TOWN OF FRAMINGHAM

September 2016

Multiple Hazard Mitigation Plan

Prepared by

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The Multiple Hazard Mitigation Plan 2017 Update was based on large part on the Multiple Hazard Mitigation Plan dated June 2005, which was prepared by the Community Planning Team and Rizzo Associates, Inc., under contract to the Town of Framingham, and the Multiple Hazard Mitigation Plan 2012 Update. The Plan Updates are prepared by the Working Group members, based on their experience in implementing the Plan and professional expertise together with public comment.

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1.0 Introduction

This Multiple Hazard Mitigation Plan (MHMP), updated September 2016 for the Town of Framingham, MA has been prepared in compliance with the requirements of the Federal Disaster Mitigation Act of 2000 (DMA). The updated MHMP expands the Town's capability to deal with natural hazards, minimize future disaster losses, identify mitigation activities and secure funding for future hazard mitigation projects.

The MHMP has been updated based on the "Local Mitigation Planning Handbook" (March 2013), prepared by the Federal Emergency Management Agency (FEMA). Funding for the preparation of the original MHMP was from a grant received by the Town from the Department of Conservation and Recreation (DCR) and the Massachusetts Emergency Management Agency (MEMA) through the Hazard Mitigation Grant Program (HMGP). This Update was prepared by the Multiple Hazard Mitigation Plan Working Group, which includes Town staff and officials as well as interested citizens. Created as a direct result of the original Plan, the Working Group has aggressively sought to implement the Plan. More recently, the Working Group has focused on updating the Plan in light of the success of the original Plan as well as the knowledge gained during its implementation.

> "Hazard mitigation" is defined in the "Local Mitigation Planning Handbook" as "sustained actions taken to reduce or eliminate long-term risk to life and property from hazards." Mitigation assists in minimizing damage that occurs as the result of a natural disaster (flooding, storms, high winds, hurricanes, wildfires, earthquakes, etc.) to structures, infrastructure and other man-made and natural resources.

The Town has developed and adopted a Comprehensive Emergency Management (CEM) Plan, which is required by the Commonwealth of Massachusetts. The CEM plan includes measures for mitigation, preparedness, response and recovery for various hazards including natural hazards such as flooding, earthquakes, hurricanes, etc., and other hazards as a result of manmade activities (e.g., hazardous material-related accidents, terrorism, rioting). The primary focus of the MHMP was to complement the CEM plan and to focus on specific mitigation measures for the natural hazards that affect the Town. That purpose remains valid for the Update.

As was true of the original Plan, this updated Plan will meet the requirements of the Federal DMA 2000, which calls for communities to have an all hazards mitigation plan in place by November 1, 2004 in order to qualify for pre-disaster and post-disaster funding under FEMA's Pre-Disaster Mitigation Program and HMGP. In addition, this updated Plan will assist the Town in applying for other hazard mitigation project funding, such as FEMA's pre-disaster mitigation program the Flood Mitigation Assistance (FMA) program, as well as other federal, state and private funding sources.

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2.0 Community Characteristics

The Town of Framingham, with a population of 68,318 (US Census Bureau, 2010), is located mid-way between Boston and Worcester and is the hub of the MetroWest region. Framingham offers a unique blend of urban, suburban and rural qualities. Framingham is home to a vibrant regional retail area along Route 9 and high technology oases in close proximity to quiet residential areas as well as working farms and dynamic commercial centers such as Framingham Centre with its small shops and historic buildings. The traditional strengths of the town have been its residents, and phenomenal location and accessibility.

From its founding in 1700, Framingham has supported a variety of industries. The mills and factories that flourished in Framingham encouraged the growth of Saxonville in Northeast Framingham and the downtown in South Framingham. Currently, the major town employers are in the Business & Professional Services, Education & Health Services, Trade, Transportation & Utilities, and Manufacturing sectors.

Framingham residents value public participation. Framingham is the largest municipality in Massachusetts with a town meeting form of government.

2.1 Geography

Location:	Located in Eastern Massachusetts, bordered by Southborough and Marlborough on the west, Sherborn and Ashland on the south, Natick on the east, Wayland on the northeast, and Sudbury on the north, Framingham is 19 miles west of Boston and 197 miles from New York City.
Total Area:	26.44 sq. miles Land Area: 25.12 sq. miles
Population:	68,318. Density: 2,720 per sq. mile
Climate[1]:	Average temperature in January.....25.5°F Average temperature in July.....73.5°F Average annual precipitation.....45.9"
USGS Topographical Plates:	Framingham
Regional Planning Agency:	Metropolitan Area Planning Council Subregion: MetroWest Regional Collaborative
Metropolitan Statistical Area:	Boston

2.2 Topography

Topographical levels range from a low of 114 feet above sea level at the surface of the Sudbury River below the Saxonville Dam, to a high of 602 feet at the top of Nobscot Hill. The central section of Town is fairly flat with an elevation of about 200 feet above sea level. The Northwest Quadrant rises to an elevation of about 400 feet and is characterized by a combination of wetlands, steep slopes and exposed bedrock.

2.3 Water Resources

Sudbury River

The Town of Framingham is entirely within the drainage of the Sudbury River, Framingham's major waterway. The Sudbury River headwaters form in Cedar Swamp, located west of Framingham in the Town of Westborough. The river flows easterly through Southborough and Ashland and then northerly into Framingham where it flows in a northeast direction to join the Assabet River in Concord. The Sudbury River passes through Massachusetts Water Resources Authority (MWRA) Reservoirs Numbers 1 and 2 as it flows through Framingham. The southern section of the river is barely thirty feet wide, but the river opens up just above the Massachusetts Turnpike I-90 bridge and widens considerably to a width of 700 feet (the area known as Mill Pond) above the dam at the bend of the river in Saxonville. From an

[1] http://www.usclimatedata.com/climate/framingham/massachusetts/united-states/usma0147 - Accessed June 2016

elevation of 146 feet above sea level just above the Saxonville dam, the river falls to 114 feet as it winds through Saxonville and north to the Great Meadows National Wildlife Refuge in Sudbury and Wayland.

Major tributaries to the Sudbury River in Framingham are Lake Cochituate, which flows through Cochituate Brook into the Sudbury River below the Concord Street bridge; Dunsdell Brook, which flows into the Sudbury River at the point where it runs alongside the MassPike; Farm Pond, which flows through Eames Brook into the Sudbury River at Mount Wayte; Sucker Brook, which flows south from Sucker Pond, to Flagg School and is then largely culverted as it flows west to a wetland adjacent to Walnut Street and then north to the Sudbury River; and Birch Meadow and Baiting Brook, which flow into the Sudbury River just below the Reservoir outflow. Hop Brook flows north into Sudbury and eventually into the Sudbury River. The Sudbury River, in turn, feeds Stony Brook, which flows into Reservoir 3, which flows into Reservoir 1. Another large brook within the Sudbury River watershed is Beaver Dam Brook, which flows from Waushakum Pond through Framingham's southeast corner, then through Natick to Lake Cochituate.

Over time, the Sudbury River's meandering has created wetland zones that integrate in small strips and patches. Despite its small size, the river represents the diversity of characteristics present in a typical river floodplain. The overall effect is one of considerable ecological diversity within a small area (Margolis, Fairbairn).

One area in particular is the oxbow, which is located near the Sudbury Town line and is a marshy wetland, only exposed to running water intermittently. The oxbow is a refuge for many water birds since it is too shallow and weed-grown to permit boating for most of the breeding season.

Following a three-year study, the National Park Service and a 13-member advisory committee, which included a representative from the Town of Framingham, recommended that a 29-mile segment of the Sudbury, Assabet, and Concord (SuAsCo) Rivers be added to the National Wild and Scenic River System. Rivers designated as "Wild and Scenic" must possess as least one "outstanding remarkable resource value." The study found that the SuAsCo segment has five of these qualities: ecological; recreational; historical/archaeological; scenic; and literary (US Department of the Interior (DOI), 1995).

At the conclusion of the study, all eight towns along the river segments (Framingham, Wayland, Sudbury, Lincoln, Concord, Bedford, Carlisle, and Billerica) voted at their 1995 spring town meetings to ask Congress for Wild and Scenic designation, which was awarded in 1999. The Sudbury River portion of the SuAsCo Wild and Scenic River begins in the Saxonville section of Framingham. Starting at the Danforth Street Bridge, the SuAsCo in Framingham includes the oxbow, and continues downstream into Wayland and Sudbury.

Section 7 of the Wild and Scenic Rivers Act restricts federal activities that have a direct and adverse effect on the values for which the river was designated. Each of the towns along the wild and scenic segment have also committed to work to protect the river resources. The Wild and Scenic River Stewardship Council (RSC), on which Framingham is represented, was created and directed by legislation to work with DOI to ensure the long-term protection of these rivers.

Ponds & Lakes

In addition to the MWRA Reservoirs, Framingham has six ponds. Farm Pond, recognized by the State as a great pond, is a natural pond consisting of 124 acres. It was once used to supply the Town's drinking water. A Town-owned park is located on the western shoreline and provides boat and fishing access to the pond.

Two ponds, Waushakum and Learned, have swimming beaches. Learned Pond consists of 34 acres with a maximum depth of 13 feet. The town beach is located on the eastern shore. Very little study or analysis has been conducted of Learned Pond.

Waushakum Pond is small (82 acres) but rather deep (50 feet). The majority of Waushakum Pond is in Framingham, but 80% of its drainage area is in Ashland. Primary recreational uses of the pond are swimming, boating and fishing. Waushakum Pond is accessible to the public through a park and swimming beach in Framingham and a boat launch in Ashland. The shoreline is privately owned except for areas of public access (Framingham Police Department, 1995). Waushakum Pond, a glacial kettle

pond, is large in relation to its watershed, which generally gives a pond an advantage in avoiding eutrophication.

Norton Pond is located in the northern portion of town. Its primary function is to provide storm water storage for the surrounding developed neighborhoods to its north. It has a surface area of about 5 acres with a maximum depth of 6 feet. Approximately two-thirds of the pond shoreline is under private ownership. The Town owns the remaining one-third adjacent to Elm Street.

Gleason Pond is approximately 12 acres and is located at the intersection of Concord Street and Prindiville Avenue. Along the eastern shoreline are single and multi-family homes, set back 100 to 150 feet from the water's edge. The western edge of the shore contains woodlands and other undeveloped land. A portion of the northern shoreline along Prindiville Avenue is under Town Ownership for conservation purposes.

The Town's third swimming beach is on the North Basin of Lake Cochituate on land that is both Town and State-owned.

2.4 Government

Municipal Offices: Main Number: (508) 532-5411

Form of Government: Board of Selectmen
Town Manager
Representative Town Meeting

Year Incorporated: 1700

Registered Voters:
(Town Clerk, 2015)

	Number	%
Total Registered	36,509	100%
Democrats	13,306	36.4%
Republicans	3,337	9.1%
Green Rainbow	52	0.1%
United Independent Party	138	0.4%
Other parties	117	0.3%
Unenrolled Voters	19,559	53.6%

State Legislators: Senator Karen Spilka
Representative Chris Walsh: precincts 1-7, 9, 13, 14, 17
Representative Tom Sannicandro: precincts 8, 10, 11, 12, 15, 16, 18
Representative Carmine Gentile: precinct 13

2.5 Housing Characteristics

Subsidized Housing Units (Department of Housing & Community Development, December 2014)

Total year round housing units 27,433
Subsidized housing units: 2,870

Framingham's 2,870 subsidized units represent 10.5 percent of the Town's total housing units.

2.6 Transportation

Framingham is located approximately halfway between Worcester, the commercial center of Central Massachusetts, and Boston, New England's leading port and metropolitan area. Rail and highway facilities connecting these major centers and other communities in the Greater Boston area are excellent.

Major Highways

Principal highways are Interstate 90 (Massachusetts Turnpike) and State Route 9, which both run east-west across the state. Three additional State highways dissect Framingham: Routes 135 and 30 running east-west, and Route 126 running north-south.

Rail Service

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Direct rail service to Boston, New York, and all other points on the Amtrak network is available through Framingham. The Massachusetts Bay Transportation Authority (MBTA) commuter rail service is available to South Station and Back Bay Station in Boston. Travel time to Back Bay Station is 42 to 45 minutes. The MBTA has low-cost parking adjacent to the Framingham Commuter Rail station. CSX Transportation provides freight rail service throughout the region and is especially active in south Framingham.

Public Bus Service

Framingham is served by the MetroWest Regional Transit Authority (MWRTA). This service links the following Towns with regular bus service to major retail and employment destinations including Framingham's Technology Park, Route 9, Framingham State University, and several commuter rail stations, along with many of their downtowns and key residential areas:

Ashland	Framingham	Holliston	Hopkinton	Marlborough	Natick
Sherborn	Southborough	Sudbury	Wayland	Weston	

MWRTA also operates the MetroWest Ride for elderly and customers with disabilities in Framingham and Natick and a "Dial-A-Ride" service in the Towns of Ashland, Marlborough, Southborough, and Wayland.

2.7 Culture and Recreation

Danforth Museum of Art
Framingham History Center
The Will C. Curtis Garden in the Woods/ New England Wildflower Society
Amazing Things
Performing Arts Center of MetroWest
Fountain Street Studios
Framingham Public Library
Brazilian American Center (BRACE)

Cochituate Rail Trail
Danforth Gym & Recreation Hall
Loring Skating Arena
Weston Aqueduct Trail Segments
Bowditch Field
Callahan State Park
Cushing Memorial Park
Wittenborg Woods
Town owned beaches: Learned Pond, Saxonville, Waushakum
Many other trails, fields, playgrounds encompassing active and passive recreation

2.8 Miscellaneous

Assisted Living
Heritage at Framingham Assisted Living—747 Water Street
Carmel Terrace Assisted Living—933 Central Street
Brookdale Cushing Park—300 West Farm Pond Road

Hospitals
MetroWest Medical Center—Framingham Campus

Nursing Homes/Rehabilitation/Long Term Care
Bethany Skilled Nursing Facility—97 Bethany Road
The Carlyle House—342 Winter Street
Countryside Nursing Home—153 Winter Street
Oak Knoll Health Care Center—9 Arbetter Drive
Kathleen Daniel Nursing & Rehab Center—485 Franklin Street
Resident Care Nursing Home—328 Concord Street
St. Patrick's Manor—863 Central Street

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3.0 Hazard Mitigation Planning Process

3.1 Multiple Hazard Mitigation Plan Working Group

The Board of Selectmen appointed a MHMP Working Group in 2006 to oversee the implementation of the MHMP and to update the Plan in a timely manner. The Working Group consists of staff and officials from the following Town Departments: Police, Fire, Public Works (DPW), Conservation, and Community and Economic Development. In addition, at least two Framingham residents with interest in, or experience, with natural hazard mitigation have served on the Working Group since its inception. The Working Group regularly seeks input from other Town entities, including Board of Selectmen, Framingham's Emergency Management Agency, Planning Board, Board of Health, and Department of Building and Wire, as well as MEMA, DCR, and local businesses and residents.

As of December 2015, the Working Group consists of the following members:

Table 3.1 – Multiple Hazard Mitigation Plan Working Group Members

Member Name	Affiliation	Status
Sampath Bade	Representative of the Conservation Commission/ Citizen Member	Existing member
James Barnett	Citizen Member	Newly appointed member under 2017 Update
Robert Bois	Representative of the Conservation Commission/Citizen Member	Newly appointed member under 2017 Update
Marianne Iarossi	Senior Planner, Community & Economic Development	Newly appointed member under 2017 Update
Sheila Lynch	Citizen Member	Existing member
John Magri	(former) Assistant Fire Chief	Existing member
Kerry Reed	Senior Stormwater & Environmental Engineer, DPW	Newly appointed member under 2017 Update
Steven Trask	Deputy Police Chief	Existing Member

The Working Group brings together individuals with exceptional backgrounds, expertise and experience in hazards affecting or potentially affecting the residents and businesses of Framingham. Each member brings an important perspective to the planning and implementation processes as well as a genuine interest in working together to insure that the Plan is in fact implemented and that the Update accurately reflects the needs of the community and how best to meet those needs. The extent of staff involvement is indicative of the Town's commitment to multiple hazard mitigation planning.

The following additionally provided important contributions to updating the Plan:

James Duane, Assistant Town Manager
Nichol Figueiredo, Public Information Officer
Geoffrey Kovar, GIS Coordinator, Engineering Department
Arthur Robert, Director of Community & Economic Development
Edward Kross, Citizen Member

Rizzo Associates, Inc. (now Tetra Tech) was retained by the Town of Framingham to help develop the original MHMP, upon which the Plan Updates are based.

Throughout the update process (as well as its ongoing efforts to implement the Plan), the MHMP Working Group was committed to insuring that the Plan:

1. Is comprehensive, practical, and cost-effective, and includes environmentally sound alternatives
2. Represents viewpoints from various departments, groups, and residents of the Town

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3. Addresses repetitive problems, or ones that have the potential to have major impacts on specific areas of Town and reduce the potential for loss of life, loss of essential services and personal property, damage to critical facilities, economic loss, hardship or human suffering
4. Is consistent with and supports the goals and objectives of the CEM

Table 3.2 provides a list of meetings held by the MHMP Working Group throughout the 2017 Plan update process. See Appendix A for a list of meetings since the original MHMP development, along with associated agendas and sign-in sheets for select 2017 Update meetings outlined below.

Table 3.2 – Multiple Hazard Mitigation Plan 2017 Update Working Group Meetings

Meeting Date and Time	Meeting Description
October 2, 2015, 10:00 am	Staff kick-off meeting to determine plan of action
November 17, 2015, 3:30 pm	Working Group kick-off meeting #1
November 23, 2015, 2:00 pm	Meeting to discuss outreach strategy with Public Information Officer
December 7, 2015, 1:00 pm	MEMA meeting to discuss 2012 Plan improvements/changes needed
January 11, 2016, 7:00 pm	Working Group progress meeting #2
March 9, 2016, 3:00 pm	Staff meeting to discuss Public Meeting #1 logistics
March 10, 2016, 7:00 pm	Public Meeting #1
March 24, 2016, 2:00 pm	Staff meeting to discuss next steps for Mitigation Strategy
March 29, 2016, 3:00 pm	Staff meeting to discuss next steps for Mitigation Strategy
May 2, 2016, 7:00 pm	Working Group progress meeting #3
July 19, 2016, 7:00 pm	Working Group progress meeting #4

Based on an understanding of and commitment to the Plan, the Working Group members are well-positioned to identify strengths and weaknesses of the plan and to identify additional needs of the community to incorporate into an Update. The Working Group began to focus on updating the Plan during the fall of 2015, at which time the Working Group determined that it should begin the update process early to insure that the Plan Update met all of the State's requirements as well as identified the community's existing and projected needs for the upcoming five years. Representing the Working Group, Ms. Iarossi, Ms. Reed, and Mr. Bade met with Marybeth Groff of MEMA on December 7, 2015 to identify the process for updating the Plan in addition to ways to improve the Plan based on the 2012 Update.

Following the meeting with Ms. Groff, the Working Group discussed the update at each of its meetings. With the invaluable assistance of Ms. Groff, Town staff reviewed the plan and identified areas that warranted improvement and/or updating and subsequently discussed the matters with the entire Working Group. Up until the first public meeting in March, the Working Group's focus was on the Risk Assessment section of this Plan. The Working Group worked together to assign specific tasks to each member, depending upon their expertise and background. For example, Community & Economic Development focused on community characteristics and the planning process; DPW focused on flooding- and geologic-related hazards; the Fire Department focused on fire-related hazards, etc. Each member focused on his or her assignment and submitted all of their comments and material directly to Ms. Iarossi who incorporated the updates in a draft Update Plan.

After the first public meeting in March, the Working Group shifted their focus to the Mitigation Strategy. Section 5.0 Mitigation Strategy describes the process taken by the Working Group for this 2017 Update.

Once completed, the draft Update was circulated to the Working Group for their review and placed on the official Town web-site to solicit comments from the public. The public was encouraged to submit comments and suggestions directly to the Division of Community and Economic Development, which documented all comments and submitted them to the Working Group for consideration. A copy of the documented comments is provided in the attached Appendix B.

3.2 Public Hearings

Input from the public was essential in order for the MHMP Update to be comprehensive and responsive to the needs of the community. In recognition of the importance of public input, the MHMP Working Group as well as its predecessor, the Community Planning Team (CPT) conducted several public hearings during the development of both the original plan and the Plan Updates.

Public Hearing Number 1 (original plan development)

Upon conducting two CPT meetings to establish a work schedule and the delegation of responsibilities, the CPT conducted the first public hearing on September 16, 2003. The hearing was publicized in the local newspaper and the cable station. The hearing was attended by approximately 14 people. The meeting was taped for broadcasting on the local cable access channel.

A slide show presentation summarizing the objectives of the MHMP, the role of CPT and the information gathered on natural hazards was followed by public input regarding known hazards. Maps showing flood zones, the town-wide drainage system, and locations of critical facilities were on display at the meeting. Copies of questionnaire sheets were made available at the meeting for written input regarding known hazards. The CPT received two completed questionnaires one related to flooding due to storm water and the other concerning stability of existing dams. Individuals provided verbal testimony regarding various potential hazards.

Public Hearing Number 2 (original plan development)

Upon completing a preliminary draft MHMP the CPT conducted the second public meeting on March 16, 2004. The meeting was publicized in the local newspaper and the cable station. The meeting was attended by approximately 14 people.

Maps showing flood zones, the town-wide drainage system and locations of critical facilities were again on display at the meeting. The need for the MHMP was emphasized. The status of the information collection process and the MHMP development was summarized, followed by a discussion about various mitigation projects for each of the potential natural hazards. The discussion was facilitated using computer software that documented mitigation projects and simultaneously displayed them on a screen that made it easier for discussion purposes. Copies of information gathering sheets were made available at the meeting for written input regarding known hazards. Individuals provided verbal testimony regarding various potential hazards and strategies to mitigate the hazards.

Public Hearing Number 3 (original Plan development)

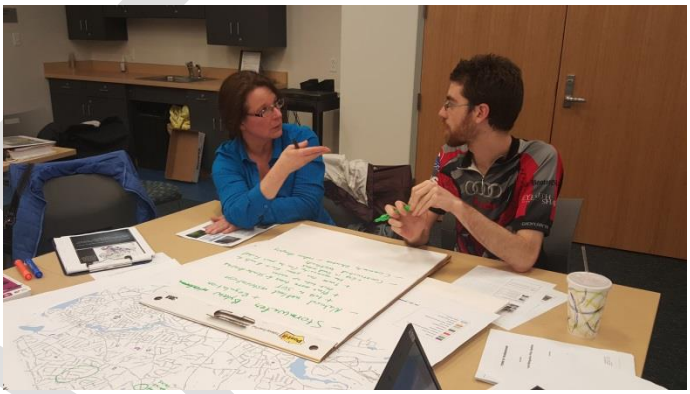
The third and last public hearing for the original plan development was held on June 21, 2004 at 7:30 p.m. during the Public Draft MHMP public comment period, which began on May 20, 2004 when the Public Draft MHMP was distributed and ended on June 28, 2004 at 5:00 p.m. The third public hearing was held specifically to obtain comments on the Public Draft MHMP; input was used to develop the final document.

Public Hearing Number 4 (2012 Plan update development)

The MHMP Working Group presented its draft 2012 Update Plan to the Board of Selectmen on June 15, 2010 at which time the Board conducted a public hearing. The Working Group provided a power point presentation that explained the mitigation planning process, provided an update on the work of the Working Group, explained the draft, and encouraged public input. The Selectmen's meeting was televised, repeatedly rebroadcast on Framingham's cable access channel, and remains accessible through streaming video via the Town's official web site. At the meeting, the plan was fully explained to the Board of Selectmen, people in the audience and to the viewing public who watched the presentation live, during rebroadcasts, or via streaming video.

Notice of the public hearing was placed on the Town's official web site together with a draft of the Plan and instructions on how to participate in the planning process.

Public Hearing Number 5 (2017 Plan update development)



After kicking off the MHMP 2017 Update process, but prior to starting the Mitigation Strategy/priority project list development, the Working Group conducted a public meeting on March 10, 2016 at 7:00 pm. Notifications of the meeting were sent via several email blasts with many recipients, including abutting communities, Metropolitan Area Planning Commission (MAPC), various local businesses and entities in Town, social service groups, MWRTA, DCR, MWRA, FEMA/MEMA and several Town departments/staff. The notice was posted on the Town's website, Town Hall bulletin boards (with attached surveys for those who could not attend the meeting), social media pages, and was sent to local newspapers including non-English speaking agencies. Citizens, Town Hall staff, and members of the Working Group attended the meeting. At the meeting, the Working Group provided a presentation that explained the process, past plans, what natural hazards are and how they can be mitigated. Two breakout sessions were conducted. One session asked attendees to mark areas where they believe or have witnessed natural hazards occur, on maps scattered around the room. The second session asked attendees ways to mitigate hazards – project ideas no matter how big or small. This was done via notepads and markers scattered around the room. Documents related to this public meeting are shown in Appendix C.

Public Hearing Number 6 (2017 Plan update development)

Include ppt, outreach, and other docs in Appendix.

3.3 Public Input

As indicated above, opportunities for public involvement are consistently provided. In fact, four of the members of the MHMP Working Group are citizens who bring with them valuable perspectives as well as extensive knowledge, relevant education, and commitment to the Town. Multiple members of the Working Group personally experience the deleterious effects of flooding at their private residences.

The Working Group developed and undertook the following process to engage the public in the review and refinement of the draft Plan Update:

1. Town staff met with Marybeth Groff of MEMA to discuss how to improve the draft Update in order to better respond to MEMA and FEMA requirements. Staff incorporated Ms. Groff's recommendations.
2. The Working Group conducted an initial public hearing partly through the Update process to gain early feedback and opinions on hazard mitigation in town. Outreach for this meeting was sent to multiple departments, members, and organizations of all levels within the town and region. The Town's Public Information Officer used multiple media outlets including social media to inform the public of the hearing and elicit feedback.
3. The Community & Economic Development Division circulated the draft Plan to the Working Group for review and in turn incorporated the comments and refined the draft.
4. The draft document was placed on the Town's official web site and people were encouraged to review the draft and submit comments to the Community and Economic Development Division. The Town notified potentially interested parties of the availability of the draft Update on the

Town's website and encouraged them to review the Update and convey comments to the Community and Economic Development Division. Comments were subsequently shared with the Working Group.

5. The MHMP Working Group submitted the draft together with a detailed explanation to the Board of Selectmen on September XX, 2016 at which time the Board conducted the final public hearing.

Please see Appendix B for all comments submitted by the public and other interested parties to the Community and Economic Development Division on behalf of the Working Group.

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4.0 Hazard Identification and Risk Assessment

The Working Group updated the risk assessments that were initially performed in the original plan by Rizzo Associates. Assessments were completed for the following potential hazards: flood-related hazards; wind-related hazards; fire-related hazards; geologic-related hazards; winter storm-related hazards; and extreme temperature-related hazards. The potential hazards were assessed and the following information for each is provided below: descriptive information, location, extent, previous occurrences, probability of future events, and vulnerability. Hazards not affecting the Town are also noted.

4.1 Flood-Related Hazards

4.1.1 Flooding

Flooding is the most prevalent serious natural hazard identified by local officials in Framingham. Communities in Massachusetts are frequently exposed to riverine flooding. Flooding events can range from minor street flooding to serious flooding resulting in damage to public and private property. Major storms including hurricanes and nor'easters have produced flooding numerous times during the past decade.

According to the Massachusetts Climate Change Adaptation Report (September 2011), New England is expected to experience a strong increase in extreme precipitation events, especially during the winter months, which will increase flooding hazards. According to the 2012 report *When It Rains It Pours – Global Warming and the Increase in Extreme Precipitation from 1948 to 2011,* intense rainstorms and snowstorms have become more frequent and more severe over the last half century in the northeastern United States**.** Extreme downpours are now happening 30 percent more often nationwide than in 1948. In other words, large rain or snow storms that happened once every 12 months, on average, in the middle of the 20th century, now happen every nine months. Not only are these intense storm events more frequent, they are also more severe: the largest annual storms now produce 10 percent more precipitation, on average, than in 1948.

Whereas flash floods occur quickly after an upstream event, riverine flooding is a longer-term event that may last a week or more. Flooding along rivers and streams is natural and inevitable. Some floods occur seasonally when winter or spring rains, coupled with melting snows, fill river basins with too much water, too quickly. Torrential rains from hurricanes or tropical systems can also produce river and stream flooding.

Flooding on a non-leveed stream occurs when over-bank flows are of sufficient magnitude to cause considerable inundation of land and roads. Flooding on a leveed stream occurs when the stream level rises above the levee. Flooding can also occur if the levee fails. The ability of the levee to withstand flooding depends on the design standards used when constructing the levee. Many private (mostly agricultural) levees are not intended to withstand major floods.

Riverine flooding is normally the result of a combination of meteorological and hydrological factors. Although excessive rainfall alone can cause flooding, the most severe riverine floods usually have multiple causative factors, including:

- Heavy prolonged rainfall from a large-scale storm or a series of large-scale storms
- Heavy rainfall from a near-stationary or slow-moving thunderstorm complex
- Saturated soil conditions from previous rainfall events
- High existing river flows from previous rainfall events
- Extreme cold temperatures followed by thawing, leading to river ice jams
- Rapid snowmelt. Snowmelt floods can develop over periods ranging from several hours to several days, depending upon the part of the country, the water content of the snow, and temperatures during the melting period. The combination of large-scale storm rainfall and rapidly melting snow can cause severe flooding
- Silt buildup in river channels during previous storm events that reduces the capacity of the river to carry water

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The dangers of riverine floods are similar to coastal and flash floods, including:

- Damaged or destroyed buildings and vehicles
- Uprooted trees causing power and utility outages
- Drowning, especially people trapped in cars
- Contamination of drinking water
- Dispersion of hazardous materials
- Interruption of communications and/or transportation systems

However, the intensity of flooding impact and the amount of damage that can result from an especially heavy rainfall is sometimes worse than expected. Flash floods can occur with startling suddenness and be especially devastating. Flash floods are fast moving floods resulting from extremely heavy rainfall generally over a period of less than 6 hours. The National Weather Service (NWS) and the New England River Forecast Center issue flood watch, flood warning, and flash flood watch and warnings through MEMA, Emergency Alert System (EAS) and the news media. A flood watch is issued if the flood stage is forecast to be reached or exceeded in 12 to 24 hours. A flood warning is issued if the flood stage forecast suggests that the flood stage for a given location will be reached or exceeded within 12 hours.

A flash flood watch would be issued if rainfall may reach or exceed the 1 or 3-hour rainfall values or amount needed to produce flooding on small streams in a forecast zone. A flash flood warning is issued based on radar or observation that the 1 or 3-hour rainfall values will be exceeded.

State and local regulations play a role in providing flood protection. Wetlands, streams, rivers, ponds, etc. (referred to as Resource Areas) are protected under Massachusetts Wetlands Protection Act (M.G.L. c. 131, sec. 40—WPA) and locally under the Town of Framingham Wetlands Protection Bylaw (Article V, Section 18). Under the WPA: "No person shall remove, fill… or alter any bank, fresh water wetland, coastal wetland, dune, salt marsh, meadow, or swamp bordering any estuary, creek, river, stream, pond, or lake or any land under such waters…without filing written notice of his intention to so remove, fill, dredge or alter including such plans as may be necessary to describe such activity and its effect on the environment and without receiving and complying with an order of conditions." Proposed activities within 100 feet of said Resource Areas or 200 feet of perennial streams (streams that flow year-round) also require review and approval by the Conservation Commission.

The Town's Wetlands Protection Bylaw (Bylaw) provides additional protection to Resource Areas and Buffer Zones. Article V, Section 18.2 of the Bylaw states: "Except as permitted by the Conservation Commission, no person shall remove, fill, dredge build upon, or alter areas within 125 feet of any freshwater wetland, lake, pond, marsh, wet meadow, bog or swamp; any bank, beach, or flat; any lake, river, pond, or stream: any land under said waters; any land subject to flooding: Riverfront Area; or land subject to inundation by surface water during the 100 year event. " Additionally the Commission "may establish a no work/no alteration zone as appropriate to each application."

Road closing during March 2010 storm

Wetlands absorb and detain surface waters which help maintain relatively stable groundwater levels and prevent downstream damage. Development and activities that damage or replace wetlands with impervious surfaces result in increased runoff rates, reduced flood storage and elevated peak flows, leading to greater potential for damage from storms.

Other flood protection is naturally occurring or engineered. Cedar Swamp in Westborough provides a natural upstream storage area for the Sudbury River. The storage area helps decrease peak flows and

the severity of flooding along the river as it passes through the town. The Sudbury Reservoir and the Framingham Reservoir system also provide some storage volume that decreases peak flood flows on the Sudbury River within Framingham. The U.S. Army Corps of Engineers has constructed flood protection dikes and walls along a portion of the Sudbury River in the Saxonville area of the town. This project reduces the threat of flooding in much of the Saxonville area.

Location

Areas in each community that are vulnerable to flooding are usually well-known. When a water body can no longer accommodate increased discharge from heavy rains or snow melt, the excess water flows onto the adjacent land. This area is known as the "floodplain," defined as the land adjacent to streams, lakes, or rivers, which is likely to flood during a storm. Floodplains are categorized according to the average frequency of flooding. Thus, the "100-year floodplain" is an area of land likely to be flooded once every 100 years, i.e. there is a 1% chance that the land will be flooded in any given year.

Floodplains are delineated on the basis of topography, hydrology, and development characteristics of the area. FEMA conducts Flood Insurance Studies (FIS) and creates Flood Insurance Rate Maps (FIRM) to provide assessments of the probability of flooding at a given location. FIRMs illustrate areas that would be inundated during a 100-year flood, floodway areas, and elevations marking the 100-year-flood level. They also include base flood elevations and areas located within the 500-year floodplain. FIRMs are the basis for implementing floodplain regulations. FIRMs are also used by insurance agents and mortgage lenders to determine if flood insurance is required and what insurance rates should apply.

FEMA conducted many FIS in the late 1970s and early 1980s. These studies and maps represent flood risk at the point in time when FEMA completed the studies. In Framingham's case, the 100 and 500-year floodplains were mapped in 1992. FEMA flood maps are not entirely accurate given that they represent flood risk at the point in time when FEMA completed the studies and do not incorporate floodplain changes due to potential new development. Manmade and natural changes to the environment may change the floodplain boundaries. These maps were subsequently revised in 2010 and 2014 to make minor adjustments for the topographic contours and create electronic versions of the floodplain maps that can be used by the Town's Geographic Information System (GIS). Combined with other layers in the Framingham's GIS System, the revised FIRMs help the Town more easily determine which properties are in the floodplain and vulnerable to flooding.

The areas included in the FIS are listed in Table 4.1 and shown on Map 1. The 100 and 500-year floodplains have not changed significantly since the first edition of this Plan.

Table 4.1 – Flood Potential

Rivers	Limits of Detailed Study
Sudbury River	Entire Length
Reservoir No. 1-North Branch	From Reservoir No 1 Dam to the Reservoir No. 3 Dam
Reservoir No. 3	From Reservoir No. 3 Dam to a point approximately 0.5 mile upstream of the Pleasant St. bridge.
Angelica Brook	From its confluence with Reservoir No. 3 to a point approximately 0.1 mile upstream of Angelica Dr.
Beaver Dam Brook	From a point approximately 180 feet downstream of Second St. to a point approximately 2.2 miles upstream
Cochituate Brook	From its confluence with the Sudbury River to the CONRAIL bridge
Hop Brook	From a point approximately 0.25 mile downstream of the Colonial Dr. bridge to a point approximately 2.2 miles upstream.
Baiting Brook	From its confluence with Beaver Dam Brook to a point approximately 0.8 mile upstream.
Brook from Waushakum Pond	From its confluence with Beaver Dam Brook to a point approximately 0.8 mile upstream

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East Outlet	From its confluence with the Sudbury River to divergence from Baiting Brook
Birch Meadow Brook	From its confluence with East Outlet to an approximately 90 feet upstream of the Weston Aqueduct

***Source**: FEMA, 1992, 2010.*

Areas having low development potential and minimal flood hazards are portions of Baiting Brook, Cochituate Brook, Hop Brook, Course Brook, Dunsdell Brook, East Outlet, Birch Meadow Brook, and numerous unnamed tributaries. These areas were studied by approximate methods, as opposed to detailed methods, due to the infrequencies of flooding.

Development in floodplains is regulated by various government bodies in order to protect the health and safety of people in the area as well as property. Unregulated and illegal development in the floodplain can increase the likelihood of flooding by decreasing flood storage and increasing the surface runoff into the stream channel. In addition, water contamination from flood-damaged sewage or septic systems and debris swept downstream from flooded properties can result in unnecessary hazards to those downstream.

Low lying areas of Framingham are subject to periodic flooding. These occasional floods are caused by the overflow of the Sudbury River, the reservoirs, Hop Brook, Angelica Brook, Beaver Dam Brook, Dam Brook, Brook from Waushakum Pond, Eames Brook/ Farm Pond, Baiting Brook, and Cochituate Brook.

In addition to the areas identified by the FIS, DPW, Fire Department, and Police Department identified the following areas as having frequent flooding:

- Lokerville Brook–Bishop Street Area
- Reservoir No. 3–Vallaincourt Drive, Westgate Road
- Farm Pond–Downtown, Park Street Area including Beech Street and the Common
- Dunsdell Brook–Brook Street, Scott Drive and McAdams Road
- Waushakum Pond–Berry Street and Gilbert Street
- Beaver Dam Brook–Waverly Street, Beaver Court, Beaver Street, Second Street, Morton, Street, Herbert Streets and Taralli Terrace
- Sudbury River–Circle Drive, Trafton Road, Bare Hill Road and Maple Street
- Sudbury River – Edgell Road
- Baiting Brook–Wayside Inn Road
- Angelica Brook–Lanewood Drive and lower Angelica Drive
- Sucker Brook–Walnut Street residences (not including the roadway)
- Hop Brook–Gregory Road, Sloane Drive, and Hemenway Road
- Cochituate Brook – Concord Street, Speen Street

Additional locations with flooding problems were noted at the first Public Hearing conducted during the development of the original Plan and the 2017 Update. Information was also obtained from responses to the Hazard Information Sheets distributed at the original meeting. The following are locations with additional flooding problems:

- Sudbury River – the areas between the Reservoir Number 1 dam and the Central Street dam, particularly just north and south of where the Sudbury River goes under Route 9 including Auburn, Beulah, Walnut and Main Streets, Union Avenue and Circle Drive.
- Edmands Road – water pooling across the road during extreme weather events was noted.

Manual stream gauge at Watson Place during March 2010 storm

Extent

The extent of flooding is measured by water level elevations. The Town owns and operates five

automated and one manual stream gauge located throughout Town, as shown on Table 4.2 and the image above-right, to measure water levels. An alarm is triggered based on pre-programmed water levels, also summarized in Table 4.2. All elevations use the NGVD29 datum.

Table 4.2 – Summary of Stream Gauges

Location	Nearby facility	Base gauge elevation	High Alarm	High-High Alarm	100-Year Flood Elevation **
Watson Place, at lower manual gauge, observation platform	King Sewer Pump Station	117.40 * Display = 4.9	119.40 * Display = 6.9	121.40 * Display = 8.9	126.0 * Display = 13.5 / 26
Beaver Dam Brook at Taralli Terrace (upstream headwall)	Police Substation at Taralli Terrace and Beaver Park Road	143.93	148.3	149.8	151.0
Sudbury River, northwest abutment of Main Street bridge	Worcester Road Pump Station	149.34	152.5	156	155.0
Dunsdell Brook at McAdams (upstream headwall)	Edgell Road Water Pump Station	203.72	205.2	206.7	[none for this location]
Hop Brook at 62 Hemenway Road (downstream headwall)	Hemenway Pump Station	165.40	167.4	168.4	175.0

** The display for the Watson Place gauge as described in the DPW's Stormwater Management Plan and the U.S. Army Corps of Engineers Saxonville Levee Operations Manual is set to match the existing staff gauge (subtract 112.5 ft from NGVD29 elevation), which is in turn used to set the action levels for management of the Saxonville Levee emergency operations (add 12.5 ft to staff gauge elevation).*
*** 100-year flood elevations and streambed elevations taken from FEMA Flood Insurance Study July 7, 2014, and adding 0.8 ft to convert from NAVD88 to NGVD29.*

Previous Occurrences

There have been major flood events in Framingham's history during significant storm events. Table 4.3 includes a summary of major flooding events, many declared federal disasters.

Table 4.3 – Summary of Major Flooding Events

Date	Type	Geographical Scope	Description
March 1987	Floods	Statewide	
April 1987	Floods	Statewide	
August 1991	Floods	Middlesex County	
October 1996	Floods	Middlesex County	
June 1998	Floods	Middlesex County	
January 15, 1999	Floods	Framingham	Rainfall of 1-2" combined with rapid snowmelt. Problem aggravated by clogged storm drains
March 22, 2001	Floods	Middlesex County	Declared a federal disaster area
October 2005	Floods	Middlesex County	
May 2006	Floods	Statewide	Declared a federal disaster area
July 7, 2009	Floods	Middlesex County	Rainfall of 5 inches in 3 hours
March 14-15, 2010 & March 30-31, 2010	Floods	New England region	Declared federal disaster area
August 27, 2011 – August 29, 2011	Floods	Statewide	Tropical Storm Irene Declared federal disaster area

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October 27, 2012 – November 8, 2012	Floods	Statewide	Hurricane Sandy
February 8, 2013 – February 10, 2013	Floods	Statewide	

Some areas of the Town are more flood prone and experience flooding on a more regular basis. The following summarizes recent flood events:

- The most severe flooding in recent memory occurred in the Sudbury River in August of 1991 as a result of back-to-back hurricanes. Many of the bridges over the Sudbury River were flooded and impassable. The Massachusetts Turnpike was damaged and there was flooding of the Sudbury River in the Central Street area. The Saxonville neighborhood was severely damaged and the Reservoir No. 1 Dam at Winter Street was overtopped.
- A storm in October of 2005, which flooded the Sudbury River and Beaver Dam Brook. Beaver Street and Taralli Terrace were closed. Route 9 experienced severe flooding, especially at the intersection with Concord Street (Route 126).
- The "Mother's Day Storm" in May of 2006, which flooded the Sudbury River and Beaver Dam Brook, resulting in making several roads impassable, including Herbert Street, Taralli Terrace, Beaver Street, and Second Street. Homeowners were evacuated, sometimes using boats since roadways were flooded with up to 4 feet of water.

Flooding at Gregory Road at northern Hop Brook Crossing after July 2009 storm

- A storm in July of 2009, which dropped 5 inches of rain in 3 hours in the northern sections of the town. Hop Brook, Baiting Brook, and Angelica Brook overtopped their channels, causing flooding in many homes. Many roads were impassable due to street flooding, especially in the area of Hemenway Road, Gregory Road, and Sloane Drive but also including Wayside Inn Road, Edmands Road, and Lanewood Avenue/Angelica Drive.
- Two storms in March of 2010, which flooded the Sudbury River to a record high level (13.99 feet according to the United States Geological Survey (USGS) streamgage at Saxonville) made several roads impassable, including Auburn Street, Auburn Street Extension, Beulah Street, Circle Drive, Taralli Terrace, Beaver Street, and Second Street. Homeowners were evacuated on Circle Drive. The storms occurred March 14-15 and March 29-31. DPW staff mobilized to prepare to close the Concord Street Flood Gate for the Saxonville Levee on March 31, however the final flood elevation was 9 inches below the trigger to close the gates, and therefore closure was not required.

Sudbury River at Concord Street bridge during March 2010 storm, looking west with flood gates on far side of bridge

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Another useful tool to determine the location of areas vulnerable to flood and severe storm hazards is the National Flood Insurance Program Repetitive Loss (RL) and Severe Repetitive Loss (SRL) Property Data. The National Flood Insurance Program (NFIP) flood loss structure information was obtained from FEMA and MEMA. As of November 2015 (latest information available when preparing this update), 210 loss claims have been recorded in Framingham, of which 158 have been closed with a total payment of $1,264,615. Fifty-one claims were closed without payment and 1 remains open. Of the loss claims, 16 properties had experienced repetitive flood loss (two or more claims of more than $1,000 were paid by the NFIP within any rolling ten-year period). One property in Framingham has had severe repetitive loss (met at least one of the following criteria: 4 or more separate claim payments of more than $5,000 each or 2 or more separate claim payments where the total of the payments exceeds the current value of the property). The properties which have claimed losses are depicted on Map 1.

Table 4.4 – Summary of National Flood Insurance Program Loss Property Data

Community	# of policies	SRL Properties	RL Properties	Total loss claims	Total payment for claims
Framingham	656	1	16	210	$1,264,615

Town-wide data obtained from FEMA (https://www.fema.gov/policy-claim-statistics-flood-insurance), dated 11/30/2015.
SRL = Severe Repetitive Loss
RL = Repetitive Loss

Although there have been large storms since the last update of the plan, there have not been additional significant flooding events.

Probability of Future Events

The frequency and locations of future flood hazard events in Framingham can be estimated based on a number of sources of information, including the FIRMs and NFIP loss damage. As stated earlier, areas within the 100-year floodplain have a 1% chance of being flooded in any given year.

Vulnerability

Areas within the 100-year flood plain as shown on Map 1 are most vulnerable to flooding. Because of the historic development of Framingham, most of these areas were developed as residential and these homes are most vulnerable to flooding. The Town's infrastructure that support these areas (i.e. roads, water, sewer, and drainage) are also vulnerable.

An indicator of vulnerability to flooding is to assess the potential losses to Town facilities. To assess the vulnerability of the Town-owned facilities, an analysis was conducted with the Town's GIS and the FEMA flood data to identify which Town-owned facilities are located within the 100-year floodplain. With the exception of 20 sewer pump stations, none of the Town's critical facilities is located within the 100-year floodplain. A cost estimate for repairing potential flooding damage was not conducted.

Areas of Town that are experiencing growth and development may have an increase in their vulnerability to and impact from associated hazards due to increased impervious surfaces and the resulting increase of stormwater flow to low lying areas. As part of the plan update process, the Working Group considered how on-going or future development may impact flooding risk. As a result of development, approximately 24% of the Town consists of impervious cover. As more land is developed, additional impervious surface is created, potentially increasing the flood risk and decreasing the area available for flood storage. The most vulnerable areas of development are land uses that are currently agricultural, wooded, or open space that could be developed residentially or commercially. Redevelopment projects (which are anticipated more than large new developments) often allow opportunities to improve storm water management and reduce flooding risk.

As development continues in Framingham, the Town's jurisdictional review boards (i.e. Planning Board, Conservation Commission, and Zoning Board of Appeals) consider the impact that the new development will have on flooding hazards and ensure that development complies with Town regulations to help mitigate potential impacts. No new development is anticipated in the 100-year floodplain, but any proposed impacts to the 100-year floodplain would be required to provide compensatory flood storage capacity through government action.

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As part of this update, the Working Group examined projects submitted to the Planning Board for permitting since 2010. Large scale projects generally need to undergo review by the Planning Board; therefore, the Working Group felt it made sense to examine those projects which were located in the floodplain. The full list of all Planning Board projects located in the floodplain which have undergone review since 2010 is in Appendix D. There have not been significant developments within the floodplain since 2010. Almost all of the projects consist of previously developed sites.

The Working Group also considered the potential flooding impacts of the following known proposed development projects:

- The Danforth Green residential complex in northeastern Framingham is currently under construction. The development incorporates stormwater management best management practices and has area reserved for conservation. This development is not expected to increase vulnerability to flooding.
- Following recent rezoning of the downtown area, redevelopment is expected to increase. The downtown area drains to the Beaver Dam Brook watershed that already experiences flooding. Redevelopment projects will be required to maintain or improve stormwater management and not increase the vulnerability to flooding for downstream properties.
- Northwestern Framingham is one of the less developed areas of Town and currently supports agricultural use. The Town expects residential development will be proposed in this area in the near future as developers have already approached Town departments. This development could increase the vulnerability to flooding since this area is located in headwaters to the Sudbury River, includes two dams, and has had other flood mitigation projects.

4.1.2 Dam Failure

Massachusetts law defines a dam as any artificial barrier, including appurtenant works, which impounds or diverts water, and which is (1) 25 ft or more in height and (2) has an impounding capacity at maximum water storage elevation of fifty acre-feet or more. A jurisdictional dam is any dam over six feet in height, regardless of storage capacity, or with a storage capacity of over fifteen acre-feet, regardless of height.

Dam failure is a highly infrequent occurrence, but a severe incident could prove deadly. Since 1984, three dams have failed in or very near to Massachusetts (one of which resulted in a death) and two have come very close to failing.

There are over 2,500 dams in the state. Of these, the Army Corps of Engineers in conjunction with DCR has classified over 50 as “structurally unsafe”. Three hundred dams including over 40 of the “unsafe dams” are designated as “high hazard” dams by DCR’s Office of Dam Safety, under Dam Safety Regulations 310 CMR 10.00. Section 10.06(3) defines “High Hazard” as: “Dams located where failure or misoperation will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).” Many of the dams in the state were built in the 19th century during the industrial revolution; some even date back to the late 18th century. These structures are definite hazards that must be considered when planning for the safety of residents. Even dams which, theoretically, would pose little threat under normal circumstances can overspill or fail under the stress of such cataclysmic events as an earthquake.

Location

There are nine dams in Town which are shown on Map 1 and summarized in Table 4.5.

Table 4.5 – Summary of Dams

Dam Name	Impoundment	Receiving Waterbody	Owner	Hazard[1] Potential
Central Street Dam	Saxonville Pond	Sudbury River	Private - Saxonville Realty Trust	High (Class I)
Reservoir No. 1 Dam	Reservoir No. 1 (Stearnes)	Sudbury River	DCR	High (Class I)

Reservoir No. 2 Dam	Reservoir No. 2 (Bracket)	Reservoir #1	DCR	High (Class I)
Reservoir No. 3 Dam	Reservoir No. 3 (Foss)	Reservoir #1	DCR	High (Class I)
Lake Cochituate Dam	Lake Cochituate	Cochituate Brook	DCR	High (Class I)
Constance M. Fiske Dam	Pl566 Flood Control Site	Baiting Brook	DCR	High (Class I)
Mt. Wayte Outlet Works	Farm Pond	Eames Brook	DCR	Significant (Class II)
Packard Dam	Baiting Brook	Baiting Brook	Private - Sudbury Valley School	Low
Fiddlers Green Dam	Sudbury River	Sudbury River	Private - Roger G. Patten	Non-jurisdictional
Landham Pond Dam	Landham Pond	Hop Brook	Town of Framingham	Non-jurisdictional

[1]*Hazard classifications are described below in* ***Extent***

Fiddlers Green Dam and Landham Pond Dam do not meet the definition of a dam because of height or impounded capacity and, therefore, have no federal or state requirements. Non-jurisdictional and low hazard dams were not analyzed further as a natural hazard affecting the Town.

In addition to the dams mentioned above that are within the Town, the Sudbury Reservoir Dam is located just west of the Framingham/Southborough town line, and has also been rated as a high hazard dam.

Below are brief descriptions of the high and significant hazard dams that could potentially impact Framingham.

The Central Street Dam is located on the Sudbury River and impounds Saxonville Pond. The dam is owned by Saxonville Realty Trust and maintained in cooperation with the Town of Framingham. The dam is a composite masonry and earth structure. Based on a hydraulic and hydrologic analysis completed by the Army Corps of Engineers included in the Phase I Inspection Report, the existing spillway of the dam appears to be adequately sized to pass the test flood outflow (10,000 cfs [cubic feet per second] = half of Probable Maximum Flood). The last inspection performed by the DCR Office of Dam Safety found that the dam was in fair condition and no evidence of apparent conditions requiring emergency actions was noted. The Massachusetts Department of Transportation began construction of the Central Street Bridge next to the dam in 2015 and completed construction in 2016. Recommended improvements to the bridge and surrounding infrastructure such as abutment repairs are included as part of the bridge project.

Reservoir Number 1 (Stearnes) Dam is located on the Sudbury River near Winter Street. The Dam along with the related water storage and supply facilities is owned and operated by DCR. Water transmission into and from the reservoir for public use is accomplished by means of gates and conduits owned and operated by the MWRA (MDC 1995).

The spillway discharge from the Reservoir Number 1 Dam is conveyed by the Sudbury River to Concord, where it joins the Assabet River. The dam consists of two earthen embankments separated by a stone masonry spillway and a gate house structure. The total length of the dam is approximately 800 feet.

The overflow spillway crest is approximately 168 feet long and 9.5 feet lower than the top of the dam. The spillway was designed to operate with up to 1.75 feet of flashboards, which have not been used recently. A gatehouse structure is located to the right of the spillway. A 48-inch cast-iron supply pipe from upstream Reservoirs Number 2 and 3 enters the upstream side of the structure. The arrangement of ten gates and various chambers in the gate house is such that water from Reservoir Number 1 and/or the 48-inch pipe can be released to the Sudbury River or diverted into the Sudbury Aqueduct, a horseshoe-shaped water supply aqueduct that flows to the Chestnut Hill Reservoir in Brookline. Note that this aqueduct has not been utilized in many years and its structural integrity is unknown.

Reservoir Number 2 (Brackett) Dam and Appurtenances is located on the Sudbury River about one mile upstream of the Reservoir Number 1 Dam. The Dam along with the related water storage and supply facilities is owned and operated by DCR. Water transmission into and from the reservoir for public use is accomplished by means of gates and conduits owned and operated by the MWRA (MDC 1995).

The spillway from Reservoir Number 2 Dam discharges into Reservoir Number 1. An earth embankment structure with a stone masonry core, the dam is approximately 1,340 feet long. The dam impounds water in Reservoir Number 2; Reservoir Number 1 is immediately downstream of the dam.

The overflow spillway is a stone masonry structure approximately 186 feet long. There are training walls on either side and there is a cast-iron framework of an abandoned walkway on the crest. The walkway was used to provide access to the spillway for the installation and removal of flashboards. Both the flashboards and the walkway have been removed. A gatehouse is located on the right side of the spillway.

Reservoir Number 3 (Foss) Dam and Appurtenances is located on Stony Brook about 0.8 miles upstream of its confluence with the Sudbury River. The Dam along with the related water storage and supply facilities is owned and operated by DCR. Water transmission into and from the reservoir for public use is accomplished by means of gates and conduits owned and operated by the MWRA (MDC 1995).

The spillway from Reservoir Number 3 Dam discharges into Reservoir Number 1. The length of the dam is approximately 1,640 feet. The spillway is 100 feet long and has a narrow-crested stone masonry weir. There are no stop logs or flashboards on the crest of the spillway. The channel below the spillway is a 200-foot wide pond that is part of Reservoir Number 1.

Lake Cochituate Dam**,** located on the western side of Lake Cochituate near the Natick town line, is owned and operated by DCR. The channel below the dam is Cochituate Brook, which flows northwesterly into the Sudbury River (MDEM 2002).

Constance M. Fiske Dam**,** located on the southern side of Callahan State Park, is owned and operated by DCR. The Soil Conservation Service constructed the flood control project for the Baiting Brook watershed in the 1980s to reduce the severity of flooding along major portions of Baiting Brook and Birch Meadow Brook. The project includes a 26 feet high, 690 feet long earthen dam on Baiting Brook. Maximum discharge is 818 cubic feet per second. Its capacity is 885 acre feet. Normal storage is 9 acre feet. It drains an area of 1.9 square miles.

Mt. Waite Outlet Works, located at the end of Sherwin Terrace and adjacent to the Town's Recycling Drop-Off Center at 255 Mount Wayte Avenue, consists of an earthen berm, flood gate, and pump support structure. It was designed to control backflow from the Sudbury River into Farm Pond during high water conditions.

Sudbury Reservoir, located in the Town of Sudbury and built between 1894 and 1898, is by far the largest water body in the Framingham area. With a surface area of 1,292 acres (MDC 2002) it is well over twice the size of Framingham Reservoirs 1, 2, and 3 combined. The reservoir has a volume capacity of 7.254 billion gallons, which is more than 3.5 times more than combined total of Framingham Reservoirs 1, 2, and 3.

The Sudbury Reservoir Dam is roughly 0.2 miles west of the Southborough/Framingham town line. The 2,000 foot-long dam (MDC 2002) along with the related water storage and supply facilities is owned and operated by DCR. Water transmission into and from the reservoir for public use is accomplished by MWRA-operated gates and conduits. Water from the Sudbury Reservoir (elevation 259 feet above sea level) flows over the dam into the Framingham Reservoir Number 3 (elevation 154 feet). Based on an analysis of 1876 to 1972 MDC flow data (MDM, 1997), an average of 21 MGD (million gallons per day) flow over the Sudbury Reservoir Dam.

Extent

Structural failure or misoperation of dams can result in the release of the impounded area. A dam failure that is seepage or small breach where the water stays within the downstream river channel is considered to be of minor severity. A breach large enough to exceed the capacity of the receiving water body and overflow causing damage to homes, businesses, critical facilities, state buildings and putting people at

risk is considered of major severity. This includes situations where the dam flow control manager releases more water than can be contained in the banks of the downstream river or creek channel.

The extent or magnitude of a dam failure event is described in terms of the classification of the damages that could result from a dam's failure; not the probability of failure. Damages may include loss of human life, economic loss including property damage, lifeline disruption and environmental damage. The DCR's Office of Dam Safety classifies dams by Hazard Potential under the Commonwealth's dam safety rules and regulations as summarized in Table 4.6.

Table 4.6 – Dam Hazard Classification

Classification	Hazard Potential
High Hazard (Class I)	failure will likely cause loss of life (7 or more) and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads
Significant Hazard (Class II)	failure may cause loss of life (1 to 6 lives) and damage to homes, industrial or commercial facilities, secondary highways or interruption of use or service of relatively important facilities
Low Hazard (Class III)	failure may cause minimal property damage to others. Loss of life is not expected

Previous Occurrences

There have been no dam failures in Framingham.

Probability of Future Events

The owners of the dams in Town comply with the federal and state regulations for dam safety and adhere to their operations and maintenance plans. Because of the ongoing operations and maintenance, there is a low probability of dam failure.

Vulnerability

As noted above, five dams in Framingham are classified as High (Class I) hazard potential dams by DCR under the Commonwealth's dam safety rules and regulations due to potential loss of life and property should a dam failure occur. As a result, the owners of high hazard dams maintain emergency actions plans (EAP). The areas immediately downstream of the dams are the most vulnerable and these potential inundation areas are specified in each EAP. The EAPs include specific procedures for each dam for emergency detection, evaluation, and classification, as well as emergency response procedures.

4.1.3 Ice Jams

Ice jams occur in the winter or early spring when normally flowing water begins to freeze. There are two types of ice jams: a freeze up and a breakup jam. A freeze up jam forms in the winter as ice formation begins. This type of jam can act as a dam and begin to back up the flowing water behind it. The second type, a break up jam forms as a result of the breakup of ice cover, causing large pieces of ice to move downstream potentially acting as a dam, blocking water flow in culverts and around bridge abutments.

Based on historic data, it was determined that there have been no recorded ice jams in the Town of Framingham. Therefore, ice jams were not analyzed further as a natural hazard affecting the Town.

4.2 Wind-Related Hazards

Wind-related hazards are associated with thunderstorms, hurricanes and tornadoes, and can result in a variety of problems, e.g., trees toppling, damage to buildings and cars, downed power lines. Table 4.7 summarizes the potential effects of various wind speeds. Winds measuring less than 30 mph are generally not considered to be hazardous.

The Wind Resources Map available through the Community Wind Collaborative, which was available during the initial development of this Plan in 2005, showed that most areas in town have an average wind speed of 12 to 13 mph. Winds in two elevated areas, specifically Nobscot Hill and Indian Head Hill,

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average 13 to 16 mph, which are not significantly higher than in other parts of Framingham. Although wind storms have caused damage such as knocking down trees or power lines, wind storms do not create significantly more impacts in these elevated areas compared with other areas in the town.

Table 4.7 – The Effect of Wind Speed

Wind Speed (mph)	Wind Effects
25-31	Large branches will be in motion
32-38	Whole trees in motion; inconvenience felt walking against the wind
39-54	Twigs and small branches may break off trees; wind generally impedes progress when walking; high profile vehicles such as trucks and motor homes may be difficult to control
55-74	Potential damage to TV antennas; may push over shallow rooted trees especially if the soil is saturated
75-95	Potential for minimal structural damage, particularly to unanchored mobile homes; power lines, and signs; and tree branches may be blown down
96-110	Moderate structural damage to walls, roofs and windows; large signs and tree branches may be blown down; moving vehicles pushed off roads
111-130	Extensive structural damage to walls, roofs, and windows; trees blown down; mobile homes may be destroyed
131-155	Extreme damage to structures and roofs; trees uprooted or snapped
Greater than 155	Catastrophic damage; structures destroyed

Source: *Washington County Office of Consolidated Emergency Management*

4.2.1 Thunderstorm Winds

Thunderstorms are essentially storms containing lightning and thunder and are characterized by moisture, rising unstable air, and a lifting mechanism.[2] During strong or severe thunderstorms, a burst of intense winds can flatten buildings and knock down trees. These winds, known as 'downbursts', are often mistaken for tornadoes due to the severity of the damage. A downburst features air diving toward the surface, whereas a tornado is composed of rising air.

Location

Thunderstorms and associated winds impact the entire Town of Framingham equally. They are not concentrated in specific areas. As mentioned earlier, Nobscot Hill and Indian Head Hill contain winds at slightly greater speeds than other areas in Town; however, this is due to the elevated topography of these areas not the occurrence of thunderstorm events.

Thunderstorm winds affect relatively small areas when compared with hurricane winds and winter storms. The typical thunderstorm is 15 miles (24 kilometers) in diameter and lasts an average of 20 to 30 minutes.

Extent

The NWS considers a thunderstorm severe if it produces air at least three-quarters of an inch (2 centimeters) in diameter, has wind gusts of 58 miles (93 kilometers) an hour or higher, or produces a tornado. Although lightning can be deadly, the NWS does not use it to define a severe thunderstorm. If it did, every thunderstorm would be severe, by definition. Also, excessive rainfall may lead to deadly flash flooding, but heavy rain is not a "severe" criterion either. Of the estimated 100,000 thunderstorms occurring each year in the United States, only about 10 percent are classified as severe.

[2] Commonwealth of Massachusetts State Hazard Mitigation Plan (SHMP) 2013

Previous Occurrences

The State of Massachusetts experiences 10-30 thunderstorm days each year.[3] Table 4.8 describes a summary of past occurrences of major thunderstorms and associated winds in Framingham.

Table 4.8 – Summary of Major Events Related to Thunderstorm Winds

Date	Type	Geographical Scope	Description
March 21, 1976	Thunderstorm		
August 4, 1993	Thunderstorm Winds	Framingham	Power lines and trees knocked down, lightning
February 26, 1996	Thunderstorm Winds		
June 1998	Thunderstorm	Middlesex County	Flooding and winds affecting many parts of Central and Eastern Massachusetts
June 2, 2000	Thunderstorm Winds/Hail	Framingham	Winds downed trees, branches, and power lines; dime sized hail
May 12, 2001	Thunderstorm Winds	Framingham	Uprooted trees, smashed windows (Cornell Rd. area)
July 1, 2001	Thunderstorm Winds	Framingham	Power lines down. Lightning struck apartment building ($125,000 damage)
July 7, 2009	Thunderstorm	Framingham	Flooding, wind, road closures
August 20, 2011	Severe Thunderstorm Winds	Middlesex County	Quarter sized hail and damaging winds causing down trees and power lines and affecting many parts of Massachusetts

Source: *Framingham MHMP 2005, Commonwealth of Massachusetts SHMP 2013*

Probability of Future Events

State and local records indicate an increase in severe storms including thunderstorms and associated winds, as shown in Table 4.8. With frequency and severity of storms correlated to climate change, the probability of thunderstorms and associated winds occurring and causing damage to property in Framingham is expected to only increase. The location of these storms and winds is expected to not be concentrated in specific areas but affect the Town equally as seen today and in the past.

Vulnerability

Loss of utilities, impassable roads, property damages, and blackout events are all caused by downed trees and power lines from thunderstorm winds. Although fatalities are unlikely during these events, thunderstorm winds can cause severe damage and injury. Residents living in areas with many trees near their homes, especially older unhealthy trees, are more susceptible to damages and impacts from downed trees and power lines.

4.2.2 Hurricane/Tropical Storm Winds

According to the Commonwealth of Massachusetts's State Hazard Mitigation Plan 2013 (SHMP), tropical storms are characterized by a low-pressure center and numerous thunderstorms that produce strong winds and heavy rain. A hurricane is a more detrimental tropical storm in which winds reach speeds of 74 miles per hour or more and blow in a large spiral around a relatively calm center. The eye of the storm is usually 20-30 miles wide and may extend over 400 miles. The dangers of the storm include torrential rains, high winds and flooding. It produces measurable damage from heavy rainfalls, winds, and flooding.

High winds are a primary cause of hurricane-inflicted loss of life and property damage. Several unsuccessful programs have studied ways to "defuse" hurricanes in their developing stages; more recent hurricane damage-mitigation steps have included better warning systems involving real-time satellite imagery. A hurricane watch is issued when there is a threat of hurricane conditions within 24-36 hours. A

[3] Commonwealth of Massachusetts State Hazard Mitigation Plan (SHMP) 2013

hurricane warning is issued when hurricane conditions (winds greater than 74 mph or dangerously high water and rough seas) are expected in 24 hours or less.

Location

The entire State of Massachusetts is affected by tropical storms, hurricanes, and their associated winds (see the images below for paths of previous occurrences of tropical storms in Massachusetts), especially coastal areas. Specifically in Framingham, tropical storms, hurricanes and their associated winds occur equally town-wide. There are not specific locations in town affected by these impacts. Additionally, when a hurricane makes landfall it does not only impact Framingham as these events are regional in nature.

Extent

The Saffir-Simpson scale is used to categorize hurricanes based on wind speeds. A Category 1 hurricane (minimal) contains wind speeds of 74-95 mph, whereas a Category 5 hurricane (catastrophic) contains wind speeds of greater than 156 mph.[4] Since 1851, 3 hurricanes which occurred within 20 nautical miles of the Town of Framingham were Categories 1, 2, and 3.[5]

Previous Occurrences

Since 1851, 70 tropical systems have impacted Massachusetts within 65 nautical miles. Thirteen of these were hurricanes making landfall along the southern New England coast.

The worst hurricane to affect New England was the great New England hurricane of 1938, which struck on September 21st. The great New England hurricane of 1938 struck at high tide, which coincided with the highest astronomical tide of the year, pushing a storm surge of 12 to 15 feet across the south coast and up the many bays and inlets including Narragansett and Buzzards Bays. Winds of over 120 mph blew across the coastal regions. The Blue Hill observatory, in Milton MA, recorded a sustained five-minute wind of 121 mph and a peak gust of 186 mph. Parts of interior Connecticut and Massachusetts not only bore the brunt of high winds, but also experienced severe river flooding as rain from the hurricane combined with heavy rains earlier that week to produce rainfall totals of up to 17 inches. This resulted in some of the worst river flooding ever experienced in parts of Connecticut and Massachusetts. This powerful storm caused 564 deaths and over 1,700 injuries. Nearly 9,000 homes and businesses were destroyed with over 15,000 damaged. The boating community was equally devastated with 2,600 boats destroyed and 3,300 damaged.

Table 4.9 provides a summary of hurricanes that have affected Framingham and the region since 1635. The images below the table represent the tropical systems according to the National Oceanic & Atmospheric Administration (NOAA).

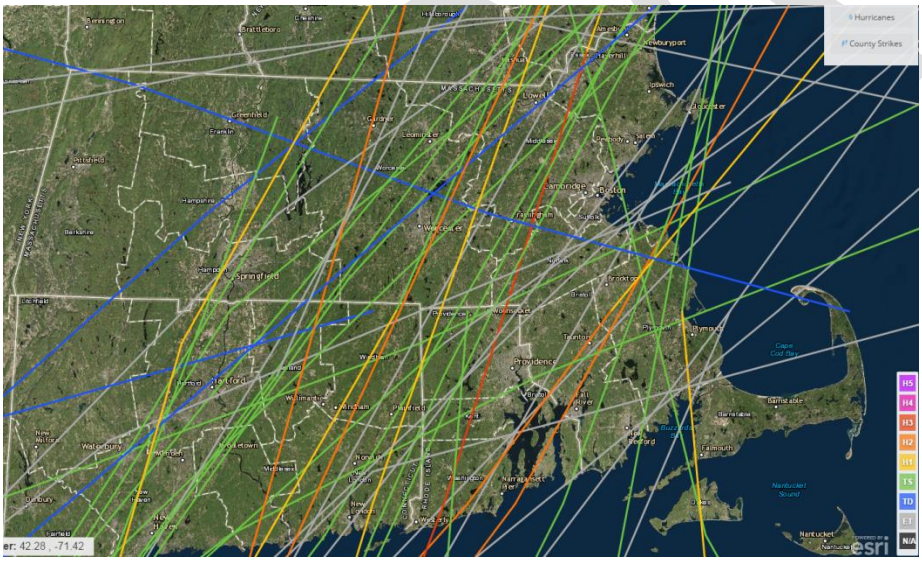
Table 4.9 – Summary of Hurricanes

Date	Type/Name	Geographical Scope	Description
August 15, 1635	Hurricane	Regional	
October 18-19, 1778	Hurricane	Regional	40-75 mph winds
April 1798	Hurricane	Framingham	
October 9, 1804	Hurricane	Regional	
September 23, 1815	Hurricane	Regional	
September 3, 1821	Hurricane	Regional	
September 15, 1858	Hurricane	Regional	Category 1; winds up to 90 mph
September 8, 1869	Hurricane	Regional	Winds in excess of 50 mph
1876	Hurricane	Framingham	
1897	Hurricane	Framingham	Winds up to 60 mph
1908	Hurricane	Framingham	

[4] Commonwealth of Massachusetts State Hazard Mitigation Plan (SHMP) 2013
[5] Data taken from the National Oceanic & Atmospheric Administration's Historical Hurricane Tracks Interactive Mapper – June 2016

1916	Hurricane	Regional	Category 1
September 21, 1938	New England Hurricane of 1938	Framingham	Winds up to 87 mph; many trees, towers, and buildings were toppled in all parts of town
September 11, 1944	Hurricane	Regional	Category 2; winds up to 125 mph
September 1954	Hurricane Carol	Regional	Category 1; 80-100 mph winds; downed trees and power lines
August 1955	Hurricane Connie	Regional	
August 1955	Hurricane Diane	Regional	Category 3; one of the costliest hurricanes in U.S. history; sustained winds of 120 mph; between 184 and 200 deaths
September 1960	Hurricane Donna	Regional	Category 3
1969	Hurricane Gerda	Regional	Category 3
September 27, 1985	Hurricane Gloria	Framingham	Category 3; winds in excess of 70 mph
August 20, 1991	Hurricane Bob	Framingham	Category 2; winds in excess of 65 mph; 110 trees down, 6000 residents w/o power, two emergency generators depleted, $112,000 estimated damages
August 2005	Hurricane Katrina	Regional	
September 2, 2010	Hurricane Earl	Regional	Category 4; sustained winds of 145 mph; one death
August 26, 2011	Hurricane Irene	Regional	Category 2; wind speeds 46-67 mph
October 2012	Hurricane Sandy	Regional	Largest Atlantic hurricane on record; sustained winds of 110 mph; 131 U.S. deaths

Source: *Framingham MHMP 2005, Commonwealth of Massachusetts SHMP 2013*



Above: Tropical storm systems crossing Massachusetts since 1851.

Right: Tropical storm systems crossing Framingham town boundary directly since 1851.

- **Tropical Storm – Unnamed 1897**
- **Tropical Storm – Unnamed 1876**
- **Tropical Storm – Unnamed 1908**

Source: Data taken from the National Oceanic & Atmospheric Administration's Historical Hurricane Tracks Interactive Mapper – June 2016

Probability of Future Events

Though the primary threat to New England is during August and September, the region has been affected as early as June, and as late as mid-October. It is not uncommon for New England to be impacted more than once in a given season. The area has been impacted by two or more tropical storms or hurricanes in one season a total of 11 times.

Vulnerability

The strongest hurricanes, such as the great New England hurricane of 1938 and Hurricane Carol, have brought severe damage to coastal locations, while totally disrupting utility power for days from downed trees and high winds. Both the stronger hurricanes and several of the weaker tropical storms have caused inland river flooding in various parts of New England.

Coastal areas are much more vulnerable to the impacts of hurricanes than inland communities, such as Framingham. However, as past occurrences have demonstrated inland communities still witness damage from these events. Aging infrastructure coupled with underserved neighborhoods possessing limited mobility and transit options, and sprawl style neighborhood developments near previously intact wooded areas, make these areas especially vulnerable to hurricanes and their associated winds.

4.2.3 Tornado Winds

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud and accompanied by thunder, wind, lightning, heavy rain, and a loud "freight train" noise. These events are spawned by thunderstorms and occasionally by hurricanes, and may occur singularly or in multiples. They develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. Most vortices remain suspended in the atmosphere. Should they touch down, they become a force of destruction. Evacuation of high-risk areas may be required on short notice. Sheltering and mass feeding efforts may be required along with debris clearance, search and rescue, and emergency fire and medical services.

Location

According to the SHMP, areas at greatest risk of a tornado touchdown run from central to northeastern Massachusetts. However, thunderstorms have been responsible for spawning tornadoes in many parts of New England. On average six tornadoes per year touchdown somewhere in New England. One to three tornadoes per year touchdown in southern New England.[6] Many of these are in rural uninhabited areas, but when one occurs in a densely populated area, disaster strikes.

Since a tornado can happen anywhere in Massachusetts given the proper conditions, Framingham does not necessarily experience more impacts from this hazard compared to other areas although the Town is located in the central to northeastern Massachusetts belt. Tornadoes are typically localized and cover a much smaller area than a cyclone or hurricane; however, high winds from tornadoes can be widespread, violent and destructive.

Extent

The Fujita Scale (F1-F4) is the standard scale for rating the severity of a tornado as measured by the damage it causes. Since 2007, the NWS begin using an Enhanced Fujita-scale (EF) which is more complicated than the original scale but creates more specific and detailed information. Wind speeds are also measured during a tornado event, but rating a tornado on the EF is based on fatalities, injuries, and property damages.

Various strengths of tornadoes have impacted Massachusetts and the region Framingham is located, including ones of F4 magnitude. Refer to the next section for specific occurrences.

Previous Occurrences

On average, the United States experiences 100,000 thunderstorms each year and approximately 1,000 tornadoes develop from these storms. “Over the course of the last 20 years, the Commonwealth has

[6] Commonwealth of Massachusetts State Hazard Mitigation Plan (SHMP) 2013

experienced 52 tornadoes, with an annual frequency of 2.6 per year."[7] The tornadoes experienced in recent history in New England have been generated by severe summer storms.

The most devastating tornado ever to occur in New England was the Worcester Tornado of July 9, 1953, a category F4 tornado which hit at 5:08 p.m. The twister tore through Barre, Rutland, Holden, Worcester, Shrewsbury, Westborough, and Southborough. Within one minute more than 90 people were dead and over 1,300 injured. Damage estimates were placed in excess of $52 million. The National Storm Prediction Center has ranked this as one of the deadliest tornados in the nation's history.

Another damaging tornado occurred in Windsor Locks, Connecticut at about 3 p.m. on October 3, 1979. This twister lasted only about 45 to 60 seconds, but managed to kill 3 people, injure over 300, destroy 40 homes and cause $300 million in property damage.

The most recent killer tornado to strike New England occurred on May 29, 1995 in Great Barrington, Massachusetts. This tornado, with winds in excess of 200 mph, killed 3 people, injured 23 and caused an estimated $25 million in damage.

The most recent tornado to impact Massachusetts occurred June 1, 2011 affecting communities in Hampden and Worcester Counties. The EF3 tornado touched down in Westfield and traveled through West Springfield, Springfield, Wilbraham, Monson, Brimfield, and Sturbridge. The tornado caused extensive property damage and resulted in a FEMA disaster declaration.

No tornadoes have been documented in Framingham since the publication of this Plan.

Probability of Future Events

Over 80% of tornadoes strike between noon and midnight when heat is the greatest. "Tornado season" is marked from March through August, although tornadoes may occur at any time. The peak months of tornado occurrence in the Northeast are June through August, with August being the most frequent month. Southwest Massachusetts experiences the highest risk for tornadoes with the greatest risk for a tornado touchdown running from central to northeastern Massachusetts. Averages of historical occurrences can assist in predicting the probability of a future occurrence. As mentioned earlier, Massachusetts has on average experienced 2.6 tornadoes per year across the State. The probability of a tornado touchdown occurring in Framingham is low, as history demonstrates a non-frequent occurrence – although wind impacts from a regionally located tornado is more likely to occur.

Vulnerability

Densely populated areas are most vulnerable to the impacts of a tornado compared to rural areas which is home to less people and structures. Collapsing buildings are the biggest threat to human life when a tornado touches down. Urban areas are most at risk for loss of life, destruction of businesses and homes, power outages, etc. Although Massachusetts and areas of Framingham are somewhat equally threatened by the impacts of a tornado, touchdown in proximity of Framingham could cause significant damage due to its urban setting and density. Unfortunately, due to the fact that tornadoes do not frequently impact this area and occur rapidly without little advance notice, warning times and emergency preparedness are weak in comparison to other natural hazards. Underserved neighborhoods with limited mobility, the over 55 population, and residents who live in mobile homes are especially vulnerable to the impacts of tornadoes and their associated winds.

4.3 Fire-Related Hazards

There are many types and causes of fires. Wildfires, arson, accidental fires and others all pose a danger to communities and individuals. Fire kills over 4,000 and injures more than 23,000 people in the United States each year. Firefighters pay a high price for this terrible fire record as well; approximately 100 firefighters die in the line of duty each year. Direct property losses due to fire exceed $11.6 billion a year. However, America's fire losses today represent a dramatic improvement from nearly 30 years ago, attributable in large measure to significantly improved mitigation and fire prevention efforts.

[7] Commonwealth of Massachusetts State Hazard Mitigation Plan (SHMP) 2013

4.3.1 Wildfires

A wildfire is any uncontrolled fire that occurs in a suburban or a wilderness area. Other names such as brush fire, forest fire, grass fire, hill fire, mulch/peat fire, vegetation fire, and wildland fire may be used to describe the same phenomenon depending on the type of vegetation being burned. A wildfire differs greatly from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to unexpectedly change direction, and its ability to jump gaps such as roads, rivers and fire breaks.

Wildfires are usually signaled by dense smoke that fills the area for miles around. There are three different classes of wildfires:

- Surface fires are the most common type and burn along the floor of a forest, moving slowly and killing or damaging trees;
- Ground fires are usually started by lightning and burn on or below the forest floor; and
- Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees.

Location

The risk of wildfire is difficult to predict based on location. Those areas and structures that are surrounded by dry vegetation that has not been suitably cleared, such as areas where untouched forests are located, are at high risk. Northwest Framingham contains the largest contiguous area of forest and tree cover and is most susceptible to future wildfire events. Homes and buildings without functioning smoke detectors are at higher risk for fires that cause injury and increased damage. However, fire danger is generally universal and can occur to any home, business or community at practically any time.

Extent

Wildfires can occur wherever dense vegetation/forests are located, especially when said vegetation is dry. The magnitude of a particular wildfire occurrence depends on several factors such as density of vegetation, wind conditions, moisture levels due to rainfall or lack thereof, and speed and capacity of local emergency response to control the occurrence.

Previous Occurrences

Wildfire season can begin in March and usually ends in late November. The majority of wildfires typically occur in April and May, when home owners are cleaning up from the winter months, and when the majority of vegetation is void of any appreciable moisture, making them highly flammable. Once "green-up" takes place in late May to early June, the fire danger usually is reduced somewhat. Anytime during wildfire season excessive periods of heat and drought can increase the occurrence of incidents.

Framingham experienced a total of 112 brush fire responses in 2015 which is a significant increase from previous years. Incident reporting data shows a ten year historical average (2005 through 2015) of 62 brush fire responses each year.

Probability of Future Events/Vulnerability

As residential areas continue to expand into relatively untouched forested areas, more people living in these communities are increasingly threatened by forest fires in the future. Protecting structures in heavily forested areas from fire poses special problems, and can stretch firefighting resources to the limit. If heavy rains follow a fire, other natural disasters can occur, including landslides, mudflows, and floods. Once ground cover has been burned away, little is left to hold soil in place on steep slopes and hillsides. A major wildfire can leave a large amount of scorched and barren land. These areas may not return to pre-fire conditions for decades. If the wildfire destroys the ground cover, then erosion becomes one of several potential problems. Drought events, such as the one which occurred in the State in 2016, increase the probability of wildfires. We anticipate climate change to cause more frequent drought and wildfire events in the future.

The Bureau of Forest Fire Control (BFFC) is responsible for the protection of the Massachusetts' 3.5 million acres of state, public, and private forested land. The majority of information in the remainder of this section was taken from the Forest Fire Control Directory (April 2004).

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Prevention and Pre-Suppression. Human carelessness, railroads, incendiary, and burning debris are the primary causes of forest fires in Massachusetts. In 1926, the Bureau of Fire Control created a system of prevention programming and pre-suppression activities. One program is called the RFP&C (Rural Fire Prevention and Control) Program, which conducts numerous education programs to increase public awareness on the prevention and hazards of forest fires.

The BFFC is also active in the Cooperative Forest Fire Prevention Program (CFFPP). They utilize CFFP materials such as "Smokey Bear," one of the greatest fire prevention marketing efforts of our time. Weather Stations are also used to determine daily fire danger classifications for posting at the State's Forests and Parks areas. The Framingham Fire Prevention Bureau also introduces wildfire safety and prevention as part of its ongoing education.

Bureau personnel carry out pre-suppression activities, which attempt to control and reduce potential fire hazards through education, training, planning, and the maintenance of existing fire equipment. Pre-suppression work includes:

- Thick brush cut back on state forest roads; water holes constructed
- Fire breaks constructed and maintained
- General fuel reduction (also called "Prescribed Burning,") performed within forested areas, which is a precision management tool which requires good planning and perfect timing.

Fire Prevention and Open Burning Permits. In 1908, Massachusetts enacted Chapter 209, which created a permitted debris burning season in the state in order to control the increase of forest fires due to human carelessness when burning debris. Within our borders Framingham's Fire Chief has the primary responsibility for the issuance of burning permits and oversight; in 2013 the Fire Chief tightened rules when applying for local Burning Permits. The Department of Environmental Protection (DEP) determines the standards for air quality and sets open burning times and dates during the year. Under severe fire conditions, the Framingham Fire Chief, the Director of Forests and Parks (State Forester) through a proclamation by the Governor of Massachusetts, may revoke existing burning permits and prevent issuance of new permits.

Fire Detection. The BFFC provides fixed-point fire detection from 43 active fire tower locations. From their vantage points (typically, the highest point in an area), skilled tower personnel utilize alidade tables, binoculars, and topographic maps to triangulate the precise location of a fire. This information is then dispatched to the local fire department for first response or the Bureau District Fire Warden for fires on State Forest or Parkland. Tower personnel also initiate dispatch requests to the District Fire Warden for state assistance when resources are requested by a local fire department. Inter-Regional dispatch of State resources should be initiated through the Regional Supervisor in the region in which the fire is located.

The BFFC also uses limited county-based fire patrols and contracted fixed-wing detection aircraft to supplement detection efforts of forested areas during periods of high fire danger. If a fire is detected, a quick response allows for swift deployment of equipment to the fire. The state maintains an agreement with the Massachusetts Army Air National Guard for use of aircraft in wild land fire detection activities. These aircraft operate from Westover and Otis Air Force Bases.

Fire Suppression. Within the state's fifteen (15) fire districts, crews of firefighters under the direction of the Fire Chiefs are used to suppress all wildfire conditions. Framingham is a member of Fire District fourteen (14) and has entered into mutual aid agreements for assistance during wildfire events. Activation of the District Fourteen (14) Wildfire Task Force is through the district control point in Ashland, MA 1-866-347-8714. In severe conditions, additional districts may be called in for assistance through the State of Massachusetts Mobilization Plan and can call for backup aid from the National Guard for helicopter water-drop suppression assistance. Helicopters equipped with 1,000 gallon buckets of water are used for aerial drops to help contain fires in remote areas. Massachusetts also benefits from mutual aid agreements with neighboring states and other forest fire fighting agencies. Bureau units are used at all fires that occur on state-owned forest land and are available to municipal fire departments for mutual assistance.

The Bureau, under extreme hazards of wildfires to people and property, ***The High Ground Management Program, the Construction Crew, and the DCR Communications Control Center.*** Reporting directly to the Bureau's Chief Fire Warden, the High Ground Management Program is authorized by

Massachusetts General Law to manage all of the Bureau's and DCR's tower facilities, mountain top areas, and communication systems as well as entering into reciprocal and financial agreements with private and state organizations for individual use of the communications and fire towers. There are currently 53 existing fire towers (43 are considered operational); 25 radio towers; and two state-of-the art microwave communications towers. One of DCR's tower facilities is in north-central Framingham at the top of Nobscot Hill.

The Construction Crew builds, maintains, and repairs the state's existing fire towers; installs radio antennas; and builds, maintains, and repairs DCR's state-owned power utilities and telephone facilities.

DCR Communications Control Center provides backup communication and daily incident reports for DCR personnel. In addition to radio relay communications, the Communications Control Center, with the cooperation of the NOAA, also maintains the state's "Early Warning Detection System." This system gives advance notice to the State's Forests and Parks in the case of severe weather detection. The Communications Control Center also monitors all FTS remote fire weather stations, Davis weather instrument systems, and a DTM Doppler satellite radar weather system; and provides emergency information to all DCR units upon threat of any natural disasters.

4.3.2 Urban Fires

Urban fires are a major problem that can affect any area of the town. Because buildings exist anywhere people live and work, fires can occur anytime and anyplace. These fires generate a variety of economic, social and indirect costs. The frequency of fires depends on a wide range of factors, which include, but are not limited to, population or building density, building use, fire safety practices (or lack thereof) by building occupants, and criminal intent related to arson. These fires are almost always caused by human activities. There have been no urban fires caused by natural events in Framingham.

4.4 Geologic Hazards

4.4.1 Earthquakes

An earthquake is the vibration, sometimes violent, of the earth's surface that follows a release of energy in the earth's crust due to fault fracture and movement. A fault is a fracture in the earth's crust along which two blocks of the crust have slipped with respect to each other. Faults are divided into three main groups, depending on how they move. Normal faults occur in response to pulling or tension: the overlying block moves down the inclined dip of the fault plane. Thrust (reverse) faults occur in response to squeezing or compression: the overlying block moves up the inclined dip of the fault plane. Strike-slip (lateral) faults occur in response to either type of stress; the blocks move horizontally along a vertical fault past one another. Most faulting along spreading zones is normal, along subduction zones is thrust, and along transform faults is strike-slip.

The focal depth of an earthquake is the depth from the Earth's surface to the region where an earthquake's energy originates (the focus). Earthquakes with focal depths from the surface to about 43.5 miles are classified as shallow. Earthquakes with focal depths from 43.5 to 186 miles are classified as intermediate. The focus of deep earthquakes may reach depths of more than 435 miles. The focuses of most earthquakes are concentrated in the crust and upper 20 miles of the Earth's crust. The depth to the center of the Earth's core is about 3,960 miles, so even the deepest earthquakes originate in relatively shallow parts of the Earth's interior.

The epicenter of an earthquake is the point on the Earth's surface directly above the focus, and the focus is the area of the fault where a sudden rupture initiates. The location of an earthquake is commonly described by the geographic position of its epicenter and by its focal depth. Earthquakes beneath the ocean floor sometimes generate immense sea waves or tsunamis if the earthquake causes upward or downward movement of the sea floor. The tsunami originates where this movement takes place.

The cause of earthquakes in eastern North America is the forces moving the tectonic plates over the surface of the Earth. New England is located in the middle of the North American Plate. One edge of the North American plate is along the west coast where the plate is pushing against the Pacific Ocean plate. The eastern edge of the North American plate is at the middle of the Atlantic Ocean, where the plate is spreading away from the European and African plates. New England's earthquakes appear to be the

result of the cracking of the crustal rocks due to compression as the North American plate is being very slowly squeezed by the global plate movements.

Location

There are five seismological faults in Massachusetts, but there is no discernable pattern of previous earthquakes along these fault lines. Earthquakes occur without warning and may be followed by aftershocks. There is an existing thrust fault line that traverses the northwest portion of the Town. An earthquake vulnerability area also exists near Pearl Street to Claflin Street, and the intersection of Routes 126 and 135.

Extent

Seismologists use a Magnitude scale (Richter Scale) to express the seismic energy released by each earthquake. Table 4.10 includes the typical effects of earthquakes in various ranges.

Table 4.10 – Measuring Earthquake Magnitude (Richter Scale)

Richter Magnitudes	Earthquake Effects
Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions
6.1-6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0-7.9	Major earthquake. Can cause serious damage over larger areas
8 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Source: *Nevada Seismological Laboratory (NSL), 2005*

Each earthquake should have just one magnitude, although the several methods of estimating it will yield slightly different values (e.g.: 6.1, 6.3). Although each earthquake has a unique magnitude, its effects will vary greatly according to distance, ground conditions, construction standards and other factors. In seismology, a scale of seismic intensity is a way of measuring or rating the *effects* of an earthquake at different sites. The Modified Mercalli Intensity (MMI) Scale (see Table 4.11) is commonly used in the United States by seismologists seeking information on the severity of earthquake effects. Intensity ratings are expressed as Roman numerals between I at the low end and XII at the high end (NSL 2005).

Rating the intensity of an earthquake's effects does not require instrumental measurements. Thus, seismologists can use newspaper accounts, diaries, and other historical records to make intensity ratings of past earthquakes for which there are no instrumental recordings. Such research helps promote our understanding of the earthquake history of a region, and estimate future hazards.

Table 4.11 – Measuring Earthquake Magnitude (Modified Mercalli Intensity Scale)

Rating	Seismic Intensity/Effects
I	People do not feel any Earth movement.
II	A few people might notice movement if they are at rest and/or on the upper floors of tall buildings
III	Many people indoors feel movement. Hanging objects swing back and forth. People outdoors might not realize that an earthquake is occurring.
IV	Most people indoors feel movement. Hanging objects swing. Dishes, windows, and doors rattle. The earthquake feels like a heavy truck hitting the walls. A few people outdoors may feel movement. Parked cars rock.
V	Almost everyone feels movement. Sleeping people are awakened. Doors swing open or close. Dishes are broken. Pictures on the wall move. Small objects move or are turned over. Trees might shake. Liquids might spill out of open containers.
VI	Everyone feels movement. People have trouble walking. Objects fall from shelves. Pictures fall off

	walls. Furniture moves. Wall plaster might crack. Trees and bushes shake. Damage is slight in poorly built buildings. No structural damage.
VII	People have difficulty standing. Drivers feel their cars shaking. Some furniture breaks. Loose bricks fall from buildings. Damage is slight to moderate in well-built buildings; considerable in poorly built buildings.
VIII	Drivers have trouble steering. Houses that are not bolted down might shift on their foundations. Tall structures such as towers and chimneys might twist and fall. Well-built buildings suffer slight damage. Poorly built structures suffer severe damage. Tree branches break. Hillsides might crack if the ground is wet. Water levels in wells might change.
IX	Well-built buildings suffer considerable damage. Houses that are not bolted down move off their foundations. Some underground pipes are broken. The ground cracks. Reservoirs suffer serious damage.
VX	Most buildings and their foundations are destroyed. Some bridges are destroyed. Dams are seriously damaged. Large landslides occur. Water is thrown on the banks of canals, rivers, lakes. The ground cracks in large areas. Railroad tracks are bent slightly.
XI	Most buildings collapse. Some bridges are destroyed. Large cracks appear in the ground. Underground pipelines are destroyed. Railroad tracks are badly bent.
XII	Almost everything is destroyed. Objects are thrown into the air. The ground moves in waves or ripples. Large amounts of rock may move.

Source: *NSL 2005 (Original Source: FEMA)*

Previous Occurrences

Although New England has not experienced a damaging earthquake since 1755, numerous less powerful earthquakes have been centered in Massachusetts and neighboring states.

Nineteen earthquakes with intensity V or greater have centered in Massachusetts. Several other earthquakes were centered off the coast and affected the eastern portion of the state. A shock in 1755 reached intensity VIII in Boston and was felt across the state. The state was affected by some of the more severe Canadian shocks plus the 1929 earthquake that centered on Grand Banks of Newfoundland.

Strong earthquakes in the St. Lawrence Valley in 1638, 1661, 1663, and 1732 were felt in Massachusetts. The 1638 and 1663 shocks damaged chimneys at Plymouth, Salem and Lynn. On June 11, 1643, Newbury, Massachusetts, was strongly shaken. On November 9, 1727, an earthquake described as "tremendous" in one report and "violent" in another caused much damage at Newbury. The shock was felt from the Kennebec River to the Delaware River and from ships at sea to the extreme western settlements. Several strong aftershocks were reported from the area through February 1728.

Eastern Massachusetts was shaken moderately on February 17, 1737 and June 24, 1741. On June 14, 1744, large numbers of bricks were shaken from tops of chimneys in Boston and other towns. People in Newbury and Ipswich were alarmed; and the quake was reported to have been felt severely in Falmouth, Maine.

On November 18, 1755, one of the most significant earthquakes in the northeastern region occurred off Cape Ann. In Boston, walls and chimneys were thrown down and stone fences were knocked down (intensity VIII, Modified Mercalli scale). Some descriptions mentioned violent ground movement, like waves of the sea, making it necessary to cling to something to prevent being thrown to the ground. In Pembroke and Scituate small chasms opened in the earth through which fine sand reached the surface. Large numbers of fish were killed and many people on vessels felt shocks as if the ships were striking bottom. This earthquake was felt from Lake George, New York to a point at sea 200 miles east of Cape Ann, and from Chesapeake Bay to the Annapolis River, Nova Scotia.

Little is known about an earthquake that occurred on October 5, 1817. Walls were reportedly destroyed in Woburn (VII - VIII), but additional details are lacking.

Moderate earthquakes in 1847 (August 8), 1852 (November 27), 1854 (December 10), 1876 (September 21), 1880 (May 12), 1903 (January 21 and April 24), 1907 (October 15), 1925 (January 7 and April 24), 1940 (January 28), and 1963 (October 16 and 30), were felt over limited areas of eastern Massachusetts. The epicenter of the January 7, 1925 shock was off Cape Ann and was felt from Providence, Rhode Island, to Kennebunk, Maine. The October 16, 1963 shock caused some plaster to fall in Somerville; in

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addition a wall was reported cracked and stones fell from a building foundation (intensity VI). Dishes were broken and many persons were alarmed in Amesbury, and a window was cracked at Winthrop. The other earthquakes did not exceed intensity V.

The residents of Nantucket Island were jolted by a moderate earthquake on October 24, 1965. Very slight damage, mostly to ornaments, was reported. Doors, windows, and dishes rattled, and house timbers creaked.

Table 4.12 – New England Earthquakes with Magnitude 4.2 or more

New England Location	Date	Magnitude
Ossipee, NH	December 20, 1940	5.5
Ossipee, NH	December 24, 1940	5.5
Dover-Foxcroft, ME	December 28, 1947	4.5
Kingston, RI	June 10, 1951	4.6
Portland, ME	April 26, 1957	4.7
Middlebury, VT	April 10, 1962	4.2
Near NH Quebec Border, NH	June 15, 1973	4.8
West of Laconia, NH	Jan. 19, 1982	4.5
Milo, ME	February 8, 1928	4.5
Southeast of Bar Harbor, ME	October 3, 2006	4.2

Source: *Northeast States Emergency Consortium (NESEC)*

Earthquakes precipitate several potentially devastating secondary effects, including:

- The collapse of buildings, bridges, roads, dams, and other vital structures
- Rupture of utility pipelines
- Flooding caused by dam failure
- Landslides
- Extended power outages
- Fires and/or explosions
- Water contamination
- Tsunami in coastal areas

Table 4.13 – New England States Historical Earthquakes

State	Years of Record	Number of Earthquakes
Connecticut	1668 – 2007	137
Maine	1766 – 2007	544
Massachusetts	1668 – 2007	355
New Hampshire	1638 – 2007	350
Rhode Island	1776 – 2007	38
Vermont	1843 – 2007	73

Total Number of Earthquakes within New England: 1497
Total Number of Earthquakes in the Northeast: 2403
Source: *Northeast States Emergency Consortium (NESEC).*

There have been no documented earthquakes centered in the Town of Framingham. On June 7, 2002, a 2.5 magnitude earthquake that occurred in Hopedale, MA was felt in Framingham.

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Probability of Future Events

Earthquakes are unpredictable and relatively uncommon in Massachusetts, but seismologists state that a serious earthquake occurrence is possible.

Vulnerability

Most buildings and infrastructures in Massachusetts were constructed without specific earthquake-resistant design features. Development in filled, sandy or clay soils is more vulnerable to earthquake pressures than other soils.

According to USGS data, damages due to the effects of an earthquake will begin at a level of ground shaking of approximately .1g. The MMI intensity scale associates damages with levels of earthquakes. According to this scale, the damage that can be expected from this range of ground shaking will vary from plaster cracking and disruption of building contents, to moderate damage to poorly constructed buildings. It should be noted, however, that the expected probability of such a level of ground shaking is extremely low, and according to the USGS data can be expected to occur once every 2,476 years.

Because of this low frequency of occurrence and the relatively low levels of ground shaking that would be experienced, the entire state of Massachusetts can be expected to have a low to moderate risk to earthquake damage as compared to other areas of the country.

4.4.2 Landslides

Based on a review of the USGS landslide website, it was determined that there have been no recorded landslides in Framingham, which is considered to be in a low landslide incidence area. Less than 1.5% of the town area is considered a landslide incidence area, as shown on the Atlantic North East Landslides map. The following website concerning landslides in Massachusetts has been researched along with any historic occurrences: http://landslides.usgs.gov/html_files/landslides/nationalmap/national.html. Therefore, landslides were not analyzed further as a natural hazard affecting the Town.

4.4.3 Sinkholes

Based on a review of websites dealing with geologic hazards, it was determined that there have been no recorded sinkholes in the Town of Framingham. Therefore, sinkholes were not analyzed further as a natural hazard affecting the Town.

4.5 Winter Storms Related Hazards

Winter storms are the most common and most familiar of Bay State hazards which affect large geographical areas. The majority of blizzards and ice storms in the Commonwealth cause more massive inconvenience than they do serious property damage, injuries, or deaths. Winter storms generally make walking and driving extremely dangerous.

A Winter Storm can range from moderate snow to blizzard conditions: blinding wind-driven snow over 35 mph that lasts several days. A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period.

A Blizzard is a snowstorm with sustained winds of 40 mph or more or gusting up to at least 50 mph with heavy falling or blowing snow, persisting for one hour or more, temperatures of ten degrees Fahrenheit or colder and potentially life-threatening traveling conditions.

An Ice Storm involves rain that freezes upon impact. Ice coating at least one-fourth inch thick is heavy enough to damage trees, overhead wires, and similar objects and to produce widespread power outages.

A Nor'easter is a large weather system traveling from South to North, passing along, or near the seacoast. As the storm approaches New England and its intensity becomes increasingly apparent, the resulting counterclockwise cyclonic winds impact the coast and inland areas from a

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northeasterly direction. The sustained winds may meet or exceed hurricane force.

According to the Massachusetts Climate Change Adaptation Report, the predicted changes in the amount, frequency, and timing of precipitation, and the shift toward more rainy and icy winters would have significant implications. Winter precipitation is predicted to be in the form of rain rather than snow. Damaging ice storms could increase, but the number of snow events is predicted to decrease. Snow is also predicted to fall later in the winter and cease falling earlier in the spring.

Location

The entire Town is susceptible to winter storms. The western half of the town receives a significantly higher amount of average annual snowfall than the eastern half.

Infrastructure, including critical facilities, may be impacted by these events, and power outages and transportation disruptions (i.e., snow and/or debris-impacted roads, as well as hazards to navigation and aviation) are often associated with the event. Ice storms can down power lines causing widespread blackouts.

Extent

Winter storm events are measured by inches of snow, wind speeds (sustained or frequent wind gusts to 35 mph or more), and reduced visibility (to or below ¼ mile). Ice storms are measured in inches of ice build-ups. Extremely cold temperatures are often associated with winter storms, but are not a formal part of storm definitions.

NOAA's National Centers for Environmental Information produces the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two thirds of the U.S. The RSI was first used during the 2010-2011 winter season. Table 4.14 explains the five categories.

Table 4.14 – Regional Snowfall Index

Category	RSI Value	Description
1	1–3	Notable
2	3–6	Significant
3	6–10	Major
4	10–18	Crippling
5	18.0+	Extreme

Source: *NOAA-National Climatic Data Center (NCDC), 2011 (http://www.ncdc.noaa.gov/snow-and-ice/rsi/)*

The RSI is based on the spatial extent of the storm, the amount of snowfall, and the juxtaposition of these elements with population. Including population information ties the index to societal impacts. Currently, the index uses population based on the 2000 Census.

The worst storms experienced in Framingham were the Blizzard of 1888 (30 to 50 inches), the Blizzard of 1978 (24-38 inches) and, most recently, Winter Storm Juno in January 2015 (approximately 34 inches). Winter Storm Juno was a Category 3 "Major" storm (RSI ~ 6.38).

Previous Occurrences

New England has a long history of severe winter storms and blizzards. The most severe winter storm to ever hit New England was the Blizzard of 1888, which occurred on March 11-14. Snow depths measured from 30 to 50 inches where precipitation was entirely snow. Areas such as Boston received a mix of snow and rain creating up to nine inches of slush.

The Blizzard of 1978 dumped 24-38 inches of snow on New England, immobilizing the infrastructure and blocking major

interstates. Thousands of motorists abandoned their cars on the highway. Two weeks were required to remove the snow. More recent blizzards and snowstorms occurred in March 1993, February 1996, March 2001, January 2011, October 2011, February 2013, and January 2015. These events injured people, caused millions of dollars in damage and left thousands of people without power for days.

Table 4.15 summarizes the area's major winter storms.

Table 4.15 – Summary of Major Winter Storms

Date	Type	Geographical Scope	Description
March 11-14, 1888	Blizzard	Regional	30-50 inches of snow
February 5-6, 1978	Blizzard	Regional	24-38 inches of snow, winds up to 60 mph
October , 1991	Nor'easter	Statewide	
March, 1993	Winter Storm	Statewide	
December 7, 1996	Snow Storm	Framingham	Power outages and fallen trees
January 7, 1996	Snow Storm	Framingham	Roof collapse on a condo and a barn (two horses killed)
March 30-April 1, 1997	Snow Storm	Framingham	Loss of electricity due to heavy/wet snow, 20 inches of snow
January 1998	Ice Storm	Middlesex County	
January 25, 2000	Snow Storm	Middlesex County	
December 12, 2008	Ice Storm	Statewide	Loss of electricity (not in Framingham)
January 11, 2011	Severe Winter Storm	Regional	Declared federal disaster area
October 29, 2011 – October 30, 2011	Winter Storm	Regional	"The Halloween snow storm" Declared federal disaster area
February 8, 2013 – February 10, 2013	Severe Winter Storm	Statewide	Declared federal disaster area
January 26, 2015 – January 29, 2015	Severe Winter Storm	Regional	"Winter Storm Juno" Declared federal disaster area
February 15, 2015	Winter Storm	Regional	Winter Blizzard Neptune

Probability of Future Events

Severe winter weather is a common occurrence each year in Massachusetts. According to the NOAA NCDC storm database, approximately two to three winter storm events occur in Framingham each year.

New England generally experiences at least one or two Nor'easters each year with varying degrees of severity. These storms have the potential to inflict more damage than many hurricanes because the high storm surge and high winds can last from 12 hours to 3 days, while the duration of hurricanes ranges from 6 to 12 hours.

Severe winter storms typically occur during January and February, however, winter storms do occur from late September through late April.

Vulnerability

In the winter months, New England may experience the additional coincidence of blizzard conditions with many of these events. The added impact of the masses of snow and/or ice upon infrastructure often affects transportation and the delivery of goods and services for extended periods. The region may experience various related negative impacts upon the economy.

During winter storms, there is an increased risk of fire because people may lose electricity and use portable heaters, gas stoves, candles and other flammable sources of heat and light. Fire during winter

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storms presents a great danger because water supplies may freeze and it may be difficult for firefighting equipment to get to the fire.

The leading cause of death during winter storms is from automobile or other transportation accidents. Exhaustion caused by overexertion is the number two killer. Frostbite is a severe reaction to cold exposure that can permanently damage its victims. A loss of feeling and a white or pale appearance in fingers, toes or ear lobes are symptoms of frostbite. Hypothermia is a condition brought on when body temperature drops to less than 95 degrees Fahrenheit. Symptoms of hypothermia include uncontrollable shivering, slow speech, memory lapse, frequent stumbling, drowsiness, and exhaustion.

A vulnerability assessment utilized a map from the SHMP, dated 2010, showing the frequency of areas in the state impacted with snow events with 5 inches or greater in one event. The entire Town, and therefore all our critical facilities, is estimated to receive storms of 5 inches or greater 0.5 to 2.4 days each year.

4.6 Drought

Drought is a temporary irregularity and differs from aridity since the latter is restricted to low rainfall regions and is a permanent feature of climate. Drought is a period characterized by long durations of below normal precipitation. Drought conditions occur in virtually all climatic zones yet its characteristics vary significantly from one region to another, since it is relative to the normal precipitation in that region. Drought can affect agriculture, water supply, aquatic ecology, wildlife, and plant life.

Location

The entire Town is susceptible to drought conditions.

Extent

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts.

The Commonwealth uses five levels of drought severity:

- Normal
- Advisory
- Watch
- Warning
- Emergency

The levels provide a basic framework from which to take actions to assess, communicate, and respond to drought conditions. They begin with a normal situation where data are routinely collected and distributed, move to heightened caution with increased data collection during an advisory, to increased assessment and proactive education during a watch. Water restrictions might be appropriate at the watch or warning stage. A warning level indicates a severe situation and the possibility that a drought emergency may be necessary. A drought emergency is when a mandatory water restriction or use of emergency supplies is necessary.

A number of drought indices are available to assess the various impacts of dry conditions. The Commonwealth uses a multi-index system to determine the severity of a drought or extended period of dry conditions. A determination of drought level is based on seven indices: Standardized Precipitation Index (SPI), Crop Moisture Index, Keetch-Byram Drought Index (KBDI), Precipitation, Groundwater levels, Stream flow levels, and Index Reservoir levels. Drought levels are declared on a regional basis in Massachusetts. A majority of the indices would need to be triggered in a region in order for a drought designation for the region to move to a more severe level.

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Table 4.16 – Drought Indices

	SPI	Crop Moisture Index	KBDI	Precipitation	Groundwater	Stream Flow	Reservoir
Advisory	3-month > -1.5 to -2.0 or 6-month > -1.0 to -1.5 or 12-month > -1.0 to -1.5	-1.0 to -1.9 Abnormally dry	200-400	2 month cumulative below 65% of normal	3 consecutive months below normal**	At least 2 out of 3 consecutive months below normal**	Small index Reservoirs below normal
Watch	3-month > -2.0 or 6-month > -1.5 to -3.0 or 12-month > -1.5 to -2.0	-2.0 to -2.9 Excessively dry	400-600	1 of the following criteria met: 3 month cum. <65% or 6 month cum. < 70% or 12 month cum. < 70%	4-5 consecutive months below normal**	At least 4 out of 5 consecutive months below normal**	Medium Index Reservoirs below normal
Warning	6-month <-3.0 or 12-month -2.0 to -2.5	<-2.9 Severely dry	600-800	1 of the following criteria met: 3 month cum. <65% and 6 month cum. <65% or 6 month cum. <65% and 12 month cum. <65% or 3 month cum. <65% and 12 month cum. <65%	6-7 consecutive months below normal**	At least 6 out of 7 consecutive months below normal**	Large index reservoirs below normal
Emergency	12-month <-2.5	<-2.9 Severely dry	600-800	Same criteria as warning and previous month was warning or emergency	>8 months below normal**	>7 months below normal**	Continuation of previous month's conditions

Notes: ** Crop Moisture Index is subject to frequent change; the drought level for this indicator is determined based on the repeated or extended occurrence at a given level*
*** Below normal for groundwater and stream flow are defined as being with the lowest 25th percentile of the period of record*
Source: *2013 SHMP*

Previous Occurrences

The Commonwealth of Massachusetts is often considered a 'water-rich' state. Abundant precipitation results from frontal systems or storms that move across the continent and exit through the Northeast. Under normal conditions, regions across the state annually receive between 44 and 47 inches of precipitation. The normal annual rainfall in Framingham is 45 inches.

Effective July 1, 2016: Following four continuous months of unusually dry weather, the Executive Office of Energy and Environmental Affairs (EEA) declared a Drought Watch for Central and Northeast Massachusetts and a Drought Advisory for Southeast and the Connecticut River Valley. The declaration was the result of a recommendation from the Drought Management Task Force and will remain in effect until water levels return to normal in the affected regions.

Probability of Future Events

Drought conditions are very rare in Framingham, and are not considered a potential hazard for the Town. According to the 2012 report *When It Rains It Pours – Global Warming and the Increase in Extreme Precipitation from 1948 to 2011,* changes in precipitation patterns and the projected future rising temperatures due to climate change will likely increase the frequency of short-term (one- to three-month) droughts and decrease stream flow during the summer.

Vulnerability

Drought conditions can cause a shortage of water for human consumption and reduce local firefighting capabilities. Populations which rely upon groundwater sources and surface water intakes for drinking water are more vulnerable to the drought hazard. Social impacts of a drought include mental and physical stress, public safety (increased threat from forest/grass fires), health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Impacts on the economy and environment may have social implications as well.

The Town's biggest vulnerability to drought is accessibility to a potable water supply. The Town is a MWRA service area which means that our water supply is maintained by the MWRA and provided from the Quabbin Reservoir in western Massachusetts. Groundwater is not typically used as a potable water supply source in Framingham. Because we have a large external water supply and an emergency water supply reservoir within Town, the Town is less vulnerable to drought conditions.

4.7 Extreme Temperatures (heat and cold)

Location

Extreme temperatures can occur anywhere in the Commonwealth including Framingham. Temperatures tend to be warmer in dense, urban areas due to high levels of grey infrastructure, such as asphalt roadways and buildings, and low levels of green infrastructure, such as open space and landscaped areas, contributing to the urban heat island effect. Downtown Framingham, South Framingham, and developed areas along Route 9 are most susceptible to extreme heat.

Extent

Extreme temperatures are relative to localized weather patterns and vary by region. Extreme heat in Massachusetts occurs when 3 or more consecutive days reach above 90 degrees Fahrenheit.[8] Extreme cold occurs when temperatures drop far below normal. In most areas of the country near freezing temperatures are considered extreme; however, in Massachusetts – an area accustomed to cold winter weather – temperatures below 0 degrees Fahrenheit would be considered extreme.

The Wind Chill Temperature Index is a tool to measure exactly how cold temperatures become. The NWS issues a Wind Chill Advisory if the Wind Chill Index is measured at -15ºF to -24ºF for 3 hours. A Wind Chill Warning is issued if the Wind Chill Index drops to -25ºF or colder for 3 hours. In 2001, a Wind Chill Temperature Index was created to describe how cold air feels on human skin.

The NWS issues a Heat Advisory if the Heat Index is measured at 100ºF to 104ºF for 2 hours. An Excessive Heat Warning is issued if the Heat Index reaches 105ºF or greater for 2 hours. Heat Index is determined based on temperature and humidity, which is essentially what a person feels.

[8] Commonwealth of Massachusetts State Hazard Mitigation Plan (SHMP) 2013

Previous Occurrences

According to the SHMP some of the lowest temperatures ever recorded in the area since 1895 were -21ºF in Blue Hill, -12ºF in Boston, and -19ºF in Worcester. Some of the highest temperatures ever recorded in the area since 1895 were 101ºF in Blue Hills, 102ºF in Boston, and 96ºF in Worcester.[9]

According to the SHMP, there have been 19 cold weather events in the State and 43 warm weather events since 1994. In 2008, Massachusetts experienced record breaking extreme heat temperatures. Worcester was three degrees hotter, beating its prior 1984 record. The year 2012 was a very warm year breaking 27 heat records.

Probability of Future Events

Based off of previous occurrences in Massachusetts and the region, more extreme heat and cold weather events have been occurring and will continue to occur into the future. Exact probability is difficult to predict but it is easy to estimate the frequency of extreme heat and cold events will increase, especially in urban environments.

Vulnerability

The homeless are the most vulnerable population to extreme heat and cold, especially the latter, due to lack of shelter and protection. Low income households and families also are more vulnerable than other households due to potential lack of appropriate heating and cooling systems. These families additionally have limited mobility options and are at higher risk of being exposed to extreme temperatures during emergencies due to walking or taking public transit. Households without proper insulation do not possess appropriate heating protection and suffer during cold temperature events. Children and the elderly are also at increased risk during extreme hot or cold temperatures. Urban areas are more vulnerable than its suburban and rural counterparts due to the heat island effect, more dangerous travel conditions during extremely cold temperatures as a result of ice, and presence of less shade.

In Framingham specifically, there are populations of homeless, low income households and families, children, elderly, and those living in urban areas – all vulnerable populations at higher risk of the impacts of extreme hot and cold temperatures. As more people move to downtown and urban areas, and more previously green space becomes more developed with impervious surfaces and grey infrastructure, impacts to health and life can only increase with heightened extreme temperature incidences.

4.8 Coastal Erosion

As Framingham is not a coastal community, the Town does not suffer from coastal erosion. Therefore, coastal erosion was not analyzed further as a natural hazard affecting the Town.

4.9 Tsunami

As Framingham is not a coastal community, the Town does not suffer from tsunamis. Therefore, tsunamis were not analyzed further as a natural hazard affecting the Town.

4.10 Risk Assessment Summary

Table 4.17 presents a summary of each of the hazards discussed in above sections in relation to the likelihood of hazard occurrence, the location of the occurrence, and the impacts of an event. The table is organized as a hazard index to measure the most likely and most damaging natural events.

[9] Commonwealth of Massachusetts State Hazard Mitigation Plan (SHMP) 2013

Table 4.17 – Hazard Identification and Analysis Matrix

Natural Hazard	***Likelihood of Occurrence*** *(Unlikely, Possible, Likely, Highly Likely)**	***Location*** *(Local or small, Medium or Regional, Multiple Communities or Larger)*	***Impacts*** *(Minor, Serious, Extensive, Catastrophic)***	***Hazard Index*** *(High, Medium, Low)****
Flood-Related Hazards				
Riverine	Highly likely	Medium or Regional	Extensive	High
Dam Failures	Unlikely	Medium or Regional	Catastrophic	Low
Ice Jams	Likely	Medium or Regional	Extensive	Medium
Wind-Related Hazards				
Thunderstorms	Highly likely	Medium or Regional	Minor	Medium
Hurricanes/Tropical Storms	Likely	Medium or Regional	Serious	Medium
Tornadoes	Possible	Multiple Communities or Larger	Catastrophic	Low
Fire-Related Hazards				
Wildfires	Possible	Local or small	Serious	Low
Urban Fires	Unlikely	Local or small	Serious	Low
Geologic Hazards				
Earthquakes	Possible	Medium or regional	Catastrophic	Medium
Landslides	Unlikely	Local or Small	Serious	Low
Sink Holes	Unlikely	Local or Small	Serious	Low
Winter Storms Related				
Winter Storm	Highly likely	Multiple Communities or Larger	Minor	High
Blizzard	Likely	Multiple Communities or Larger	Serious	Medium
Ice Storm	Likely	Multiple Communities or Larger	Serious	Medium
Nor'easter	Likely	Multiple Communities or Larger	Serious	Medium
Drought	Possible	Multiple Communities or Larger	Minor	Low
Extreme Temperatures	Highly Likely	Multiple Communities or Larger	Serious	Medium
Coastal Erosion	Unlikely	Medium/Regional	Extensive	Low
Tsunami	Unlikely	Medium/Regional	Catastrophic	Low

**Likelihood of occurrence is expected to increase into the future with climate change impacts*
******Minor*** *– Limited & scattered property damage, limited damage to public infrastructure and essential services not interrupted, limited injuries or fatalities.*
Serious *– Scattered major property damage, some minor infrastructure damage, essential services are briefly interrupted, some injuries and/or fatalities.*
Extensive *– Widespread major property damage, major public infrastructure damage (up to several days for repairs), essential services are interrupted from several hours to several days, many injuries and/or fatalities.*
Catastrophic *– Property and public infrastructure destroyed, essential services stopped, numerous injuries and fatalities.*
****Ranked by combining how much impact & how frequently this affects the community*

4.11 Multiple Hazard – Risk Assessment Map

Map 1 has been produced based on flooding information summarized in Section 4.0, Hazard Identification & Risk Assessment and includes water bodies, Repetitive Loss and Severe Repetitive Loss Structures, and other flood-related hazard resources.

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5.0 Mitigation Strategy

5.1 Existing Protection Matrix

Table 5.1 is a summary of the existing protection measures in place at this time. This table has been updated under the 2017 Update.

Table 5.1 – Existing Protection Matrix

Type of Existing Protection	*Description*	*Area Covered*	*Effectiveness and/or Enforcement*	*Improvements or Changes Needed*
Flood Related Hazards				
Storm water management standards	State regulation under the Wetlands Protection Act to regulate storm water and other point source discharge	Town-wide	Enforced by the ConCom (Wetlands Protection Act) and Planning Board (Subdivision Control Law and site plan review)	Will be updated by July 2019 to comply with latest NPDES MS4[(1)] permit
Rivers Protection Act	State Law 310 CMR 10.58 & Local bylaw Article V Sect.18 development and activity in riverfront area	200-foot [(2)]	Enforced by the ConCom & DEP	Not applicable
Wetlands Protection Act (state) and Wetlands Protection Bylaw (local)	State and local laws regulating development and activity within wetland buffer zone	100-foot state buffer around wetland area[(3)]; local bylaw policy requires a 30 foot no disturb area closest to wetland	Enforced by the ConCom	Not applicable
100 Year Flood Zone[(4)] Town Bylaw Sec. III. H. Flood Plain Districts	State law and local bylaw requiring elevation above 100-year flood level of new and substantially improved residential structures in floodplain	100-year floodplain as shown on FIRMs	Enforced by the Building Inspector, Planning Board, and ConCom	FIRMs updated as of July 7, 2014.
Maintenance of municipal storm water drainage system	Regular cleaning of catch basins, storm drains, and culverts	Town-wide	Directed by DPW	Additional personnel and equipment needed
Maintenance of open conveyance channels	Regular removal of debris and sediment build-up	Town-wide	Directed by DPW, contracted with regional Mosquito Control agency	Not applicable
Culverts replacement	Replacement of culverts that are undersized and/or deteriorated	Town-wide	Directed by DPW	Conduct Town-wide culvert infrastructure assessment and inventory
Maintenance of public water bodies (ponds, streams, brooks, wetlands)	Periodic cleaning of waterways needed, e.g., remove trash, debris.	Town-wide	Directed by DPW with guidance from ConCom	Additional personnel and equipment needed

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Inspection of major dams	Periodic inspections of the structural integrity of the dam and appurtenances	Major dams including Reservoir No.1, 2, and 3 dams, Central St. Dam and Lake Cochituate Dam	Directed by the DCR Office of Dam Safety	Update dam failure studies for the dams rated as high hazard
Automated stream level gauges	Surface water level sensors and communications equipment are installed at five locations with high-risk for flooding	Sudbury River, Beaver Dam Brook, Hop Brook, Dunsdell Brook, Cochituate Brook	Directed by DPW/USGS	Install additional stream gauges; provide public interface
Floodplain on-line mapping	The latest FIRM information is available to the public through the Town's on-line GIS tools.	Town-wide	Data and on-line platform maintained by DPW	Not applicable
Wind Related Hazards				
State Building Code	State Law related to design loads to include wind effects	Town-wide	Enforced by Building Department	Not applicable
Tree maintenance	Regular inspection and tree maintenance to cut branches threatening power lines and overhead utilities	Town-wide	Utility companies	Additional staff
Fire Related Hazards				
Limited brush Clearing	provide access to Emergency Services	Town-Wide	Fire Dept	Identify areas with potential for brushfires
Geologic Hazards				
Location of earthquake vulnerable areas	Potential Earthquake Vulnerable Area has been Identified			
Winter Storms Related Hazards				
Residential parking bans	Parking bans to enable effective snow removal from residential streets	Town-wide	DPW	Additional enforcement needed
Pre-treatment of major arterial routes	Pre-treating roads reduces roadway icing and other hazards	Town-wide	DPW	Not applicable
Clearing snow from major arterial routes	Ensure access to emergency services	Town-wide	DPW	Additional personnel and equipment needed
Pavement sensors	Pavement sensors evaluate the temperature of pavement during cold weather to optimize	Town-wide	DPW	Additional pavement sensors

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	pre-treatment and prioritize clearing			

[1]*National Pollutant Discharge Elimination System – Municipal Separate Storm Sewer System*
[2]*Riverfront Area is the land measured horizontally outward from the edge of river and a parallel line located 200-feet away*
[3]*125 foot town bylaw buffer*
[4]*Compensatory storage shall be provided for all flood storage volume that will be lost as a result of a proposed project*

The Town continues to comply with NFIP. In 2009, the Town completed a certification process to ensure that the Saxonville Levee meets all the criteria set forth in NFIP Regulations 44 CFR 65.10 "Mapping of Areas Protected by Levee Systems". This certification was accepted by FEMA in the fall of 2009. In addition, FEMA has updated the FIRMs and the Town adopted the new maps at Town Meeting. As of May 31, 2016, there are 711 flood insurance policies in force in Framingham.

5.2 Goals and Objectives

In line with the SHMP, our goal is to:

Reduce the loss of life, property, infrastructure, and cultural resources throughout the Town of Framingham from natural disasters through a multiple hazard mitigation program that involves increased coordination, planning, education and capital improvements.

The objectives that need to be accomplished in order to meet this goal are as follows:

1. Increase awareness of hazard mitigation among Town Officials, private organizations, businesses and the general public.
2. Increase coordination between departments in pre-disaster planning and continuous hazard mitigation implementation. Integrate hazard mitigation planning into the Town's reports, plans, and day to day functions.
3. Identify and seek funding for measures to mitigate or eliminate occurrences of hazardous incidents and its impacts.
4. Implement a broad range of programs and projects which promote the Town's comprehensive mitigation strategy.
5. Implement prevention measures via wetland, stormwater, and other requirements or regulations.

5.3 Development of Mitigation Projects

A comprehensive list of mitigation projects was initially developed by the CPT, Town staff and the consultant following several public hearings in 2003 and 2004. The MHMP Working Group has, over the years, reviewed the projects and updated them as appropriate. The complete listing of mitigation projects proposed since 2003 can be found in Section 9 (page 34) in the 2012 MHMP Update and Appendix E of this Update.

For the 2017 MHMP Update, the Working Group revisited this mitigation projects list and either removed, retained, or revised projects based on feasibility of implementation and comments from MEMA. The goal was to create a more actionable projects list with projects that are more relevant in 2017 to the Town than they may have been in 2003. Many projects were removed because they were determined to be infeasible or are considered standard operations and maintenance in Town. Many other projects were vague and in turn retained but revised and strengthened. Others have been completed since 2003. Refer to Appendix E to see the status of each project, and a description as to why the project was removed, retained, or revised.

Additionally for this Update, the Working Group brainstormed new mitigation project ideas (both public and private) for consideration and added them to the projects list. The final revised mitigation projects list, including 2005 and 2012 projects carried forward for consideration, is shown in Table 5.2 below. A sub-group of the full Working Group then moved on to the prioritization of the mitigation projects described in the next section.

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5.4 Prioritization of Mitigation Projects

For the original Plan development, the CPT developed and carried out a process to prioritize the mitigation projects at that time, which in general consisted of assessing the STAPLEE analysis of proposed mitigation projects conducted by the Town's consultant, reviewing all public input, and interviewing Town personnel. However, even after implementing this prioritization process, the CPT found it difficult to eliminate potential projects from continued consideration. For that reason the Community and Economic Development Division developed a method of numerically rating the potential mitigation projects. Section 9 (page 34) in the 2012 MHMP Update and Appendix E of this Update provides the list of the potential mitigation projects that six CPT members individually rated in order to assist with the Town's hazard mitigation prioritization process.

CPT members numerically rated the proposed mitigation projects 0 through 5. Giving a project a rating of 0 meant without any doubt the CPT member believed it should be removed from the list of mitigation projects. Giving a rating of 5 meant the CPT member believed the proposed mitigation project definitely should be one of the Town's highest priority projects. The Community and Economic Development Division compiled input from other CPT members. Average ratings are shown in the Appendix E list. Average ratings of 4 or over were given higher consideration than those with lower ratings.

The process of numerically rating the potential mitigation projects spurred dialogue at a May 2, 2005 CPT Meeting resulting in a fairly rapid thinning of projects. In addition to numerical ratings, several CPT members provided written comment including the reasons for their rating. As a result, some projects that received high ratings were not considered a priority mitigation project. Some of the potential mitigation projects were actually disaster response and recovery activities. Others were private owner issues, which the majority of CPT members believed should not be the responsibility of the Town, or could be handled with a public education approach. Other potential mitigation measures were already being done by a specific Town department or agency (e.g., Fire Department, DPW). The priority mitigation projects focused on preparing Town infrastructure for flooding and to a smaller extent winter storms (hazards most affecting Framingham). In addition, education and outreach regarding mitigation of all natural hazards were a priority. Priority projects from prior MHMP updates can be viewed in those Plans.

For the 2017 Update, the Working Group utilized a similar but somewhat different prioritization approach. A sub-group of the Working Group, utilizing the STAPLEE criteria (and additional criteria the group added), ran through the revised mitigation projects list (shown in Table 5.2 below) and ranked the projects numerically 1-3 for the following criteria:

- Socially Acceptable
- Technically Feasible
- Administratively Possible
- Politically Acceptable
- Legal
- Cost/Benefit
- Environmentally Sound
- Protection of Life
- Protection of Public Property
- Protection of Private Property
- Compliments Other Town Objectives/Plans

The Division of Community & Economic Development compiled the sub-group's rankings which created an average score for each project. The 2017 Update mitigation project list and corresponding averaged scores are shown below, sorted by highest to lowest scored.

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Table 5.2 – 2017 Mitigation Projects List

Mitigation Measure	TOTAL SCORE
Evaluate current bylaws and regulations regarding floodplain development to ensure they are consistent and updated	28.4
Purchase & install 4 automated weather stations	27.6
Integrate flood storage review into open space plan	27.4
Install additional stream gauges	26.8
Enhance current bylaws and regulations to prevent future development in the floodplain	26.8
Install additional pavement sensors	26.4
Develop stormwater bylaw & regulations	26.4
Develop green infrastructure bylaw & regulations	26.2
Emergency generators for traffic signals	26.2
Conduct a Climate Change Vulnerability Assessment	26
Culvert replacement at CSX crossing of Hop Brook	26
Prepare, adopt, implement, and update a comprehensive flood hazard mitigation plan	26
Complete Stormwater Master Plan Phase IV	25.8
Complete Stormwater Master Plan Phase V	25.8
Develop green infrastructure marketing/education program to business community	25.8
Construct Walnut Street Sewer Pump Station	25.4
Nobscot Fire Station Area Drainage Improvements	25.4
Web based public portal for stream gauge data	25
School Street bridge replacement	24.6
CRS program assessment	24.4
Fountain Street Drainage Improvement	24.2
Expand rain barrel program	24
Taralli Terrace Bridge replacement	24
Second Street Bridge replacement	24
Replace Farm Pond outfall	23.8
Culvert retrofit at Fuller School pedestrian path	23.8
Emergency generators for general store	23.6
Woodfield Playground infiltration system	23.2
Install green infrastructure in the vicinity of Butterworth Park	23
Develop hazard mitigation incentive program	23
Constructed wetlands or wetlands restoration project	23
Flood Protection of private property with flood loss in Hemenway neighborhood	22.8

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Flood Protection of private property with repetitive loss in Auburn Street neighborhood	22.8
Flood Protection of private property with repetitive loss in Circle Drive neighborhood	22.8
Flood Protection of private property with repetitive loss in Prescott St neighborhood	22.8
Develop and implement a residential rain garden program	22.6
Charlotte Dunning School green infrastructure	22.6
Edmands Road culvert upgrade	22.4
Install beaver deceivers near pedestrian bridge near high school	21.4
Flood Protection of Town Buildings	21
Acquisition and Relocation or flood protection of private properties with repetitive loss in Beaver Dam Brook neighborhood	20.6
Acquisition and Relocation or flood protection of private properties with repetitive loss in Walnut Street neighborhood	20.2
Rehabilitate flood control berm at Callahan Senior Center	20
Acquisition and Relocation or flood protection of private properties with repetitive loss in Auburn Street neighborhood	19.8
Relocation of Town Buildings out of floodplain	17.8

Taking the mitigation project ranking scores in mind, the Working Group discussed prioritization of the projects. The Working Group noted that some of the top 10-15 ranked projects were efforts that could be completed administratively – in-house with Town staff – while others could be integrated into the Town's operating budget (though these are not considered "Operations & Maintenance" projects for the purposes of this Plan) or were ideal for future grant opportunities, such as FEMA funding. Based off of this understanding, the Working Group thought it made sense to group the top administrative projects as one effort for the Working Group and Town staff to focus on and "chip away" moving forward. The Working Group then chose the next top 9 ranked projects to advance as priorities.

It was noted that multiple projects which focused on neighborhood scale analysis and investment into flooding issues fell to the bottom of the ranking list. This was largely due to the scale, overall price, and political/social acceptance to pursue such projects. However, the group also felt that these projects are very important on their face. Therefore, one neighborhood project was chosen to include on the prioritization list as a pilot neighborhood project. Recurring flooding issues in multiple neighborhoods warrants a focus study such as this.

The Walnut Street neighborhood was chosen for a variety of reasons:

- the Town's Stormwater Master Plan work completed thus far has included this neighborhood; therefore, we have more information for this area compared to others
- the neighborhood abuts Town amenities used by the entire community, such as Bowditch Field
- flooding in this neighborhood impacts both public and private properties and structures
- this effort would complement efforts to construct new public infrastructure on Walnut Street
- multiple Working Group members live in this neighborhood and feel very strongly about analyzing solutions
- the Town's only SRL structure is located in this neighborhood
- the neighborhood contains a smaller number of homes impacted by flooding compared to other neighborhoods and therefore is more feasible to target as a pilot project

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The resulting MHMP 2017 Update priority mitigation projects (Action Plan) are displayed in the following table.

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Table 5.3 – Priority Mitigation Projects: Action Plan

Mitigation Measure	*Summary*	*Estimated Cost*	*Potential Funding Source*	*Timeframe**
Administrative				
Evaluate current bylaws and regulations regarding floodplain development to ensure they are consistent and updated.	Review zoning bylaw, wetlands bylaw, building code, and health & safety regulations in order to ensure consistency across the regulations and most modern information is included. Could additionally leverage technical assistance via a consultant.	Working Group/Town staff		
Integrate flood storage review into open space plan	The Town's current Open Space & Recreation Plan creates a priority list of open space parcels for the Town to consider protecting from future development. Integrating flood storage capacity as a criterion in this analysis would reflect properties that would be prime candidates for increasing flood storage and mitigate flooding impacts.			
Enhance current bylaws and regulations to prevent future development in the floodplain	Review Planning & Wetlands bylaws in regards to allowable development in floodplains. Currently, development is not prohibited, but mitigation is needed. Bylaw revisions need to be approved at Town Meeting. This is one of the activities to get credit for the CRS program.			
Develop stormwater bylaw & regulations	Develop bylaws for stormwater management for new and re-development within Town.			
Develop green infrastructure bylaw & regulations	Develop bylaws for green infrastructure for new and re-development within Town. Could additionally leverage technical assistance via a consultant. Note: the NPDES MS4 permit will require the Town to assess local regulations regarding green infrastructure by 2021.			
Develop green infrastructure marketing/education program to business community	Develop green infrastructure marketing/education program to business community. Could additionally leverage technical assistance via a consultant. Note: the NPDES MS4 permit will require the Town to provide public education to businesses, institutions, commercial facilities, and developers.			
Priority Projects				
Purchase & install 4 automated weather stations	Purchase and install 4 automated weather stations throughout Town, with web-based access. Weather stations will assist DPW personnel with assessing storms to improve response to extreme precipitation, high winds, and winter storms. They will also assist Police & Fire with emergency response for storm events.	$10,000	Operating budget; FEMA funding	Short
Install additional stream gauges	Install additional automated stream gauges (surface water level sensors and communications equipment) at high risk areas. Angelica Drive (Angelica Brook) Bates Rd (Beaver Dam Brook)	$15,000-$30,000/each	Capital budget; FEMA funding	Medium

	Hop Brook (downstream)			
Install additional pavement sensors	The DPW Highway Department use pavement sensors to evaluate the temperature of pavement during cold weather. This data enables the Highway Department to identify roads for pretreatment which reduces roadway icing and other hazards associated with winter storms.	$20,000	Operating budget; FEMA funding	Short
Emergency generators for traffic signals	Power can be lost during winter storm events or high winds, including power used for traffic signals. For example, during a 2013 storm event, power was lost at a major intersection's traffic signal for 6 days. Police details were required, pulling limited emergency personnel from other weather-related emergencies. Loss of power to traffic signals compounds hazardous travel conditions. Emergency, back-up generators for traffic signals will help facilitate traffic flow and mitigate hazardous conditions.	$10,000	Operating budget; FEMA funding	Short
Conduct a Climate Change Vulnerability Assessment	The Climate Change Vulnerability Assessment would help the Town understand how we are vulnerable or resilient to potential climate change in terms of impacts on people, infrastructure, public health, and the economy. It would serve as the technical reference for identifying and planning mitigation projects. The Town would also use it to revise Town regulations for private development to improve resiliency.	$75,000-$100,000	FEMA funding	Long
Culvert replacement at CSX crossing of Hop Brook	Feasibility of a culvert replacement will be analyzed as part of the Landham Pond Dam Removal project. The culvert will be rehabilitated or replaced to increase capacity and meet stream crossing standards. Would require site control/CSX corridor acquisition.	$1.5M	FEMA funding	Long
Prepare, adopt, implement, and update a comprehensive flood hazard mitigation plan	Use standard planning process (similar to the MHMP process) to develop plan. Plan would need to be approved by Board of Selectmen. Updates would be required every 5 years. This is a minimum requirement for the CRS program for all repetitive loss communities.	$50,000	FEMA funding; Administrative	Medium
Complete Stormwater Master Plan Phase IV	Phase IV will continue the study of the Town's stormwater system. Five of the Town's twenty-two sub-basins will be studied as part of this project: North and South Saxonville, Cherry Meadow Brook, Birch Meadow Brook and Baiting Brook drainage sub-basins.	$450,000	Capital budget	Medium
Complete Stormwater Master Plan Phase V	Phase V will complete the study of the Town's stormwater system. Five of the Town's twenty-two sub-basins will be studied as part of this project: Wayside, Square Meadow Brook, Reservoir #1 & #2 South, Reservoir #3 North, and Willow Brook drainage sub-basins.	$400,000	Capital budget	Long
PILOT NEIGHBORHOOD PROJECT: Acquisition and Relocation or flood protection of private properties with repetitive loss in Walnut Street neighborhood	Identify, acquire, and/or relocate flood-prone buildings so that they are out of the floodplain. Place restrictions on purchased land in floodplain to prevent future development. Identify and protect existing flood-prone buildings by floodproofing, elevation, or minor structural projects. Assume 171, 175, & 179 Walnut Street. Potentially more properties on eastern side of Walnut Street.	$1.3M	FEMA funding; Administrative	Long

**Short* – *1-3 years*
Medium *– 3-5 years*
Long *– 5+ years*

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5.5 Completed Projects

Appendix F provides a list of the projects completed to date that have been included since the original Plan development or have been implemented by the Town with the goal of hazard mitigation. When new mitigation projects are completed, they will be added to this list moving forward and will be utilized for future plan updates.

5.6 Multiple Hazard – Mitigation Strategy Map

Map 2 has been produced based on the information summarized in Section 5.0, Mitigation Strategy and includes completed projects and priority projects. ***To be created***

6.0 Plan Review, Evaluation, and Implementation

Maintenance of the Town's Plan, including the Plan Update, includes a schedule for monitoring and evaluating the Plan on an ongoing basis and producing an update every five years. The Working Group will continue to review and revise the mitigation priority projects to determine their relevance to changing situations in the town, their feasibility, as well as changes in State or Federal policy. New funding opportunities will be discussed in order to implement the priority projects. The Working Group also reviews and monitors the risk assessment portion of the Plan to determine if this information should be updated or modified, given any new available data. The Working Group will continue to monitor the progress on implementation of priority projects, difficulties that may be encountered, success of coordination efforts and strategies that may be developed or revised. Completed and in-progress projects will be recorded appropriately in this Plan. Every five years the Plan Update will be submitted to the State Hazard Mitigation Officer and FEMA for review.

The Working Group will continue to seek public input on the MHMP. Copies of the Plan will be cataloged and kept at the Public Libraries, Community and Economic Development Division, DPW, Conservation Department, and Police and Fire Departments. In addition, copies of the MHMP will be posted on the Town's official website. The site will also include directions relative to how and to whom comments should be submitted. At least one public hearing will be held every five years during each plan update process. The public hearings will provide the public a forum for which they can express concerns, opinions, or ideas about the MHMP. The Working Group will publicize all public hearings and, whenever possible, televise the meetings on public access television and streaming video.

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7.0 Plan Adoption

The draft MHMP Update was approved by a vote of XX by the Framingham Board of Selectmen on September XX, 2016 and subsequently submitted to MEMA for review and comment. The final MHMP Update was adopted by the Framingham Board of Selectmen at its meeting on XX, 2017. The Certificate of Adoption is attached hereto as Appendix G.

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Appendix A – Multiple Hazard Mitigation Plan Working Group Meetings

Comprehensive List

Agendas, minutes, & sign-in sheets

Appendix A

Meeting Date and Time	Meeting Description
July 29, 2003, 7:00 p.m.	Initial Kickoff Meeting
August 26, 2003, 7:00 p.m.	Progress Meeting, Preparation for Public Hearing No. 1
October 28, 2003, 7:00 p.m.	Progress Meeting
January 13, 2004, 7:00 p.m.	Progress Meeting
March 23, 2004, 7:00 p.m.	Progress Meeting, Preparation for Public Hearing No. 2
September 20, 2004, 7:00 p.m.	Progress Meeting to review Draft MHMP comments
May 2, 2005, 7:00 p.m.	Progress Meeting
October 25, 2006, 7:00 p.m.	Progress Meeting
November 29, 2006, 7:00 p.m.	Progress Meeting
June 27, 2007, 7:00 p.m.	Progress Meeting
September 12, 2007, 7:00 p.m.	Progress Meeting
September 26, 2007, 7:00 p.m.	Progress Meeting
November 28, 2007, 7:00 p.m.	Progress Meeting
December 12, 2007, 7:00 p.m.	Progress Meeting
December 19, 2007, 7:00, p.m.	Progress Meeting
January 23, 2008, 7:00 p.m.	Progress Meeting
April 23, 2008, 7:00 p.m.	Progress Meeting
October 28, 2008, 7:00 p.m.	Progress Meeting
January 28, 2009, 7:00 p.m.	Progress Meeting
February 25, 2009, 7:00 p.m.	Progress Meeting
March 25, 2009, 7:00 p.m.	Progress Meeting
April 22, 2009, 7:00 p.m.	Progress Meeting
September 23, 2009, 7:00 p.m.	Progress Meeting
November 25, 2009, 7:00 p.m.	Progress Meeting
December 16, 2009, 7:00 p.m.	Progress Meeting
February 24, 2010, 7:00 p.m.	Progress Meeting—Assignments for Update
April 7, 2010, 7:00 p.m.	Update
June 2, 2010, 7:00 p.m.	Update
June 8, 2010, 7:00 p.m.	Presentation of draft Update to Board of Selectmen—Public Hearing
MHMP 2017 Update	
November 13, 2015	Call with MAPC to discuss MHMP process
November 17, 2015, 3:30 p.m.	Kick-off meeting – WG meeting #1
December 7, 2015, 1:00 p.m.	Staff meets with MEMA to discuss 2012 Plan items to address for the 2017 Update
January 11, 2016, 7:00 p.m.	WG meeting #2
March 10, 2016, 7:00 p.m.	First public hearing
May 2, 2016, 7:00 p.m.	WG meeting #3
July 19, 2016, 7:00 p.m.	WG meeting #4

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Multiple Hazard Mitigation Plan Update – Working Group

November 17, 2015
3:30 pm, Executive Conf Room

MINUTES

Attendees: Steve Trask (Police), Marianne Iarossi (C&ED), Nichol Figueiredo (PIO), Kerry Reed (DPW), Art Robert (C&ED), Jim Duane (Assistant Town Manager), Sam Bade (citizen rep and ConCom member)

1. Confirm plan purpose
    a. How can we make this document more practical for Department use?

    Marianne kicked off the meeting by explaining the reasons why the Town needs to update the Multiple Hazard Mitigation Plan (MHMP), read the plan's purpose, and asked if anyone had suggestions for making the document more practical for Department use.

    Kerry provided an update on FEMA related grant funding the Town has been awarded and status of those projects.

2. Review task list
    a. **Capability Assessment**

       Risk Assessment analysis of current disaster conditions

       Mitigation of risks

    b. Risk Assessment process of deliverable: MEI to send assigned pieces to each dept along with helpful guidance; use tracked changes of your edits/updates/additions; flag any action items/goals; send back to MEI to incorporate into main report

    The MHMP has three overarching sections: Capability Assessment, Risk Assessment, and Mitigation. A document was handed out showing what sections of the Plan would be designated to each Department to update. The process for updating the sections was reviewed.

The group discussed the new MHMP FEMA regulations that were released after the last Framingham Update was approved in 2012 (such as including all hazards listed in the State's plan even if the locality is not affected by said hazard). It was suggested that staff meet with Marybeth Groff from MEMA to review the Plan and discuss what changes need to be made to make the Plan compliant. The Working Group was told to hold off on updating their sections until the MEMA meeting is held.

3. Review schedule

   Marianne explained that the schedule is based off of the original thought that the individual sections would only need to be updated along with the mitigation projects/priority. This could change once staff meets with MEMA to determine the overall volume of work. Potential meeting dates are included in the schedule.

4. Outreach strategy

   a. Initial public meeting and draft plan public meeting
   b. Anyone else to include on this Working Group?

   Nichol Figueiredo shared methods for outreach such as social media and press releases. Marianne and Nichol will meet separately on outreach details. The public meetings should be set up by mid-January through social media outlets and "Notify Me".

   The group discussed including new members on the Working Group. One citizen member that partook in the group for the 2012 Update is no longer participating. Another member will have less participation. Nichol will work on creating a press release requesting 2-3 new citizen participants.

5. Other

   a. MEMA training

   Marianne explained the ~30 minute MEMA training available if anyone is interested.

   Art suggested including climate change discussions into the Plan.

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Multiple Hazard Mitigation Plan Update – MEMA

December 7, 2015
1:00 pm, Executive Conf Room

MINUTES

Attendees: Marybeth Groff (MEMA), Marianne (C&ED), Kerry (DPW), Sam (Conservation Commission/resident)

1. Discuss Framingham MHMP Update
    a. Overall revisions – MEMA/FEMA regulation changes
    b. Weaknesses to address
    c. Other items
2. Next Steps

Marybeth stated Framingham's 2012 Plan was very good but needs some tweaks in order to be compliant with new FEMA regulations. Using the "Appendix A: Local Mitigation Plan Review Tool" (Local Mitigation Planning Handbook – March 2013) the group reviewed compliancy with Elements A through E. Discussion ensued regarding suggested changes that should be made.

Some major changes are to restructure the Plan so that it follows FEMA's format and revisit the priority mitigation projects tables in order to create a more realistic action plan and rethink or revisit priorities established when the Plan was originally created.

Scanned documents on C&ED's drive (*Pland→Plans→Multiple Hazard Mitigation Plan→MHMP Update 2015→Guidance*) show specific comments and include Marianne notes and Marybeth notes.

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Multiple Hazard Mitigation Plan Update – MEMA

December 7, 2015
1:00 pm, Executive Conf Room

AGENDA

Anticipated Attendees: Marybeth Groff (MEMA), Marianne Iarossi (C&ED), Kerry Reed (DPW), Sam Bade (Conservation Commission/resident)

1. Discuss Framingham MHMP Update
    a. Overall revisions – MEMA/FEMA regulation changes
    b. Weaknesses to address
    c. Other items
2. Next Steps

Marybeth Groff	HMPlanner Mema	marybeth.groff@massmail.state.ma.us
Marianne Iarossi	C+ED, Framingham	mei@framinghamma.gov
Kerry Reed	DPW	kr@framinghamma.gov
Sam Bade	Conservation Commission/Resident	sbade@SSV-eng.com

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Multiple Hazard Mitigation Plan Update – Working Group

January 11, 2016
7:00 pm, Ablondi Room

MINUTES

Attendees: Marianne Iarossi, Kerry Reed, Jim Barnett, Bob Bois, John Magri, Sam Bade

1. Working Group composition/meetings moving forward

   Kerry, Marianne, Bob, and Jim Barnett were appointed to the Working Group (WG) by the Selectmen on 12/15/15. Does the group feel Jim Duane and Art also need to be formally appointed? The consensus was not necessary. WG meetings moving forward will generally be every other month at 7 PM to allow the citizens to be present. Staff will meet internally as needed.

2. Debrief of MEMA meeting

   Marybeth Groff (MEMA) met with Marianne, Kerry and Sam in December to talk about the Town's Plan and how it should be updated. Overall she thought the plan was good but had comments. Some major comments included reordering sections, describing FEMA/MEMA required elements for each hazard that were missing from the 2012 Plan (extent, location, vulnerability, etc.), tighten up mitigation projects list/make it more actionable, and discuss recent developments that could affect the hazards (Marianne will talk to Amanda Loomis for recent or upcoming developments in addition to the Departments adding new developments).

3. Review schedule & task list

   a. Risk Assessment process of deliverable – Risk Assessment pieces were provided to DPW, Police, and Fire by Marianne which included comments embedded from MEMA. The process of updating these pieces was discussed. Usage of Google drive or a SharePoint site was also discussed.

   b. Maps (Location of Fires, Geologic Features? Additional?) – The group could not identify where the Location of Fires and Geologic Features maps would be. The group discussed what maps should be included. The following was decided: Flood Hazard Map, Completed Mitigation Projects Map, and Priority Mitigation Projects Map.

c. Looking forward - Jim discussed the major flooding issues of the Hemenway neighborhood where he lives. The group talked extensively about Town implemented projects in the neighborhood, mitigation projects that could be implemented, and how the FEMA/MEMA grant processes work and why this Plan is important to that process. The Community Rating System (CRS) was discussed and the BFRT-CSX culvert. Kerry showed a list of communities enrolled in the CRS program and the percentage flood insurance holders receive as a discount. She stated it is a large effort that doesn't seem to turn around massive benefits. She noted a number of communities have rescinded from the program.

   The next step after Risk Assessment is updating the Mitigation Strategy. A process was suggested for updating the mitigation projects list along with identifying new priority projects for the 2017 Plan. The group discussed moving forward, strategies to update the Plan in an effective manner. The end result would be a more concise, practical Plan. It was suggested and agreed that a closer look at climate change be included in this Plan update.

   A revised schedule was provided. Deadline for the Risk Assessment pieces was decided.

4. Outreach strategy
   a. First public meeting dates? The first and second week of March (on a Tues, Wed, or Thurs) was discussed for the first public meeting, taking into consideration other Town department/board meetings.
   b. Agenda/structure of first public meeting – The group discussed having a powerpoint, maps for attendees to display where problem areas are, and request suggestions for mitigation projects.

NEXT STEPS:

- MEI to coordinate with Nichol on setting up first public meeting
- DPW/Police/Fire update Risk Assessment sections and send back to MEI by 3/1/16
- Inform MEI of any maps that may be needed. Determine map template to use moving forward
- Anyone who may have it, check your emails and files for the excel sheet of the mitigation projects rating system used in past updates of the Plan
- MEI to send report to WG

The meeting adjourned at 9:05pm.

Date 1/11/16 MHMP Meeting #2

Topic Attendees

Meeting Objectives

Attendees

Notes

Marianne Iarossi	mei@framinghamma.gov
Bob Bois	bbois131@gmail.com
Jim Barnett	barnettech@gmail.com
John Magri	Jcm@Framinghamma.gov
Sam Bade	Sbade@SSV-eng.com
Kerry Reed	kr@framinghamma.gov

Action Items

FRAMINGHAM COMMUNITY & ECONOMIC DEVELOPMENT
150 CONCORD STREET ▫ MEMORIAL BUILDING ▫ ROOM B-2
FRAMINGHAM, MA 01702-8325
T: 508.532.5455

Multiple Hazard Mitigation Plan Update – Working Group

May 2, 2016
7:00 pm, Executive Conference Room

MINUTES

Attendees: Marianne Iarossi, John Magri, Kerry Reed, Sam Bade, Sheila Lynch, Jim Barnett, Ed Kross

1. Debrief of First Public Hearing

   The Working Group (WG) was debriefed on the first public hearing that occurred on March 10th. WG members and residents (10 total) attended. Kerry and Marianne presented on the Plan and process. There were two breakout sessions where attendees were asked where they believe natural hazards are occurring and what project ideas they had to mitigate hazard impacts. Feedback will be incorporated into the Update.

   Emergency and retail store generators were project ideas that John noted are in process and will be able to provide more detail for the Plan.

2. Risk Assessment Update

   a) Wind section?

   The draft Risk Assessment – Sections 1-4 of the Plan – is complete with the exception of the Wind section. Marianne will touch base with Steve Trask to discuss more. The group discussed potential sources of information to be used to collect recent data for the Wind section (State plan, Natick and other communities' plans).

   The group decided to hold off on posting Sections 1-4 on the website for public comment until the entire Plan Update is drafted.

3. Mitigation Strategy – Project Prioritization

   a) Goals & Objectives – The group was provided with the 2005/2012 Goals & Objectives and asked if they were still relevant for the 2017 Plan. After some discussion, it was decided to revisit these after the Mitigation Strategy has begun.

b) How it's been handled in the past – The 2005 Plan was developed by a consultant. Through public meetings, WG and consultant input, an expansive mitigation projects list was developed. The WG at that time "prioritized" the project list via a 1-5 numerical ranking under FEMA's STAPLEE criteria. Averages were compiled. In the 2012 Update, some projects were added to the list but the master list was not re-prioritized at that time. Kerry and Marianne over the past month combed through the master list and recommended removing or revising each project for further consideration in the 2017 Update for various reasons such as being too vague, being an operations/maintenance item, or being a project that has been completed. The 2017 Update will include this original master list in the Appendix with new "Completed Projects" "Potential Projects" and "Priority Projects" tables in the body of the Plan.

   At the 5/2/16 meeting, outstanding items/questions regarding the master list were discussed with the Working Group. Marianne will circulate the master list to see if others agree with Kerry and Marianne's reasoning for the projects.

c) Ideas for new Mitigation Projects – The group was then asked for new mitigation project ideas which included: raising/expanding the culvert under the trail to Farley Middle School; additional stream gauges downstream at Hop Brook; automated weather station wind gauges; public sharing of real-time weather data from Town systems; stormwater bylaw & regulations; etc.

   The new "Potential Projects" list will include those projects carried over from the old master list and new project ideas from the WG and public meeting.

d) 2017 process – evaluation criteria. How do we want to divide the work now? Options: Entire Working Group go through evaluation criteria or a subset of the Working Group? Dedicate a meeting to go through it together or assign as "homework" and regroup? – Discussion ensued regarding the options for how to prioritize the "Potential Projects" list. The group felt we should utilize a similar prioritization process as done in prior plans (STAPLEE criteria with numerical rankings). Marianne will circulate the appropriate documents and whoever would like to rank the projects may do so. Kerry (Engineering), Marianne (Planning), Sam (citizen), and Bob (citizen) will at least be able to rank the projects providing a varied set of input.

4. Schedule moving forward

NEXT STEPS:

- Complete mitigation project evaluation criteria by June 3

Sign-in Sheet 5/2/16 Working Group

Marianne Iarossi
John Cmagri
Kerry Reed
Sampath Bade
Sheila Lynch
Jim Barnett
Ed Kross pTc. 12 559 Union Ave edwardkross@rcn.com

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FRAMINGHAM, MA 01702-8325
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Multiple Hazard Mitigation Plan Update – Working Group

July 19, 2016
7:00 pm, Executive Conference Room

MINUTES

Attendees: James Barnett, Bob Bois, Steve Trask, Sheila Lynch, Ed Kross, Kerry Reed, Marianne Iarossi

1. Mitigation Strategy
   a) Mitigation project ranking results
   b) Selection of priority projects to highlight

The group reviewed the project ranking results which prioritized the mitigation projects and was performed by 5 members of the Working Group. Discussion ensued regarding the results and whether this should be the priority list moving forward. It was noted that some of the top 10-15 ranked projects were those that could be undertaken in house with Town staff and resources as they involved education/outreach, bylaw revisions, etc. The group felt that these projects could be worked on simultaneously with other projects that may require larger resources; therefore, the group decided to combine all the "administrative" level projects into one category.

After looking at the next top 10 projects on the ranking list, the group felt that they should move forward as the priorities. However, there was much discussion surrounding the larger scale neighborhood level projects. A few neighborhoods in Town frequently succumb to flooding impacts. Multiple WG members felt strongly about doing something about this as they live in the neighborhoods and pay high flood insurance rates. These projects may have ranked low due to their scale, potential cost, and political/social support. After discussion, it was suggested to make one of the neighborhood projects a priority pilot project. The Walnut St neighborhood was chosen for a variety of reasons. Moving forward, the WG can design a neighborhood plan and work on action items and objectives for Walnut St to see what may work and could be applied to other neighborhoods.

2. Draft MHMP 2017 report status – Marianne will finalize the draft based on today's discussion and circulate to the Working Group for comment.
3. Next Steps/Schedule –Once comments are received and addressed, the draft Plan can go out for public review. Aim to go to the Selectmen for the final public hearing in Sept and to FEMA/MEMA in Oct.

NEXT STEPS:

- Complete review of draft MHMP & send comments/edits to Marianne by August 16th

Date 7/19/16

Topic MHMP WG #4 - Sign in sheet

Meeting Objectives

Attendees

Notes

Name	Email	Affiliation
Marianne Iarossi	mei@framinghamma.gov	C+ED
James Barnett	barnettech@gmail.com	citizen volunteer
Bob Bois	bbois131@gmail.com	citizen volunteer
Steve Trask	sdt@framinghamma.gov	FPD
Sheila A. Lynch	sheila.lynch1@verizon.net	citizen
Ed Kross	ekross1976@[redacted]gmail.com	
Kerry Reed	kr@framinghamma.gov	DPW

Action Items

Appendix B – Public Comments received on the 2017 Update

Appendix B

Comments to be inserted here

Appendix C – Public Meeting Documents

Public Meeting #1:

- Invitees List
- Email Invitation
- Outreach Brochure & Survey
- Agenda
- Sign-in Sheet
- Presentation
- Break out session feedback maps and notes

Public Meeting #2:

- *To be inserted*

Appendix C

Invitees List:

Adesa
Bose Corporation
CSX
Department of Conservation & Recreation (DCR)
Federal Emergency Management Agency (FEMA)
Framingham Coalition
Framingham Downtown Renaissance (FDR)
Framingham State University (FSU)
Genzyme Corporation
Mass Bay Community College (MBCC)
Massachusetts Water Resources Authority (MWRA)
Metropolitan Area Planning Council (MAPC)
MetroWest Medical Center
MetroWest Regional Transit Authority (MWRTA)
New England Wildflower Association
Pelham Apartments
South Middlesex Opportunity Council (SMOC)
Staples Corporation
TJX Companies
Town of Ashland
Town of Framingham (Conservation Commission, Planning Board, Board of Selectmen, Public Works, Zoning Board of Appeals, Schools, Parks & Rec, Town Manager's Office)
Town of Marlborough
Town of Natick
Town of Sherborn
Town of Southborough
Town of Sudbury
Town of Wayland
Multiple businesses who signed up for Town's "Notify Me" system

Marianne E. Iarossi

From: Marianne E. Iarossi
Sent: Tuesday, March 08, 2016 10:23 AM
To: Marianne E. Iarossi
Subject: Framingham's Multiple Hazard Mitigation Plan (MHMP) 2017 Update
Attachments: March 10 Flyer.pdf

Good morning,

Attached for your information and distribution is a flyer regarding Framingham's Multiple Hazard Mitigation Plan 2017 Update Public Meeting scheduled for **Thursday, March 10th at 7:00 p.m. at the New Christa McAuliffe Branch Library located at 746 Water Street in Framingham**. If you are not the appropriate person for this correspondence, can you please forward to the appropriate party? If you are able to attend, we would be glad to have you.

For more information, visit our website: http://www.framinghamma.gov/2047/Multiple-Hazard-Mitigation-Plan

Let me know if you have any questions. Thank you.

Marianne Iarossi, AICP
Senior Planner
Community and Economic Development
Zoning Board of Appeals

Town of Framingham
150 Concord Street, B2
Framingham, MA 01702-8325
(508) 532-5456
mei@framinghamma.gov

www.chooseframingham.com
@ChooseFram

Please be advised that the Massachusetts Secretary of State considers e-mail to be a public record, and therefore subject to public access under the Massachusetts Public Records Law,M.G.L. c. 66 § 10.

MHMP 2017 Update Introductory Meeting

Join us to learn about Framingham's ***Multiple Hazard Mitigation Plan (MHMP)***

MHMP: a document describing a community's natural hazard risks and ways the community can alleviate those risks

Natural Hazards: flooding, earth-quakes, wildfires, winter storms, etc.

Learn all this and more!

What is an *MHMP* and why do we need one?

What do we mean by "hazards"?

Who creates the Plan and then what do we do with it?

How can we mitigate Framingham's most common hazards?

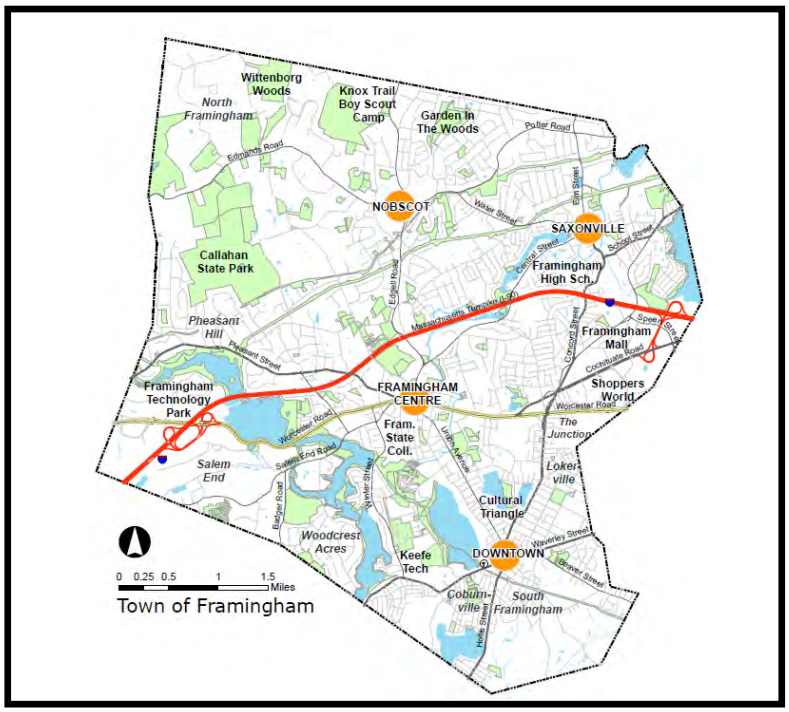
Thursday, March 10, 2016 @ 7:00pm

Christa McAuliffe Branch Library
746 Water St, Framingham MA 01701

Unable to attend the meeting? Fill out the survey on the back of this flyer.

Where are Framingham's natural hazards?

Circle the area/s where you think natural hazards are a problem.



Additional comments/description of area/s circled:

_____

_____

_____

_____

_____

Name: _____

Address: _____

Email: (if you want updates on the MHMP process) _____

Please bring this completed survey to the meeting on March 10th, leave it in the designated envelopes on bulletin boards at the Memorial Building, or drop it off at the Memorial Building, Room B2.

FRAMINGHAM COMMUNITY & ECONOMIC DEVELOPMENT
150 CONCORD STREET ▫ MEMORIAL BUILDING ▫ ROOM B-2
FRAMINGHAM, MA 01702-8325
T: 508.532.5455

Multiple Hazard Mitigation Plan Update – Public Hearing

March 10, 2016
7:00 pm, Christa McAuliffe Branch Library

AGENDA

2016 MAR -7 P 4:48
TOWN CLERK
FRAMINGHAM

7:05 Introduction & presentation

- What is a Multiple Hazard Mitigation Plan (MHMP)?
- Why do we need a MHMP?
- Who prepares the MHMP?
- What hazards are we talking about?

7:20 Break out session #1: ***Where should we focus?*** Using the maps around the room, mark any areas in Town you are aware of that are affected by natural hazards.

7:30 Presentation continued

- How do we mitigate these hazards?

7:40 Break out session #2: ***Help us identify potential projects.*** Using the notepads around the room, jot down ideas for projects the Town could undertake with the goal of mitigating impacts of natural hazards.

7:55 Final thoughts

- Next Steps

Town of Framingham
Multiple Hazard Mitigation Plan 2017 Update
Initial Public Meeting
March 10, 2016, 7:00 p.m., Christa McAuliffe Branch Library

Sign-In Sheet

Name	Affiliation	Email
Bob Bois		bbois131@gmail.com
Steve Trask	Framingham Police/EMD	Sdt@framinghamma.gov
Kerry Reed	DPW	kr@framinghamma.gov
Matt Torti	SCHOOL DEPT.	mtorti@framingham.k12.ma.us
Karen Snegby		kelinea@gmail.com
[illegible]	CED	apr@framinghamma.gov
John Magee	FFD	JCM@Framinghamma.Gov
Marianne Tarossi	Town of Fram.	mei@framinghamma.gov
Alex Volfson	Transition Framingham	alex.oofor you@gmail.com

MULTIPLE HAZARD MITIGATION PLAN (MHMP) UPDATE 2017

Presented by
The Multiple Hazard Mitigation Working Group

First Public Hearing
March 10, 2016

Agenda

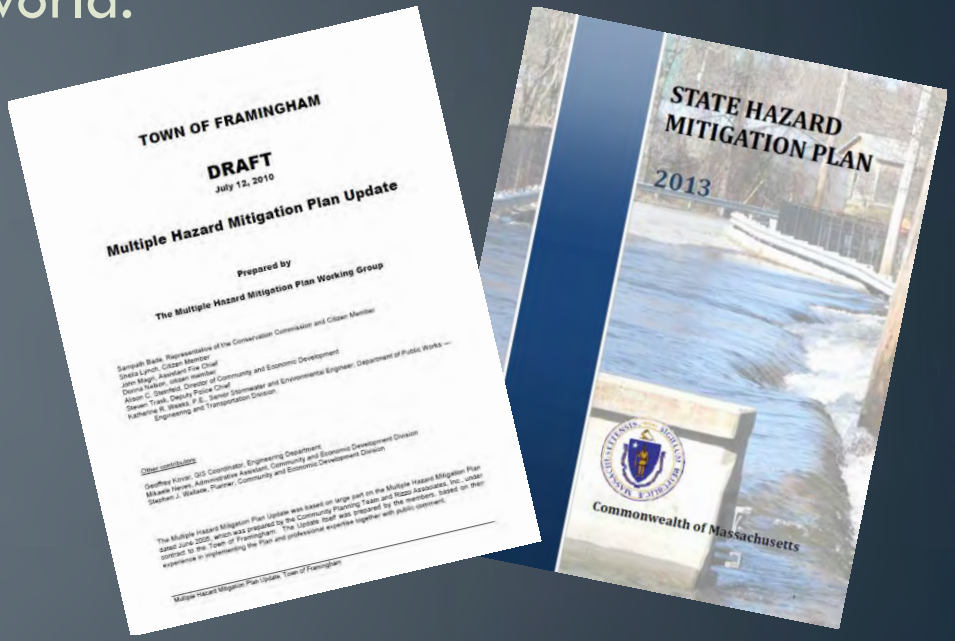
- What is a Multiple Hazard Mitigation Plan?
- Why do we need a MHMP?
- Who prepares the MHMP?
- What hazards are we talking about?
- **Break out session #1: *Where should we focus?***
- How do we mitigate these hazards?
  - Completed Projects
  - Potential Projects
- **Break out session #2: *Help us identify potential projects.***
- Next steps

What is a Multiple Hazard Mitigation Plan?

A *natural hazard* is a weather or climate event that occurs naturally in all parts of the world.

Natural hazards include:

- Flooding
- Hurricanes
- Tornadoes
- Fires
- Thunderstorms
- Earthquakes
- Winter storms
- Tsunami
- Coastal Erosion



A **mitigation plan** is a demonstration of the commitment to reduce risks from natural hazards to people, structures, or infrastructure and serves as a strategic guide for decision makers as they commit resources.

Why do we need a MHMP?

- Federal Disaster Mitigation Act of 2000
  - Requires municipalities to have an all-hazards mitigation plan for funding
  - Plan must be updated & approved by FEMA every 5 years
- Allows the Town to be eligible for federal pre- and post- disaster funding
- Original Plan - June 2005
- Updated - October 2012

Who prepares the MHMP?

- MHMP Working group prepares Plan updates & oversees implementation of the Plan
- Members

Sam Bade	Conservation Commission & Citizen
Bob Bois	Conservation Commission & Citizen
Sheila Lynch	Citizen
Jim Barnett	Citizen
Marianne Iarossi	Community and Economic Development
Steven Trask	Deputy Police Chief
John Magri	Assistant Fire Chief
Kerry Reed	DPW Stormwater Engineer

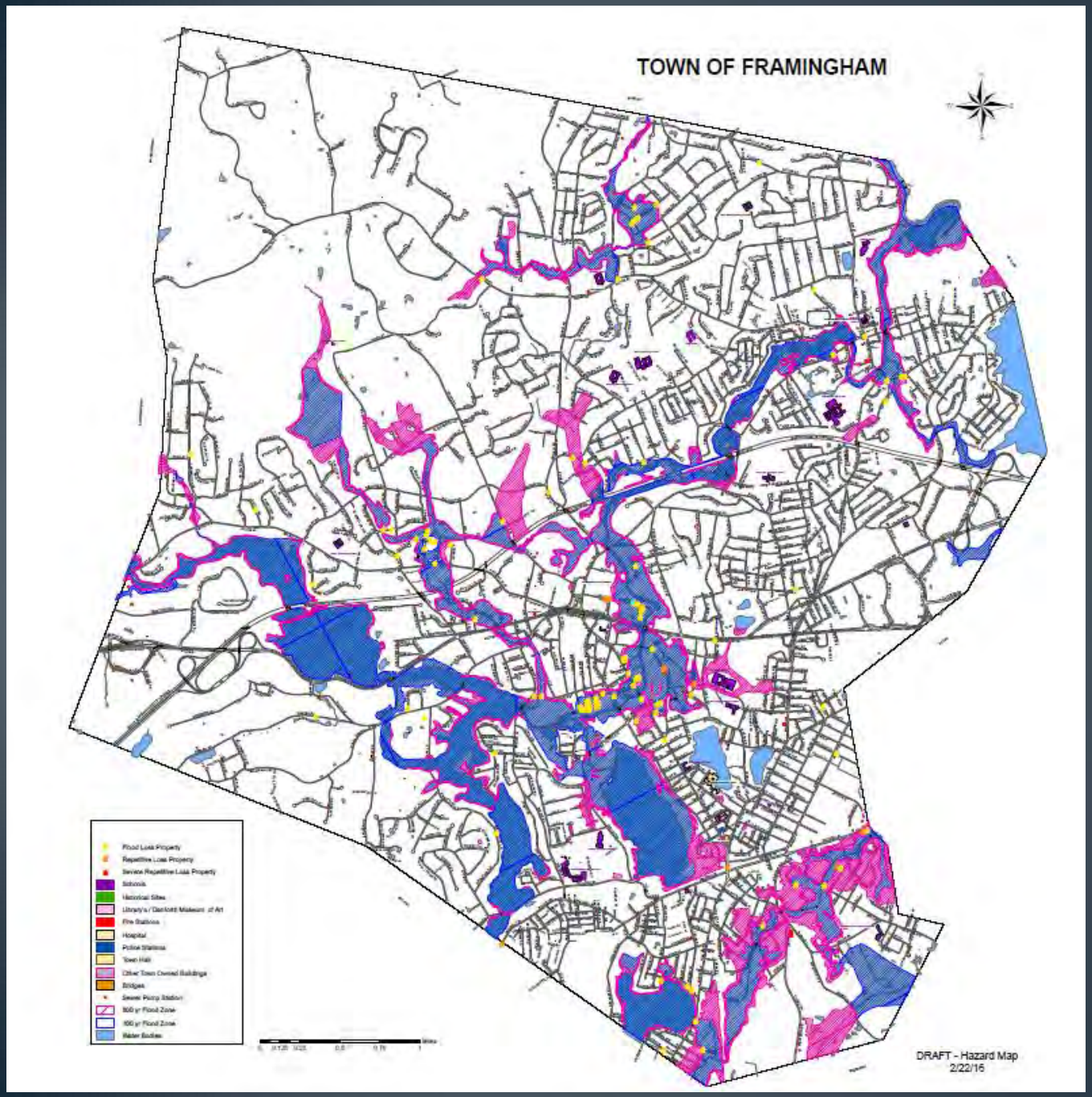
- Appointed by the BOS
- MEMA provides technical assistance
- FEMA approves plan
- RESIDENTS for guidance and input

What hazards are we talking about?

- Flooding
- Winter Storms
- Dam Failure
- Thunderstorms
- Nor'easters
- Hurricanes

Our hazard assessment looks at:

- Location
- Extent
- Past Events
- Probability of Future Events
- Vulnerability



Flooding is the most prevalent serious natural hazard identified by local officials in Framingham.

Break out session #1: *Where should we focus?*

Using the maps around the room, mark any areas in Town you are aware of that are affected by natural hazards.

How do we mitigate these hazards?

Most effective strategy is proactive – developed before disaster occurs!

- Education
- Partnerships
- Align mitigation with other community objectives
- Identify, prioritize, & implement actions/projects

Types of Mitigation Projects

Door dams installed prior to flood events in Melrose. Source: SHMP

Culvert upgrade/reconstruction in Danvers. Source: MEMA

Road/slope stabilization in Becket. Source: MVPC

Property acquisition & structure demolition/relocation
Structure elevation
Safe room construction
Wildfire mitigation
Soil stabilization
Floodproofing of residential/non-residential structures
Generators
Post-disaster code enforcement
Infrastructure retrofit
Mitigation reconstruction
Etc……

Example Mitigation Actions/Projects in Framingham

- Flood Warning Program
- Distribute Flood brochure
- Stormwater Master Plan Phases I – III
- Purchased pumps for emergency response to flooding

Completed prior 2012

- Installed back flow preventers (funded partly by FEMA)
- McAdams Rd drainage improvements
- Installed stream gauges
- Installed pavement temperature sensors
- Upgraded emergency communications

Completed 2012-2016

- Cunningham Drive Drainage Improvements
- Landham Pond Dam Removal
- Beaver Dam Brook Stream Restoration @ Mary Dennison Park
- A/Concord Street culvert replacements (recommended by MEMA for FEMA funding)

In progress

Break out session #2: *Help us identify potential projects.*

Using the notepads around the room, jot down ideas for projects the Town could undertake with the goal of mitigating impacts of natural hazards.

Next Steps

- Identify & prioritize potential projects/actions
- Prepare draft Plan Update
  - Post on Town's website
- Public Meeting #2
- BOS endorsement of the draft
- MEMA/FEMA review – target Fall 2016

Thank you!

For more information & to follow the process:

http://www.framinghamma.gov/2047/Multiple-Hazard-Mitigation-Plan

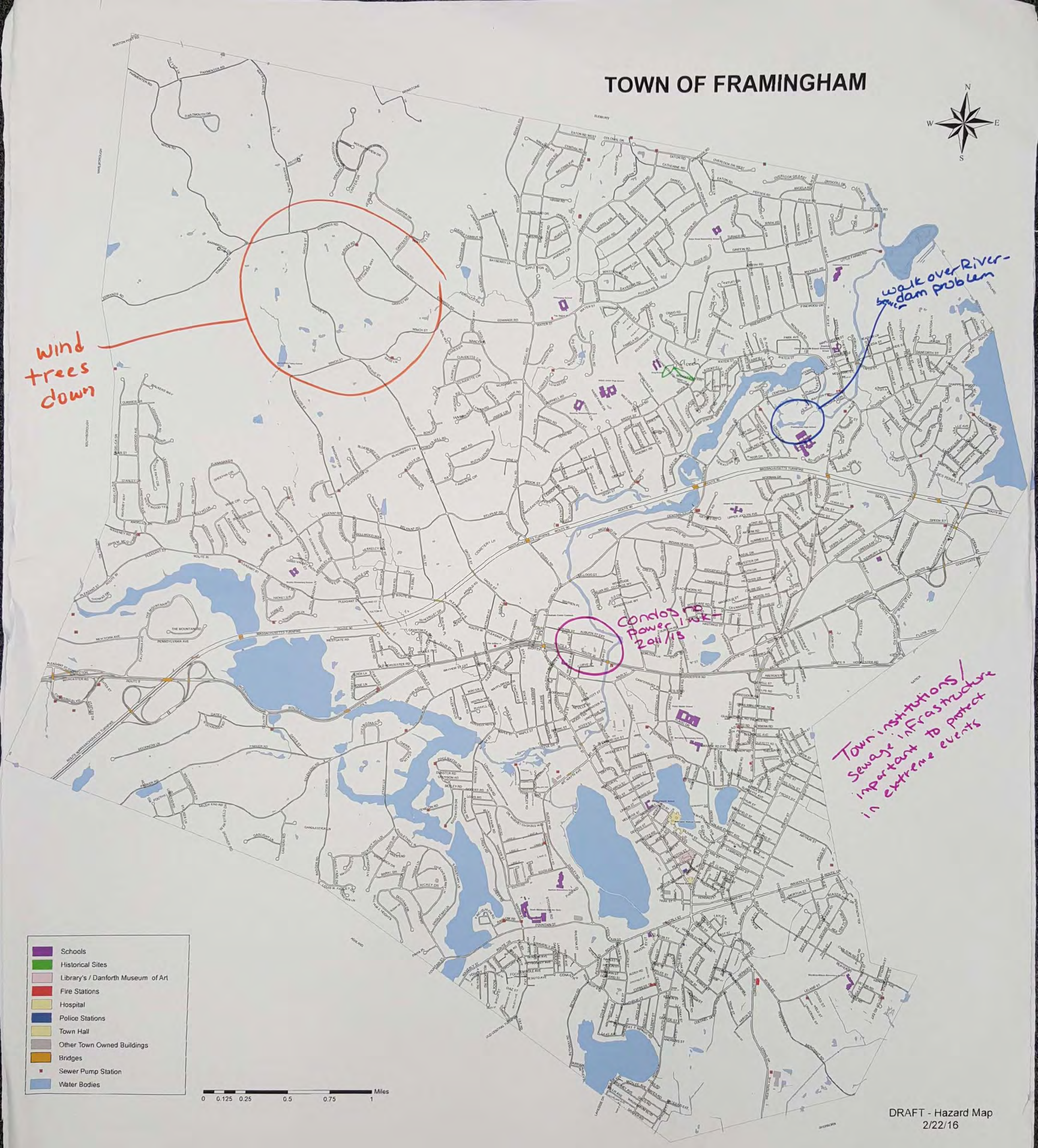
Marianne Iarossi, Senior Planner

mei@framinghamma.gov

Kerry Reed, Senior Stormwater & Environmental Engineer

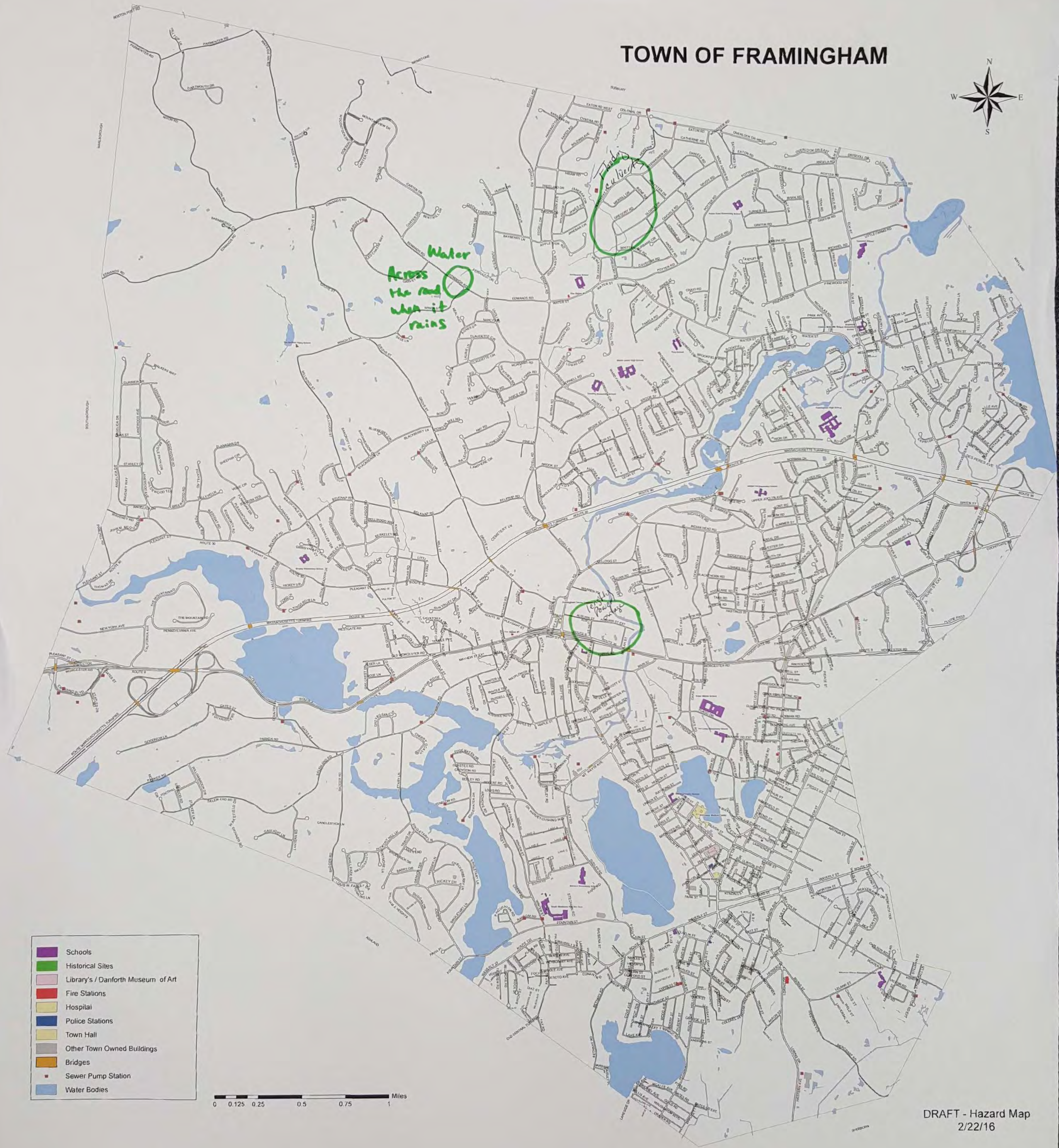
kr@framinghamma.gov

TOWN OF FRAMINGHAM



DRAFT - Hazard Map
2/22/16

TOWN OF FRAMINGHAM



DRAFT - Hazard Map
2/22/16

- Coch Rail Trail wash-out
  OCP

- Emergency Gen for traffic signals

- Green Infrastructure Bylaw / guidelines

- marketing / education to business community of GI

- Generators @ grocery store / gas station (@ least 1) for emergencies.

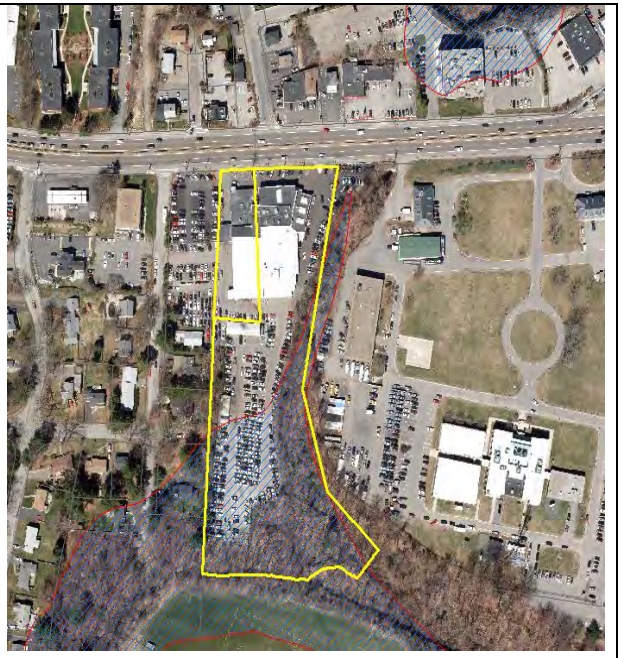
- Stormwater Bylaw ~~w/ enforcement~~
  + Regulation
- Natural wetland restoration
  + talk to SUT + Garden in the woods
  + Plant more trees & shrubs & cattails that take up water
  + Trees can grow fruit & nuts for the community (can be grant funded!)
  + Esp in flood areas
- Constructed Wetlands
- Community Education - reduce dumping
- Rain barrels thoughout the town
  ↳ 50 gal barrels from Whole Foods & a workshop to help people turn them into rain barrels. (we have done this before)
- UPS for traffic lights

Appendix D – Planning Board Projects since 2010 within the Floodzone

Planning Board Projects within the Flood Zone (2010-July 18, 2016)

Project Number		
Project Address		115 Beaver Street
Permits Granted		Special Permit for Use
Decision Date		May 26, 2011
Project Description		The Premises consist of lot with an area of approximately 159,210sf or 5.8 acres, an industrial building containing approximately 21,440 square feet of gross floor area and a second building containing an area of approximately 3,000 square feet. The premises are located within a General Manufacturing District ("M") and are abutted primarily by industrial and commercial buildings and uses. There is an access easement that crosses the site and serves as the sole access to an automobile salvage yard on the westerly side of the railroad tracks. Safeway, Inc. proposes to use the premises as a regional location from which it would store, maintain and deliver scaffolding equipment to area jobsites
Status of Project		Complete

Project Number		
Project Address		500-540 Worcester Road
Permits Granted		Site Plan Review and Special Permits for Use and Dimensional Relief to Off-street Parking Design Standard.
Decision Date		June 16, 2011
Project Description		The Applicant and its consultants explained to the Planning Board (the "Board") that Claremont Realty Trust is the owner of the land, buildings and improvements situated at 500-540 Worcester Road. The premises are leased to Herb Connolly Acura and Herb Connolly Hyundai. The land and the businesses are owned by members of the Connolly family. The project site contains a land area of approximately 267,162 square feet (6.34 acres). These dealerships are located in two, contiguous buildings and contain the typical features of an automobile dealership, including vehicle display and vehicle storage areas, customer parking, service department parking and employee parking, and interior showrooms, office space and repair facilities. The front portion of the site is zoned Business (B) and Highway Overlay (HC). The back portion is zoned Single Family Residence (R-1) and was originally permitted by a decision of the Framingham Zoning Board of Appeals as a use variance on January 21, 1966.
Status of Project		Complete



Project Number		
Project Address		2 and 30 Worcester Road
Permits Granted		Site Plan Review, Special Permit for a Reduction in the Parking Requirements and a Special Permit for Dimensional Relief to Off-street Parking Design Standards
Decision Date		November 17, 2011
Project Description		The proposed project, which will be built in two phases, consists of: Phase 1 (i) razing the Existing Front Building; (ii) rebuilding a new structure in a new location further back from Worcester Road, increasing the building size slightly from approximately 11,786 square feet to approximately 12,532 square feet (such new structure, the "New Building"); and (iii) installing significant landscaping and lighting improvements; and Phase 2 (i) renovating the Rear Building by removing the loading dock; and (ii) upgrading the Project Site by adding thirteen (13) parking spaces and installing related landscaping and lighting improvements. The building footprint or lot coverage, as well as the gross floor area, of the total Project Site will increase by approximately 136 square feet (44,162 square feet existing, 44,298 square feet proposed). The building footprint, lot coverage, and floor area of the New Building will slightly increase over the Existing Front Building by approximately 746 square feet (11,786 square feet existing, 12,532 square feet proposed). The number of parking spaces, upon completion of Phase 2, will be increased from 226 to 239 spaces, but will still be less than the minimum number of parking spaces required by Section IV.B.1. of the By-Law, which is 301.
Status of Project		Complete

Project Number		
Project Address		47 New York Ave
Permits Granted		Site Plan Review
Decision Date		November 17, 2011
Project Description		The Applicant's representatives explained that the proposal is to install approximately 16,500 square feet of modular office trailers. The location of the trailers will be in the same general area as the location of the former transportation center. The Applicant's representatives explained that as a result of staff meetings, it was determined to install the new trailers so that they abut and connect to the existing trailers on the site. All building improvements are located in the Town of Framingham. The property is zoned Technology Park (TP)
Status of Project		Complete

Project Number		PB-006-13
Project Address		4 & 12 West Street
Permits Granted		Site Plan Review
Decision Date		March 13, 2014
Project Description		The project included redevelopment of two lots into one paved area for temporary storage/stacking of pre-owned motor vehicles. The properties are zoned Business (B)
Status of Project		Complete

Project Number		PB-007-13
Project Address		24 Blandin Ave
Permits Granted		Site Plan Review, Special Permit for Use, Special Permit for a Reduction in the Required Number of Parking Spaces, Special Permit for Land Disturbance, and a Public Way Access Permit
Decision Date		February 27, 2014
Project Description		The project included the demolition of the existing building and the construction of a new multi-tenant retail building, parking area, lighting, landscaping and utilities. The property is located in the General Manufacturing (M) Zoning District.
Status of Project		Complete

Project Number		
Project Address		Planned Unit Development off Danforth Street
Permits Granted		Definitive Development Plan
Decision Date		April 29, 2013
Project Description		The Application was filed for the construction of 360 residential units and Clubhouse off RiverPath Drive, zoned General Manufacturing District (M) and Planned Unit Development Overlay District (PUD)
Status of Project		Approved – In progress

Project Number		PB-011-13
Project Address		PUD
Permits Granted		Special Permit for Dimensional Relief to Off-Street Parking Design Standards, Special Permit for Ground Water Protection, Planned Unit Development Special Permit Amendment, a Special Permit for Affordable Housing, a Special Permit for Land Disturbance, and a Public Way Access Permit
Decision Date		July 17, 2013 and August 8, 2013
Project Description		for Dimensional Relief to Off-Street Parking Design Standards pursuant to Section IV.B.3.g, Ground Water Protection pursuant to Section III.N., Planned Unit Development Special Permit Amendment pursuant to Section III.J., Affordable Housing pursuant to Section IV.O. and pursuant to Section V.E. of the Zoning By-Law of the Town of Framingham, Massachusetts. The site is located in the General Manufacturing (M) District and Planned Unit Development Overlay District (PUD).
Status of Project		Approved – In Progress

Project Number		PB-020-14
Project Address		78 Bethany Road
Permits Granted		Public Way Access Permit and Scenic Roadway Modification Permit
Decision Date		October 8, 2014
Project Description		The Applicant proposes to construct three driveways on a scenic way. The property is located in the General Residential (G) Zoning District.
Status of Project		Approved – Pending Construction

Project Number		PB-021-14
Project Address		2 School Street
Permits Granted		Extension of Time: Site Plan Review, Special Permit for Use, and Special Permit for Drive-thru Facilities
Decision Date		October 2, 2014 (original permit date March 5, 2009)
Project Description		The Application for an Extension of Time for an extension of two years from the expiration of the existing Special Permit for Use and Drive-thru Facilities, March 5, 2009, expiring March 5, 2015 for an additional two years with the new expiration date of March 5, 2017. The property is located in the Community Business (B-2) Zoning District.
Status of Project		Approved – Permits expire March 5, 2017

Project Number		PB-023-14
Project Address		120 Waverly Street
Permits Granted		Site Plan Review, Special Permit for Use, Special Permit for a Reduction in the Required Number of Parking Spaces, and a Public Way Access Permit
Decision Date		December 11, 2014
Project Description		The Application was filed to construct a new warehouse building for the existing metal recycling facility, including accessory office space and the construction of site improvements, including new walls, fencing, parking, and drive isles, in addition to a modification of the public way access. The property is located in the Business (B) and General Manufacturing (M) Zoning Districts.
Status of Project		Complete

Project Number		PB-027-14
Project Address		1 Worcester Road – Kohl's + Pier One
Permits Granted		Modification to a Special Permit for a Reduction in the Required Number of Parking Spaces
Decision Date		December 4, 2014
Project Description		Modifications to an Approved Special Permit approved by the Planning Board on June 25, 2002. Said modifications to the property are to accommodate a new tenant by conducting interior, loading, façade, and egress modifications. The property is located in the Business (B) Zoning District and Regional Center Overlay District (RC).
Status of Project		Complete

Project Number		PB-034-14
Project Address		1 Worcester Road – Chick-Fil-A
Permits Granted		Site Plan Review, Special Permit for a Drive-thru Facility, Modification to the Planning Board's June 25, 2002 Decision for a Special Permit for a Reduction in the Required Number of Parking Spaces, and a Public Way Access Permit
Decision Date		March 19, 2015
Project Description		The Application was filed to construct a single story 4,815 square foot Chick-fil-A in the northeast corner of the Kohl's/Bradlees parking area with a drive-thru, landscaping, site improvements, and patio seating. The property is located in the Business (B) Zoning District and Regional Center (RC) Overlay District.
Status of Project		Complete

Project Number		PB-001-15
Project Address		**1 Worcester Road – Cost Plus Market (Sign)**
Permits Granted		Amendment of an Approved Decision for Sign Review Approval in Conjunction with a Special Permit Application dated August 10, 1994
Decision Date		March 19, 2015
Project Description		A modification to an Approved Planning Board Decision for Sign Review Approval in Conjunction with a Special Permit for Site Plan Application dated August 10, 1994 (hereinafter referred to as the August 10, 1994 Decision). An application was filed to modify the August 10, 1994 Decision, specifically to amend Condition B. Store Front/Rear Signs for Building A of the Shoppers' World Regional Shopping Center to allow for the installation of a green awning above the entrance of Building A. The property is located in the Business (B) Zoning District and in the Regional Center (RC) Overlay District
Status of Project		Complete

Project Number		PB-007-15
Project Address		88 Blandin Ave
Permits Granted		Modification to an approved Site Plan Review and Special Permit for Use Decision dated January 4, 2000 and to further modify the April 8, 2002 Decision
Decision Date		July 9, 2015
Project Description		The proposed modification is for the construction of a 2,736 square foot (45'6"x60') one-story addition onto the existing commercial building used for automotive repair, auto body work, general motor repair, along with associated site improvements. The property is located in the General Manufacturing (M) Zoning District
Status of Project		Complete – Pending occupancy review

Project Number		PB-014-15
Project Address		1 Worcester Road – Toys R us (Sign)
Permits Granted		Request to amend an Approved Decision for Site Plan Review Approval in Conjunction with ah Special Permit Site Plan Application dated August 10, 1994, to modify Condition B., specifically for Building B
Decision Date		October 27, 2015
Project Description		The applicant seeks to remove the existing non-conforming primary wall sign above the entrance of Building B – Toys R Us. The Applicant proposes to replace the existing letters: T O Y S U S that are 5' tall with new letters: T O Y S U S letters that are as well 5' tall. The letters T O Y S U S are compliant with the August 10, 1994 Planning Board Decision, which permits primary signs to have signs 5' x 40'. The Applicant further requests to remove the nonconforming 10' star with the "R" and replace it with a lesser nonconforming R that is 7'6", which exceeds the permitted height by 2'6". The property is located in the Business (B) Zoning District and in the Regional Center (RC) Overlay District
Status of Project		Complete

Project Number		PB-015-15
Project Address		63 Western Ave
Permits Granted		Minor Site Plan Review
Decision Date		December 17, 2015
Project Description		The Project consists of five solar canopies, located over an existing impervious area utilized by Adesa for the storage of vehicles. The solar canopies will vary in height, with the lowest point constructed at 14'6" above grade and the highest point constructed at 26'4". These heights allow vehicles to maneuver under the solar canopies without impediment or damage to either the vehicle or the solar canopy. The column foundation will be constructed roughly 10' below finished grade due to the sandy nature of the soils. The property is located in the General Manufacturing (M) Zoning District
Status of Project		Approved - In Progress

Project Number		PB-010-16
Project Address		**156, 158, 160 Edgell Road**
Permits Granted		Special Permit for a Common Driveway, a Public Way Access Permit, and a Scenic Roadway Modification Permit
Decision Date		June 2, 2015
Project Description		The Project will include one curb cut on Edgell Road that will service one common driveway for three buildable lots. Edgell Road is classified as a scenic roadway. The property is predominately wooded with several areas of wetlands. A stone wall runs along the frontage of Edgell Road. The Applicant proposes to reuse stones removed from the stone wall to reconstruct several areas of the wall that have been damaged and/or missing. The property is located in the Single Family Residential (R-3) Zoning District
Status of Project		Approved – In progress

Appendix E – Mitigation Projects Table since Original Plan

Appendix E

The following table was taken from the 2012 MHMP Update and includes all mitigation projects identified in both the 2005 and 2012 plans. These projects were re-evaluated as part of the 2017 Update and either removed for consideration, retained, or revised.

Prioritization of Mitigation Projects		
Suggested Natural Hazard Mitigation Project, Program, or Strategy	**2005 Rating**	**2017 Status**
Analyze Structures Impacted by Hazards:		
Identify appropriate and feasible mitigation activities for identified repetitive flood properties	4.20	**Revised.** More specific mitigation projects were identified for definitive neighborhood areas frequently impacted by flooding. See Table 5.2 in the 2017 MHMP Update for the revised mitigation projects.
Contact repetitive loss property owners to discuss mitigation opportunities, and determine interest should future project opportunities arise	3.70	
Explore options for incentives to encourage property owners to engage in mitigation.	3.80	
Master Drainage Plan		
The Master Drainage Plan should take a watershed-based approach and should include the following items:		**Revised.** The Master Drainage Plan is being undertaken in five phases and includes the elements to the left. See Appendix F (Completed Projects) for more information on Phases 1-3 which have been completed. See Table 5.2 for the revised mitigation project which includes Phases 4 & 5.
Aerial survey or GIS base maps of the Town with the storm water drainage system delineated	3.40	
A description and review of the Town's existing drainage system for each watershed. This would include hydraulic analyses to determine the capacities of each system	4.00	
A description and analysis of the hydrologic condition of the Town and how future developments may impact drainage systems, streams and wetlands in each watershed	3.67	
A review of the Town's regulations as they pertain to or affect drainage issues	3.40	**Revised.** This project was strengthened. See Table 5.2 for the revised mitigation project.
Recommendations for the development of drainage facilities within the Town for each watershed	4.00	**Revised.** The Master Drainage Plan is being undertaken in five phases and includes the elements to the left. See Appendix F (Completed Projects) for more information on Phases 1-3 which have been completed. See Table 5.2 for the revised mitigation project which includes Phases 4 & 5.
Develop a plan for each watershed for the implementation of specific recommendations to upgrade existing drainage systems and provide for adequate operation and maintenance procedures.	4.50	
Development with respect to Flood Elevations		
Explore raising the base elevation requirement for new residential construction to two or three feet above base flood elevation, or greater. An increased elevation standard in one activity the town can engage to receive credit from the NFIP Community Rating System Program (CRS)	3.67	**Revised.** This project's feasibility will be evaluated through a CRS Program Assessment. See Table 5.2 for the revised mitigation project.
Identify opportunities to upgrade the Federal Insurance Rate Map	3.08	**Complete.** FEMA updated floodplain maps in 2014. See Appendix F (Completed Projects).
Eliminate or reduce the amount of "Grandfathering" allowed under existing regulations.	2.75	**Removed.** Ongoing Operations & Maintenance (O&M).
(Re)Development of Vulnerable Properties		
Incorporate information from the Plan relative to vulnerability of existing buildings, infrastructure and critical facilities located in identified hazard areas into the Town's development review and planning processes	TBD	**Complete.** In 2014, the Town established a "Permit Framingham: Plan-Build-Grow" permitting review process. Through this process, DPW, Police, Fire, and Planning amongst other departments meet before & during certain development projects to provide support & direction on said projects. Additionally, this is an ongoing process through the MHMP implementation and updates. See Appendix F (Completed Projects).
Incorporate information from the Plan relative to vulnerability of potential development or redevelopment in hazard areas described in Section 5 into the Town's development review and planning processes.	TBD	
Monitor land use and development trends to determine consistency with the Plan. Identify methods to redirect or modify development to insure consistency with Plan, to the maximum extent possible.	TBD	**Removed.** This is an ongoing process through the MHMP implementation and updates.
Develop a system to estimate potential dollar losses to vulnerable structures	TBD	**Complete.** This is an ongoing process already performed by DPW. See Appendix F (Completed Projects).
Track Depth of Sudbury River		

Evaluate the location of existing stream gauges located along the Sudbury River. Contact the United States Geological Survey to install a simplified stream gauge that would provide real time stream gauge to enable accurate predictions of imminent flooding.	3.50	**Complete.** Five stream gauges have been installed. See Appendix F (Completed Projects). Installing additional stream gauges is retained as a mitigation project in Table 5.2.
Evaluation of Drainage System		
Prepare and update an inventory of culverts that historically create flooding problems. Identify and prioritize candidate culverts for replacement	4.67	**Removed.** Ongoing O&M.
Institute regular maintenance program for culverts in problem areas	4.83	
Prepare and update an inventory of areas with drainage problems and conduct engineering studies in each of the areas to identify causes and develop potential mitigation actions	4.67	**Removed.** Ongoing as part of the Stormwater Master Plan (SWMP).
Prepare and update an inventory of open channels that require dredging or other significant maintenance and identify a plan for operations and maintenance of these channels that incorporates required permitting, such as from the Conservation Commission, the DEP, and the U.S. Army Corps of Engineers.	4.90	
Flood Damage Reduction		
Public Works and Utilities:		
Obtain whatever equipment is required to lessen impacts during flooding events	3.42	**Complete.** Three pumps purchased. See Appendix F (Completed Projects). Also, too general.
Install backflow preventers at the end of storm drain outfalls to stop the water from the Sudbury River from reversing flow*	3.17	**Complete.** Two backflow preventers installed. See Appendix F (Completed Projects).
Evaluate the sewerage pumping stations that are located in the frequent flooding areas and elevate them beyond the flood elevations.	4.50	**Removed.** Ongoing O&M.
Protect or elevate ground-mounted transformers	2.92	**Removed.** Determined to be infeasible due to site control and private ownership.
Elevate vulnerable equipment, electrical controls and other equipment at wastewater treatment plants, potable water treatment plants and pump stations	3.00	**Complete.** As part of DPW's Capital Improvement Plan this has been evaluated. See Appendix F (Completed Projects).
For sewer lines in the floodplain, fasten and seal manhole covers to prevent floodwater infiltration	3.80	**Removed.** Ongoing O&M.
Replace low bridges or other obstructions that may induce flooding of houses or businesses.	3.70	**Revised.** Strengthened and specified bridges. See Table 5.2 for the revised mitigation project.
Move building contents to a higher floor or store outside of floodplain	1.50	**Removed.** Ongoing O&M.
The Department of Public Works has sandbags in storage that can be borrowed for use by Framingham residents and businesses.	2.92	
Store important documents and irreplaceable personal objects where they will not get damaged	0.80	**Removed.** Ongoing O&M. These are best practices to be expressed through public education.
Elevate or relocate furnaces, hot water heaters and electrical panels	3.40	
Provide openings in foundation walls that allow flood waters to move, thus avoiding collapse of walls incapable of resisting hydrostatic pressure	2.00	
Build and install flood shields for doors and openings (after evaluating whether the building can handle the forces) to prevent floodwater from entering	3.20	
Buy and install sump pumps with back-up power.	2.80	
Businesses:		
Store important documents, such as insurance papers, where they will not get damaged	1.00	
Elevate or relocate furnaces, hot water heaters, electrical panels and other equipment	3.80	
Provide openings in foundation walls that allow food waters to move, thus avoiding collapse of walls incapable of resisting hydrostatic pressure	2.00	
Build and install flood shields for doors and other openings (after evaluating whether the building can handle the forces) to prevent the floodwater from entering	3.20	
For drains, toilets and other sewer connections, install backwater valves or plugs	3.60	

Identify stored hazardous materials or other chemicals which should be relocated or elevated, in the case of flooding.	4.20	
Public Education and Outreach		
Collect information on public educational materials for protecting life, property and the environment from flooding, windstorm, and winter storm events	3.17	**Complete.** Website has since been updated and a Flood Facts Brochure was released. See Appendix F (Completed Projects).
Disseminate emergency public information and instructions concerning flood preparedness and safety including dam hazards	3.50	**Removed.** Ongoing O&M.
Obtain/maintain records of flooding incidents in local neighborhoods	3.33	
Make a presentation of this plan to the Board of Selectmen	2.00	**Complete.** This was done for the 2012 MHMP Update and will continue to be done for future updates, including this one. See Appendix F (Completed Projects).
Provide public information about floods prevention, insurance, preservation of wetlands, etc. as inserts included in the utility bills	3.25	**Complete.** Done and deemed not to be effective. See Appendix F (Completed Projects).
Institute system of warnings and fines for landscapers found to be dumping grass clippings, leaves and yard wastes in wetlands and flood plains	3.50	**Removed.** Ongoing O&M through Conservation Commission bylaw & enforcement.
Hiring of fire prevention and educational personnel to conduct and oversee educational programs	2.42	**In progress.** Hiring Life Safety Educator & developing Fire Prevention Division.
Visit neighborhoods located in the high risk areas to conduct education and outreach activities	2.42	**Removed.** Public hearings for DPW capital projects are performed on an ongoing basis. This will also be done as part of the specific neighborhood projects shown in Table 5.2.
Fire Station to hold open houses and allow the public to visit, see the equipment, and discuss wildfire mitigation with the station crew.	2.42	**Removed.** Ongoing O&M occurring annually.
Maintenance and Readiness		
Develop adequate warning/notification systems in the areas prone to flooding to notify of imminent flooding. This could be expanded to include areas located downstream from high hazard dams	3.50	**Complete.** This was completed prior to 2012 Update. See Appendix F (Completed Projects).
Identify appropriate shelters for people who may need to evacuate due to loss of electricity and heat and make their locations known to public	2.33	
Assure that critical facilities such as police and fire station and schools are accessible and equipped	2.33	
Obtain equipment for clearing streets and roads of fallen trees and snow to assure the passage of public safety vehicles and general traffic	2.67	**Removed.** Ongoing O&M.
Distribute educational materials to the residents and public and private sector organizations regarding preparedness for no power situations	2.75	**Removed.** Determined to not be practical for mitigating hazards.
Disseminate education information to property owners to reduce risk from tree failure to life, property and utility systems	2.67	
Identify potentially hazardous trees in critical areas	2.50	**Removed.** Ongoing O&M.
Increase staff to assist tree warden to identify and remove hazardous trees	2.50	**Removed.** This is not considered a priority project currently.
Maintain snow removal equipment and adequate supplies of deicing materials ready for deployment	3.33	**Removed.** Ongoing O&M.
Update and maintain plans for managing emergency response activities due to flooding including addressing potentially hazardous dams	4.00	
Emergency management and other local government agencies should familiarize themselves with technical data and other information pertinent to the dams which impact Framingham. This should include determining the probable extent and seriousness of the effect of failures on downstream areas	4.00	**Removed.** Ongoing O&M. Also, not actionable.
Determine minimum notification time for areas downstream from the dams.	3.40	**Removed.** This is a requirement under the state's Dam Safety Program. High risk dams already have emergency action plans which include these details.
Underground Electrical Utilities		

Increase the use of underground utilities where possible	2.25	**Removed.** Ongoing O&M.
Develop partnerships with utility providers to relocate overhead utilities underground to minimize disruption of services, especially power.	2.92	
Coordination between Residents and Fire Department		
Encourage single-family residences to have fire plans and practice evacuation routes	2.50	**Removed.** Fire education taught in schools; determined to not be practical for mitigating hazards.
Encourage fire inspections in residential homes by fire departments to increase awareness among homeowners and fire responders	2.20	
Require fire department notification of new business applications to ensure that appropriate fire plans have been developed	2.40	**Removed.** Ongoing O&M and done through the new permitting review process mentioned above.
Encourage the Building and Wire, Planning and Economic Development, and Engineering departments to work closely with landowners and/or developers to identify and mitigate conditions that aggravate wildfires, including:	2.80	
Limited access for emergency equipment due to width and grade of roadways;	2.80	
Inadequate water supplies and the spacing, consistency and species of vegetation around structures	2.70	
Inadequate fuel breaks, or lack of defensible space	2.80	
Highly flammable construction materials	2.70	
Building lots and subdivisions that are not in compliance with the state and town land use and fire protection regulations, and	2.60	
Inadequate entry/escape routes.	2.90	
Encourage the public to evaluate access routes to remote areas for fire-fighting vehicles and to develop passable routes if they do not exist	3.00	
Clear trimmings, trees, brush, and other debris completely from sites when performing routine maintenance and landscaping to reduce fire risk.	2.80	**Removed.** Ongoing O&M and limited site control on private properties.
Revise Planning/Zoning and Building Codes		
Planning/Zoning to keep critical facilities away from seismic fault lines	1.83	**Removed.** Fault lines deemed a low risk – no further consideration of this item.
Planning, zoning and building codes to avoid areas below steep slopes or soils subject to liquefaction	3.00	**Removed.** Ongoing review through the Town's Land Disturbance Special Permit process.
Building Codes to prohibit loose masonry, overhangs, etc.	2.17	**Removed.** Earthquake/wind hazards deemed a low risk. State Building Code requires buildings to be designed to wind speed. Limited control over State Building Codes.
Evaluate current building codes and revise to enhance structural resistance to high winds	2.33	
Allow new construction in areas that are not vulnerable to direct wind effects.	1.17	**Removed.** Received a low score in 2005 Plan – deemed not feasible.
Enhanced Weather Monitoring		
Improve capability to monitor weather forecasts, conditions and warnings issued by the National Weather Service	1.83	**Complete.** In 2015, DPW upgraded the emergency operations center for weather conditions, which receives direct data through contracted weather stations. See Appendix F (Completed Projects).
Evaluate the need for more weather stations/services and/or weather instrumentation	1.67	**Revised.** Revised to suggest installation of a weather station in each quadrant of Town. See Table 5.2 for the revised mitigation project.
Retrofit Public Buildings and Critical Structures		
Evaluating and retrofitting public buildings and critical facilities to withstand snow loads	2.00	**Removed.** Ongoing O&M.
Clearing roofs of excessive snow accumulations	3.33	
Evaluating and retrofitting public buildings and critical facilities to withstand high winds.	3.00	

Appendix F – Completed Projects

Appendix F

Mitigation Project	Outcome
Master Drainage Plan	Phases 1-3 have been completed. The Stormwater Master Plan is being conducted in five phases using a prioritized, watershed-based approach. SWMP Phase I included the Beaver Dam Brook and Farm Pond sub-basins. Phase II was completed for following 5 additional sub-basins: Lokerville, Angelica Brook, Jacobs Brook, Cochituate, and Sucker Brook. Phase III was completed for following 4 additional sub-basins: 9/90, Dunsdell Brook, Hop Brook, and Old Town Center.
Identify opportunities to upgrade the FIRMs	FEMA updated floodplain maps in 2014.
Incorporate information from the Plan relative to vulnerability of existing buildings, infrastructure and critical facilities (and potential development or redevelopment) located in identified hazard areas into the Town's development review and planning processes	In 2014, the Town established a "Permit Framingham: Plan-Build-Grow" permitting review process. Through this process, DPW, Police, Fire, and Planning amongst other departments meet before & during certain development projects to provide support & direction on said projects. Additionally, this is an ongoing process through the MHMP implementation and updates.
Develop a system to estimate potential dollar losses to vulnerable structures	This is an ongoing process already performed by DPW.
Evaluate the location of existing stream gauges located along the Sudbury River. Contact the USGS to install a simplified stream gauge that would provide real time stream gauge to enable accurate predictions of imminent flooding.	Five (5) automated stream gauges (surface water level sensors and communications equipment) were installed at the following high risk areas: • Main Street (Sudbury River) • Saxonville Levee Drain Pumping Station (Sudbury River) • McAdams Road (Dunsdell Brook) • Hemenway Road (Hop Brook) • Second Street (Beaver Dam Brook)
Obtain whatever equipment is required to lessen impacts during flooding events	Three small portable pumps were purchased to provide backup support for smaller flooding situations. The Fire Department also purchased three 6-hp pumps for medium-sized jobs.
Install backflow preventers at the end of storm drain outfalls to stop the water from the Sudbury River from reversing flow	Town of Framingham was faced with recurring flooding on Auburn Street and the Auburn Street Extension causing repetitive damages to the town and private properties as a result of the Sudbury River backing up at these locations into the town's storm water drainage system. In order to mitigate this problem, the town decided to install two backflow preventers, a component of which is a "duckbill" style check valve. This valve allows liquids to flow in a single direction. These valves are used in situations where the direction of liquid flow must not be allowed to reverse itself. Two backflow preventers were installed at 18 Auburn Street and 18 Auburn Street Extension. A third backflow preventer was proposed to be installed at Sucker Brook near Main Street, but could not be installed due to regulations regarding compensatory flood storage as required by the state's Wetland Protection Act.
Elevate vulnerable equipment, electrical controls and other equipment at wastewater treatment plants, potable water treatment plants and pump stations	As part of DPW's Capital Improvement Plan this has been evaluated.
Collect information on public educational materials for protecting life, property and the environment from flooding, windstorm, and winter storm events	A Flood Facts Brochure was produced, distributed to 3,000 floodplain properties. The brochure is available on the Town's website at: http://www.framinghamma.gov/1603/Flood-Management
Make a presentation of this plan to the Board of Selectmen	This was done for the 2012 MHMP Update and will continue to be done for future updates, including this one.

Provide public information about floods prevention, insurance, preservation of wetlands, etc. as inserts included in the utility bills	Distributed public services message on flooding with fall tax bill and deemed not to be effective.
Develop adequate warning/notification systems in the areas prone to flooding to notify of imminent flooding. This could be expanded to include areas located downstream from high hazard dams Identify appropriate shelters for people who may need to evacuate due to loss of electricity and heat and make their locations known to public Assure that critical facilities such as police and fire station and schools are accessible and equipped	This was completed prior to 2012 Update. The Town's Connect CTY Program and reverse 911 program provide adequate warning/notification systems for hazards.
Improve capability to monitor weather forecasts, conditions and warnings issued by the NWS	In 2015, DPW upgraded the emergency operations center for weather conditions, which receives direct data through contracted weather stations.
Mount Wayte flood control improvements	A pump was purchased for use by DPW during major storm events to alleviate flooding at the flood gate at Sherwin Ter. (Eames Brook). A pump support structure was constructed at Sherwin Terrace to improve operations of the flood control system during emergency pumping operations.
Drainage improvement at McAdams Road	A historically open drainage swale was culverted in the 1950s. The culvert was insufficiently sized (one 36" pipe) for the flow during significant storm events. The area frequently flooded, causing a safety hazard to pedestrians and drivers as well as flooding of the property on the north side of McAdams Road. A second 36" pipe was constructed with fewer bends to provide greater capacity.
Installed Roadway Camera Network	60 Traffic Cameras were installed which observe real-time weather conditions and allow for condition assessment and mitigation actions.
Public Information Project Manager positions at Town Manager office and DPW	Public Information PMs are responsible for emergency alerts and public outreach by using website, social media, and written communications. The PMs effectively relay information (e.g. storm warnings, initiating emergency parking bans). The PMs can also access and utilize reverse 9-1-1 if needed.
Pavement temperature sensors	DPW installed pavement sensors on Town roads in key areas to evaluate the temperature of pavement during cold weather. Pavement temperature, not air temps, dictates road freezing conditions. Sensors allow DPW to make proactive decisions based on real time data and improves effectiveness of anti–icing treatments. The sensors: Programed to notify (call/text) supervisor when specific temp thresholds are met; recognize trends for appropriate response; eliminates need for handheld temperature sensor
Upgrade "Snow Room" emergency control center	DPW upgraded the "Snow Room" which is used as a control center during winter storm emergencies. Upgrades included improved communication systems to better track storms and manage personnel and equipment conducting sanding/salting and snow removal operations. This improves the Town's responsiveness to winter storms.
DPW Communications Tower	A 210 foot communication tower at 100 Western Ave facility used by Public Safety Departments in order to provide back up to both voice and data systems. The tower has Microwave capability installed to provide addition redundancy and future

	regional emergency communications throughout the area.
McAuliffe Library	Stormwater BMPs were incorporated at the newly constructed McAuliffe Library to manage stormwater onsite and reduce localized flooding. Note: the cost is for design & construction of the entire project. Specific flood mitigation costs were not quantified.
Purchased floodplain model for education	This model helps students/citizens understand the critical role that floodplains play in the life of a watershed, and the impact of unplanned development and human activity in key areas through innovative hands-on simulations.

Appendix G – Certificate of Adoption

To be inserted