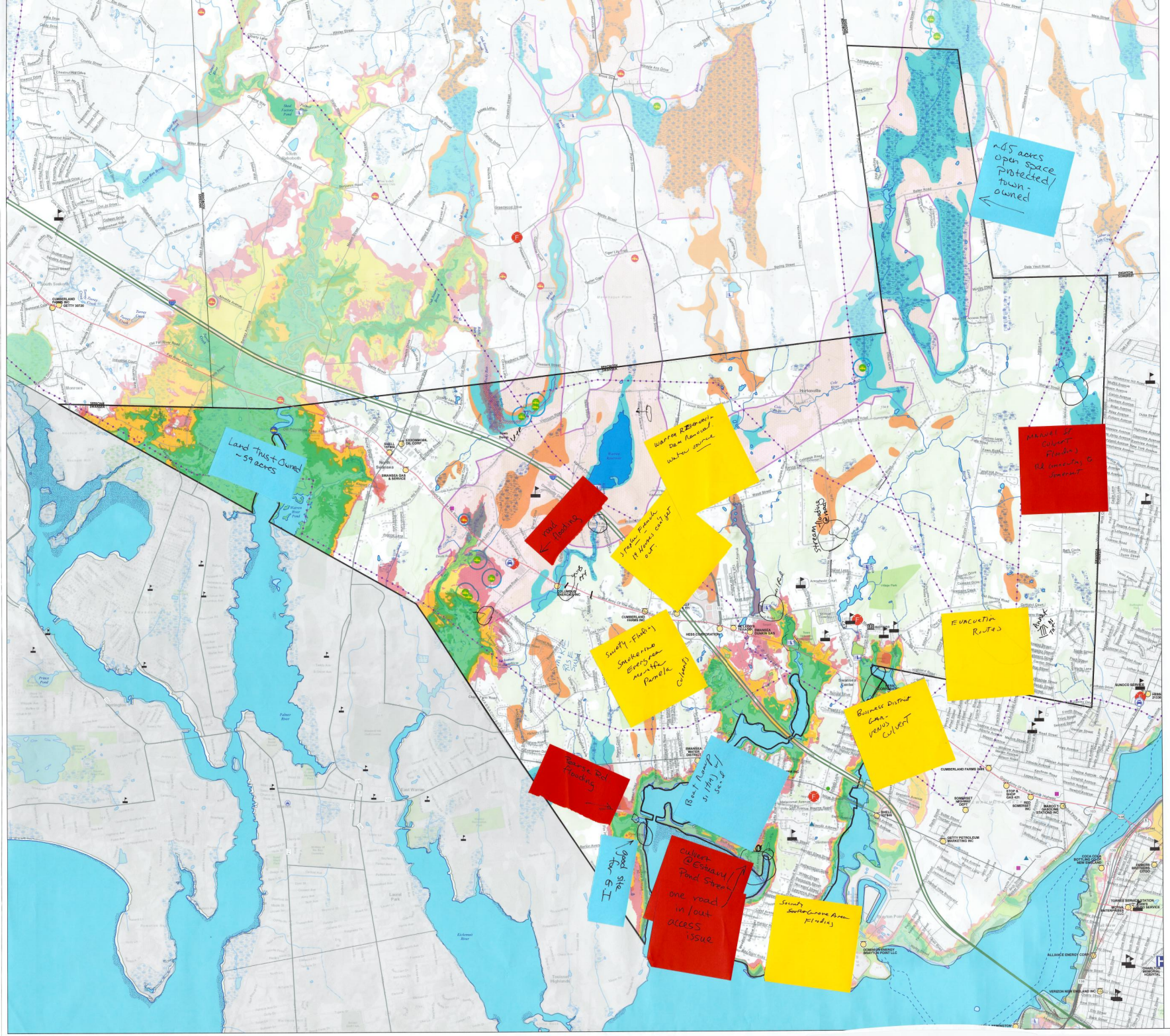
N W E S

0 0.25 0.5 1 1.5

Miles

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

FUSS & O'NEILL



SWANSEA, MA

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

- Town Hall
- School
- Police Station
- Fire Station
- Hospital
- Community Groundwater Source
- Surface Water Intake
- Non-Community Groundwater Source
- Dams
- Underground Storage Tanks
- Assisted Living Facility
- Nursing Home
- Rest Home
- Powerline
- Railroads - Active Service

Worst-case Hurricane Surge Inundation Zones

- Category 1
- Category 2
- Category 3
- Category 4
- Perennial Stream
- Intermittent Stream
- Shoreline
- Ditch/Canal
- Channel in Water
- Pond, Lake, Ocean
- Reservoir
- Wetland
- Salt Wetland
- Tidal Flat
- Inundated Area
- Wellhead Protection Zone I
- Wellhead Protection Zone II

Flood Zone Designations

- 1% Annual Chance of Flooding
- Regulatory Floodway
- VE: High Risk Coastal Area
- 0.2% Annual Chance of Flooding

N W E S

0 0.25 0.5 1 1.5
Miles

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

FUSS & O'NEILL

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	COASTAL STORMS	NOR'EASTERS	HEAT / DROUGHT	SEA LEVEL RISE	Priority H-M-L	Time S Long O ngoing
Infrastructural									
Culverts (Manuel Street, Hortonville, Rt 6 Stephen-French Rd, Pearse Rd; private Pond St.; by police station; Venus)	town-wide	State + town	V	Study, town-wide to prioritize. w/ concept design.					
dams – Warren Reservoir – potential removal			V	municipal agreements / mous or purchase to protect wells, downstream neighborhoods, water supply	need for back-up water supply increase H2O capacity		if abandoned, no control, needs to be maintained as flood control		
dams – Milford Dam (V)			S/V	dam + seawall repair grant Swansea Dam on M. Street - just redone					
Pearse Road			V	Assessment of how to prevent flooding – Management Strategy – nature-based solution as focus	"soil bunits"				
Miles Bridge			V	Address flooding via a study and G.I. opportunities					
Boat Ramp underwater regularly		State	V	Channel dredging/ raise lot and ramp					
Societal									
Evacuation Routes	town-wide		V	Installation of route signage + portable message boards					
RAVE system	town-wide		S/V	comm. system for emergencies – upgrade + make agreements to reach all (must be subscribed now)		all phones w/in certain geographic range + review annually			
Emerg. Comm. Towers to elim. reliance on Comcast/Verizon		Town	S	Water tank @ Sharps Lot Rd > built Tower @ Police Station Tower @ Station 2 - Fire HQ – @ Town mtg for infrastm. appropriations					
Support from Town for Public Safety			S						
Smoke Rise, the Grove, Rt 6 Venus Area, Bushie Rd			V	areas/popn vulnerable to flooding					
Environmental									
Open space in NE corner ~45 acres			S						
Boat Ramp silting w/ sand									
Land Trust property in NW corner ~60 acres			S						
Shellfishing – bacteria			V						

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	NOREASTERS	COASTAL STORMS	HEAT DROUGHT	SLR	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
PIERCE RD (RT 6, VENUS, COLE RIVER, BUSHY RD) MILFORD RD (STATE OWNED)	TW	LOCAL STATE (G)	V	✓	✓		VENUS	H	O
OLD PROVIDENCE RD BRIDGE ACCESS	RTE 6 – SPEAK TO DOT DIST RE: STATUS/PLANS VULNERABILITY ASSESS/FEASIBLE TO RAISE/ WHAT IS BENEFIT?							H N	
	MINOR FLOOD – CONSIDER WITHIN RW IMPROVEMEN VULNERABILITY ASSESS – THREATS TO PUMP STATION & DECAL/ EVAL INTAKE KNOWN VEHICLE HYDROPLAN							M-L H	O
WELL OPERATION PLAN RI DAMS	REVIEW/ASSESS IF EMERGENY PLANS RESPOND TO CURRENT THREATS STAY INVOLVED IN DAM REMOVAL DISCUSSIONS								
FIRE STATION 3	REMOVE EQUIPMENT/RECORDS) IN FLOOD AREA CONSIDER CLOSING								
C									
Societal									
COA. EVACUATION ROUTES	CONSIDER HOW IT CAN BE USED BEFORE STORM – POTENTIAL RALLY POINT FOR EVAC MORE AWARENESS- SIGNAGE/PROMOTE IN PUBLIC FACILITIES								
TRANSPORTATION			S	TOWN HAS BUSES & DRIVERS					
POLICE STATION			S	SIMULCAST ABILITY FOR EMERGENCIES					
Environmental									
CLOSED HESS GAS STATION EAST OF DUNKIN		P		CONSIDER REOPEN/CLOSE POTENTIAL ENVIRONMENTAL THREAT (FLOOD)					
CLEAN GROVE STOUISSET TITLE V ISSUES			T						
BEACH CLOSURES									

Appendix C

CRB Workshop Presentation Materials

FUSS & O'NEILL

Boston Firefighters, January 4, 2018 (Reuters)

Cambridge Reservoir, Lincoln, MA (Boston Globe)

Municipal Vulnerability Protection Program
Community Resilience Building Workshop
Town of Swansea

May 1, 2018

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 Carver
- Discussion by Carver representatives on status of current planning
- Introduction to CRB Workshop process

- Large group
  - Determine top four hazards

- Small work groups (Using Risk Matrix)
  - Identify Swansea'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

FUSS & O'NEILL

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.

FUSS & O'NEILL

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.

Kurt Mailman

Kurt manages diverse wastewater and stormwater management projects from evaluation of pumping systems to capital improvement plans, funding, assessment, and design of challenging hydraulic conveyance systems and training of operations staff. He is adept at managing all aspects of complex multidisciplinary projects from project initiation through construction and commissioning of facilities.

Shawn Martin

Shawn's diverse project experience in land development includes surveying, land planning, environmental site assessments, stormwater management, water distribution, and wastewater collection and treatment systems. He is expert at the application of low-impact development strategies for a broad range of project types, including Brownfields sites with complex environmental conditions.

FUSS & O'NEILL

MVP Program - Swansea $16,000

- Grant Supports Climate Change Vulnerability Assessments and Resiliency planning
  - Comprehensive Approach
    - Infrastructure
    - Society
    - 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

FUSS & O'NEILL

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
- Priority given to projects that propose nature-based solutions, green infrastructure, and enhancement of natural systems
- Phased approach encouraged
- Application deadline May 18
- Project award early June
- Next funding round anticipated early in FY19

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

FUSS & O'NEILL

Terminology

Climate Change

The Change in Usual Climate Conditions

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

Town of Swansea – Narragansett Bay and Mt. Hope Bay Basin

Rising Temperature

Narragansett Bay and Mt. Hope Bay 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)	50.46	2.07 to 3.81	2.71 to 6.04	3.21 to 8.67	3.49 to 10.61
Annual Days with Maximum Temperature over 90°F (Days)	7.08	4.89 to 13.51	7.18 to 28.94	8.93 to 50.87	11.52 to 66.23
Annual Days with Minimum Temperature below 32°F (Days)	120.51	-14.39 to -28.92	-19.61 to -45.66	-24.28 to -58.55	-25.86 to -68.72

FUSS & O'NEILL

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
  Fish species and shell fish migration northward

FUSS & O'NEILL

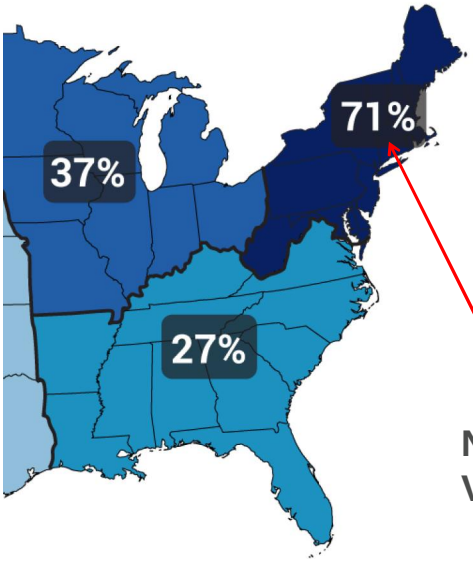
Town of Swansea – Narragansett Bay and Mt. Hope Bay Basin

Changing Precipitation

Narragansett Bay and Mt. Hope Bay 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)	46.69	-0.12 to 4.17	0.65 to 5.87	1.37 to 7.03	0.77 to 8.06
Annual Consecutive Dry Days (Days)	17.27	0.05 to 1.84	-0.02 to 2.38	-1.29 to 3.19	-.97 to 33.92

FUSS & O'NEILL

Changes in Rainfall Events



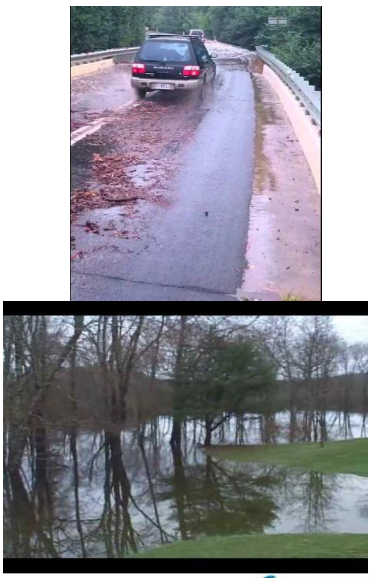
Percent increase in the amount of precipitation falling in very heavy events (defined as the heaviest 1% of all daily events) from 1958 to 2012.

Northeast has the highest Variation in the Country

FUSS & O'NEILL

Climate Change Impacts - Precipitation

- Economic
  - Dangerous Floods
- 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

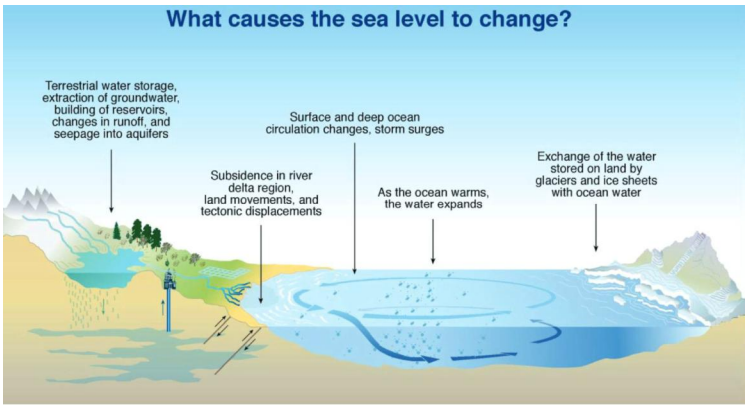


FUSS & O'NEILL

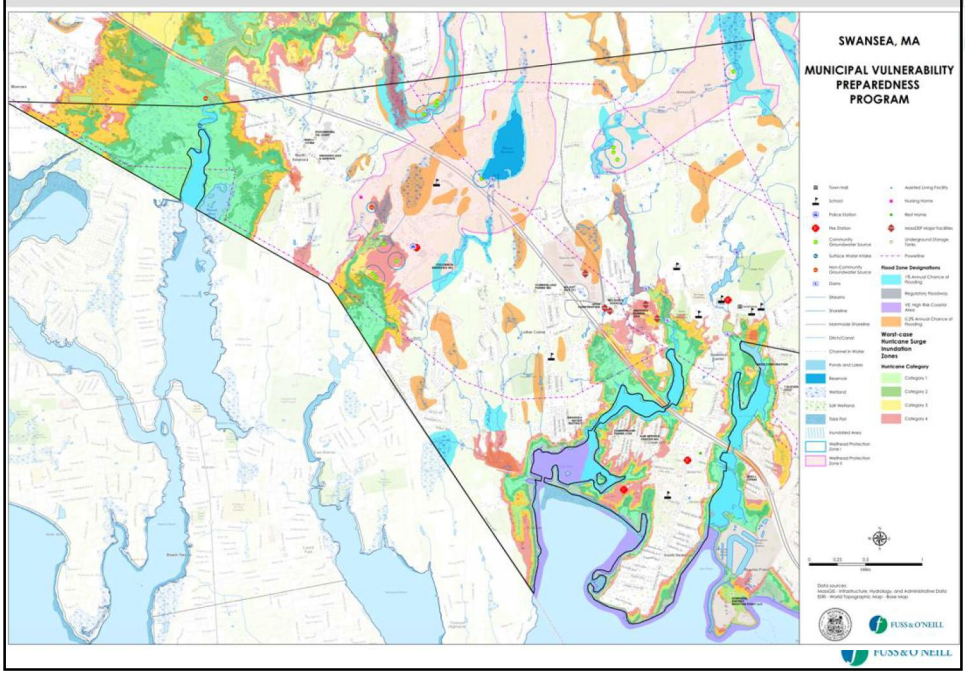
Sea Level Rise

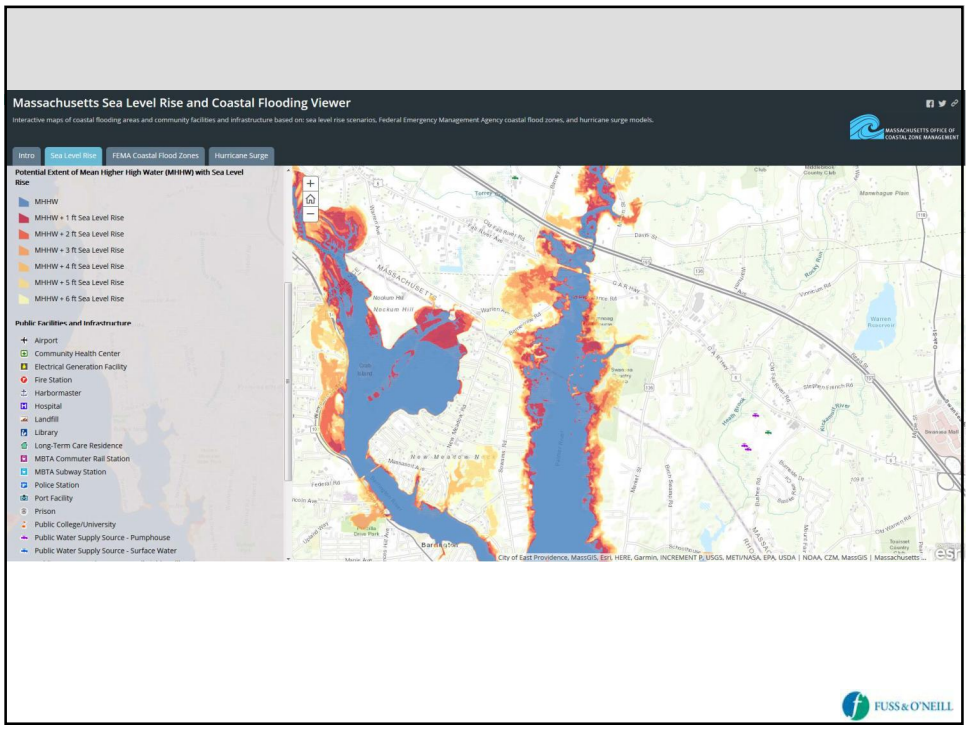
Sea level rise is caused by

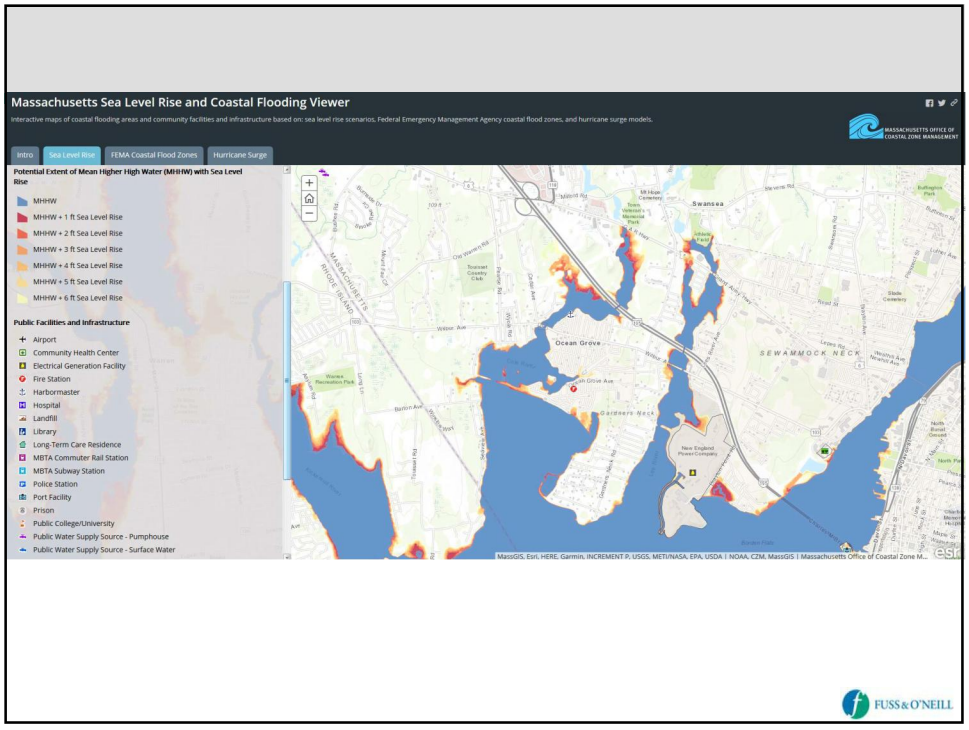
- Loss of land based ice
- Thermal expansion of oceans (with increased temperature)
- Land subsidence



FUSS & O'NEILL




Massachusetts Sea Level Rise and Coastal Flooding Viewer
Interactive maps of coastal flooding areas and community facilities and infrastructure based on: sea level rise scenarios, Federal Emergency Management Agency coastal flood zones, and hurricane surge models.
MASSACHUSETTS OFFICE OF COASTAL ZONE MANAGEMENT
Intro
Sea Level Rise
FEMA Coastal Flood Zones
Hurricane Surge
Potential Extent of Mean Higher High Water (MHHW) with Sea Level Rise
MHHW
MHHW + 1 ft Sea Level Rise
MHHW + 2 ft Sea Level Rise
MHHW + 3 ft Sea Level Rise
MHHW + 4 ft Sea Level Rise
MHHW + 5 ft Sea Level Rise
MHHW + 6 ft Sea Level Rise
Public Facilities and Infrastructure
Airport
Community Health Center
Electrical Generation Facility
Fire Station
Harbormaster
Hospital
Landfill
Library
Long-Term Care Residence
MBTA Commuter Rail Station
MBTA Subway Station
Police Station
Port Facility
Prison
Public College/University
Public Water Supply Source - Pumphouse
Public Water Supply Source - Surface Water
City of East Providence, MassGIS, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA | NOAA, CZM, MassGIS | Massachusetts ...
FUSS & O'NEILL


Massachusetts Sea Level Rise and Coastal Flooding Viewer
Interactive maps of coastal flooding areas and community facilities and infrastructure based on: sea level rise scenarios, Federal Emergency Management Agency coastal flood zones, and hurricane surge models.
MASSACHUSETTS OFFICE OF COASTAL ZONE MANAGEMENT
Intro
Sea Level Rise
FEMA Coastal Flood Zones
Hurricane Surge
Potential Extent of Mean Higher High Water (MHHW) with Sea Level Rise
MHHW
MHHW + 1 ft Sea Level Rise
MHHW + 2 ft Sea Level Rise
MHHW + 3 ft Sea Level Rise
MHHW + 4 ft Sea Level Rise
MHHW + 5 ft Sea Level Rise
MHHW + 6 ft Sea Level Rise
Public Facilities and Infrastructure
Airport
Community Health Center
Electrical Generation Facility
Fire Station
Harbormaster
Hospital
Landfill
Library
Long-Term Care Residence
MBTA Commuter Rail Station
MBTA Subway Station
Police Station
Port Facility
Prison
Public College/University
Public Water Supply Source - Pumphouse
Public Water Supply Source - Surface Water
Swansea
Ocean Grove
SEWAMMOCK NECK
MassGIS, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA | NOAA, CZM, MassGIS | Massachusetts Office of Coastal Zone M...
FUSS & O'NEILL

Local Leaders

FUSS & O'NEILL

Risk Matrix

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									
Societal									
Environmental									

FUSS & O'NEILL

MVP Program

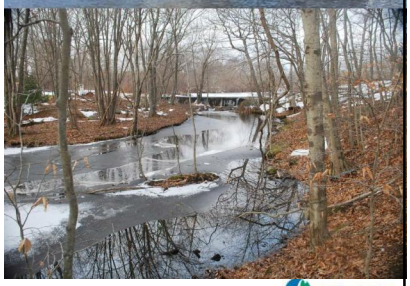
- Identify Top Four Hazards
  - Review MVP Sectors
  - Maps as tool
  - List infrastructure, societal, environmental feature
  - Determine whether a vulnerability or strength
  - Identify actions to reduce vulnerability or reinforce strength
  - Prioritize actions
  - Report Out

- Finalize Prioritization Plan

FUSS & O'NEILL

Climate Change Hazards

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



FUSS & O'NEILL

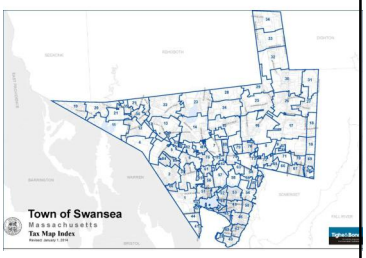
MVP Sectors

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

FUSS & O'NEILL

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



FUSS & O'NEILL

MVP Sectors

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

FUSS & O'NEILL

Community Resilience Building Workshop

Next Steps:

Public Review of Priorities
Monitor and Update
Annual Review

FUSS & O'NEILL

Questions?

Regional Projects Addendum to the

Somerset-Swansea-Dighton

MVP Plans

October
2020

Resilient Taunton Watershed Network

SOMERSET-SWANSEA-DIGHTON MVP PLAN/REGIONAL ADDENDUM SUPPLEMENTAL SCOPE

Task 1. Convene and conduct a Regional MVP Workshop

On October 15 and 21, 2020, a regional MVP meeting/workshop was convened by the local Core Team (Somerset), with the Provider, and partnering towns (Swansea and Dighton) to review the recommendations in their individual plans that involve regional assets and afford opportunity for cooperative, inter-municipal approaches to addressing environmental, infrastructural, and societal vulnerabilities, as well as to look at new opportunities resulting from this regional meeting. The meeting was socially distanced, and hosted by the Town of Dighton in the large meeting room of the Old Dighton Town Hall.

It was mutually agreed upon that the local Core Team Leaders (Nancy Durfee, Somerset; Nancy Goulart, Dighton; Colleen Brown, Swansea) would solicit input from their respective Core Teams, and bring that information to the regional meetings. All information was recorded on the standard MVP/CRB matrices, and all potential projects were located on a draft regional map.

Task 2. Set of MVP Regional Maps and GIS files for the Towns of Somerset, Swansea, and Dighton

A final set of hazard/vulnerability/potential regional project maps will be developed, from the activities undertaken in Task 1, and reviewed with the participating town representatives and their Core Teams. An approved final map is included in the addendum, and along with the narrative, will become part of the MVP Plans for each of the participating towns. GIS files will be made available to the Towns for integration into their other community plans.

Task 3. Assess and summarize vulnerabilities/projects matrices and prepare a regional addendum for the participating community MVP Plans

As stated above, the approved list of identified regional vulnerabilities/potential projects identified in Task 1 will appear in a final list of recommendations for the regional addendum.

Task 4. Aid the towns in submitting the Somerset/Swansea/Dighton regional addendum to EEA.

The approved final addendum maps and regional plan will be completed and the plan will be submitted to EEA MVP Regional Coordinator for final review.

SOMERSET/SWANSEA/DIGHTON REGIONAL VULNERABILITY CONCERNS

INFRASTRUCTURE (Red Dots on the Regional Map)

1. Feasibility study for the Somerset Reservoir Dam and associated infrastructure, **and 3.,** the culverts on North Street and Elm Street in Somerset, in relation to regional flood impact **(HIGH PRIORITY) ***

2. Acquire the Warren Reservoir in Swansea in order to enhance regional water supply assets

4. Feasibility study of the Muddy Cove Pond dam and land off of Elm St., at Sally Richmond Brook, as part of a regional flood, recreational, and water assets strategy

5 – 13. Assess the following bridges and culverts for flood hazard remediation with sea level rise and tidal surge:

5. Route 103 bridge over the Lees River
6. Culvert on Route 6 at the near the Venus de Milo
7. Pleasant Street at Muddy Cove **(HIGH PRIORITY) ***
8. Interstate Route 195 bridge near Ocean Blvd. and Halsey Rd.
9. Briggs Street Bridge
10. Center Bridge at Middle Street
11. Baker Rd. culvert on the Coles River **(HIGH PRIORITY) ***
12. Locust St. culvert
13. Route 138, Elm Street, Whetstone Hill/and around the reservoir **(HIGH PRIORITY) ***

ENVIRONMENTAL (Green Dots on the Regional Map)

1. Increase the land holdings around, and saltmarsh protection and remediation in, Broad Cove*****

2. Conduct a Phase 2 study on the landfill off of Hart St.

3. Increase the holdings off of Sharp's Lot Rd., north of Marvel St., and in Dighton, in order to protect the headwaters of the Coles River*****

4. Increase holdings off of Cedar St. to protect the Dighton water supply*****

5. Increase holdings in Dighton and Somerset in the Elm St. area of the Labor-in-Vain Brook watershed*****

(COLLECTIVELY, ACTIONS 1, 3, 4, and 5 are HIGH PRIORITY)

6. Feasibility study of the Muddy Cove Pond dam and land off of Elm Street, at Sally Richmond Brook, as part of a regional flood storage, recreational opportunity, and water assets strategy

7. Assess our shared watershed and sub-watershed resilience capacity*****

8. Assess the role of our green infrastructure and open space in terms of long-range resiliency planning*****

9. Protect land and flood storage capacity in the headwaters of the Segregansett River (this would also involve Taunton) *****

(COLLECTIVELY, ACTIONS 7, 8, and 9 are HIGH PRIORITY)

SOCIETAL (Blue Dots on the Regional Map)

1. Encourage more inter-municipal communication prior to and during emergencies (create a regional plan/team, if necessary, and involve Fall River for water issues)

2. Create Debris Management Plans (individual and regional) **(HIGH PRIORITY) ***

3. Assessment of our emergency response needs for equipment and generators/mutual aid

4. Assessment of our ability to handle and dispose of hazardous materials in times of emergency/social vulnerability; associated planning and training needs

5. Create a flow chart for regional emergency response for Town Hall use (aggregate as appropriate) **(HIGH PRIORITY) ***

6. Regional educational materials on flooding, stormwater, and MS4 issues; develop a story map similar to the EPA-Mattapoisett model **(HIGH PRIORITY) ***

7. Highlight evacuation routes as part of our educational package

8. Assess regional sheltering capacity (short and long-term)

Somerset,Dighton,Swansea Regional MVP Map

Legend

FEMA National Flood Hazard Layer
Flood Zone Designations

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

- Green Infrastructure Network (unprotected)
- Green Infrastructure Network (protected)
- Open Water

- ENVIRONMENTAL
- INFRASTRUCTURAL
- SOsocietal

- Fire Stations
- Local Police
- State Police
- Libraries
- Town Halls
- Seasonal Farmers Market
- Assisted Living Residence
- Nursing Home

Schools

- Public
- Private
- Collaborative Program
- Special Education

- 7 POLICY ITEMS REFER TO TEXT
- 8 POLICY ITEMS REFER TO TEXT
- 9 POLICY ITEMS REFER TO TEXT
- 1 POLICY ITEMS REFER TO TEXT
- 2 POLICY ITEMS REFER TO TEXT
- 3 POLICY ITEMS REFER TO TEXT
- 4 POLICY ITEMS REFER TO TEXT
- 5 POLICY ITEMS REFER TO TEXT
- 6 POLICY ITEMS REFER TO TEXT
- 7 POLICY ITEMS REFER TO TEXT
- 8 POLICY ITEMS REFER TO TEXT

1 mile

October 2020: Maps produced by SRPEDD are for the sole purpose of aiding regional planning decisions and are not warranted for any other uses. This map is not intended for engineering, legal, or survey purposes. Data sources: MassGIS, MassDOT,Mass Audubon, and the town of Dighton, Somerset, and Swansea.

ATTLEBORO FIRE DEPARTMENT
Twin Village Station
REHOBOTH FIRE DEPARTMENT
Station 2
TAUNTON FIRE DEPARTMENT
Oakland Station
Rehoboth Town Hall
DIGHTON FIRE DEPARTMENT
Station 2
REHOBOTH FIRE DEPARTMENT
Headquarters
Rehoboth
Dighton Care and Rehabilitation Center LLC
Dighton Town Hall
SEEKONK POLICE
Warren Upper Reservior
Muddy Cove Pond
REHOBOTH FIRE DEPARTMENT
Station 3
Broad Cove
Somerset Reservoir
Warren Reservior
Cole River Pond
Country Gardens Health & Rehabilitation Center
Taunton River
SWANSEA FIRE DEPARTMENT
Fire Dept. 4
Milford Pond
Somerset Town Hall
SWANSEA FIRE DEPARTMENT
Station 1
SWANSEA POLICE DEPT
SOMERSET POLICE DEPT
SOMERSET FIRE DEPARTMENT
Headquarters
Lee River
Catholic Memorial Home
Somerset Ridge Center
Highlander Nursing and Rehabilitation
SWANSEA FIRE DEPARTMENT
Station 3
Clifton Assisted Living Community
Clifton Rehabilitation Nursing Center
Adams House
Highland Manor Care and Rehabilitation Center LLC
FALL RIVER FIRE DEPARTMENT
Stanley Street Station
Kimwell Nursing and Rehabilitation
Fall River Jewish Home, Inc.
Fall River / Ruggles Park
Crawford Skilled Nursing and Rehabilitation Center
Fall River City Hall
Fall River / Kennedy Park
Landmark at Fall River
Fall River/Downtown
FALL RIVER CITY POLICE DEPT
Sarah Brayton Nursing Care Center