



FEMA

October 29, 2008

Mr. Martin Pillsbury
Manager of Regional Planning Services
Metropolitan Area Planning Council
60 Temple Place
Boston, MA 02111

Dear Mr. Pillsbury:

Thank you for the opportunity to review the Marlborough Annex of the Metropolitan Area Planning Council (MAPC) North West Multi-Hazard Mitigation Plan. The Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) Region I has evaluated the plan for compliance with the Interim Final Rule published in the Federal Register on February 26, 2002 (44 CFR Parts 201 and 206). The plan satisfactorily meets all of the mandatory requirements set forth by the regulations except §201.6(c)(5), adoption by the local governing bodies.

As you are aware, Federal regulations require that a plan must include documentation of its formal adoption by the governing bodies of the jurisdictions it represents. Accordingly, this letter reflects a conditional approval of the plan for the participating communities listed below until we receive copies of their signed and stamped adoption resolutions. If the plan is not adopted within one calendar year of FEMA's conditional approval, the jurisdiction must update the entire plan and resubmit it for FEMA review.


- Town of Marlborough

Once this documentation has been received and accepted, a formal letter of approval, signed by our Regional Director, will be sent to you. After this plan is formally approved, those jurisdictions that adopt it and belong to the National Flood Insurance Program (NFIP) will be eligible to apply for Mitigation Grants administered by FEMA.

Along with copies of the communities' adoption resolutions, please also submit an electronic version of the plan. FEMA must upload complete, electronic versions of all approved plans into the National Emergency Management Information System (NEMIS) database. Acceptable electronic formats include a *.doc* or *.pdf* file and may be submitted to us on a CD.

Thank you for your continued dedication to public service demonstrated by preparing and adopting a strategy for reducing future disaster losses. Congratulations once again for achieving this milestone and ensuring a safer future for the residents of Marlborough, Massachusetts. Should you have any questions, please do not hesitate to contact Marilyn Hilliard at (617) 956-7536.

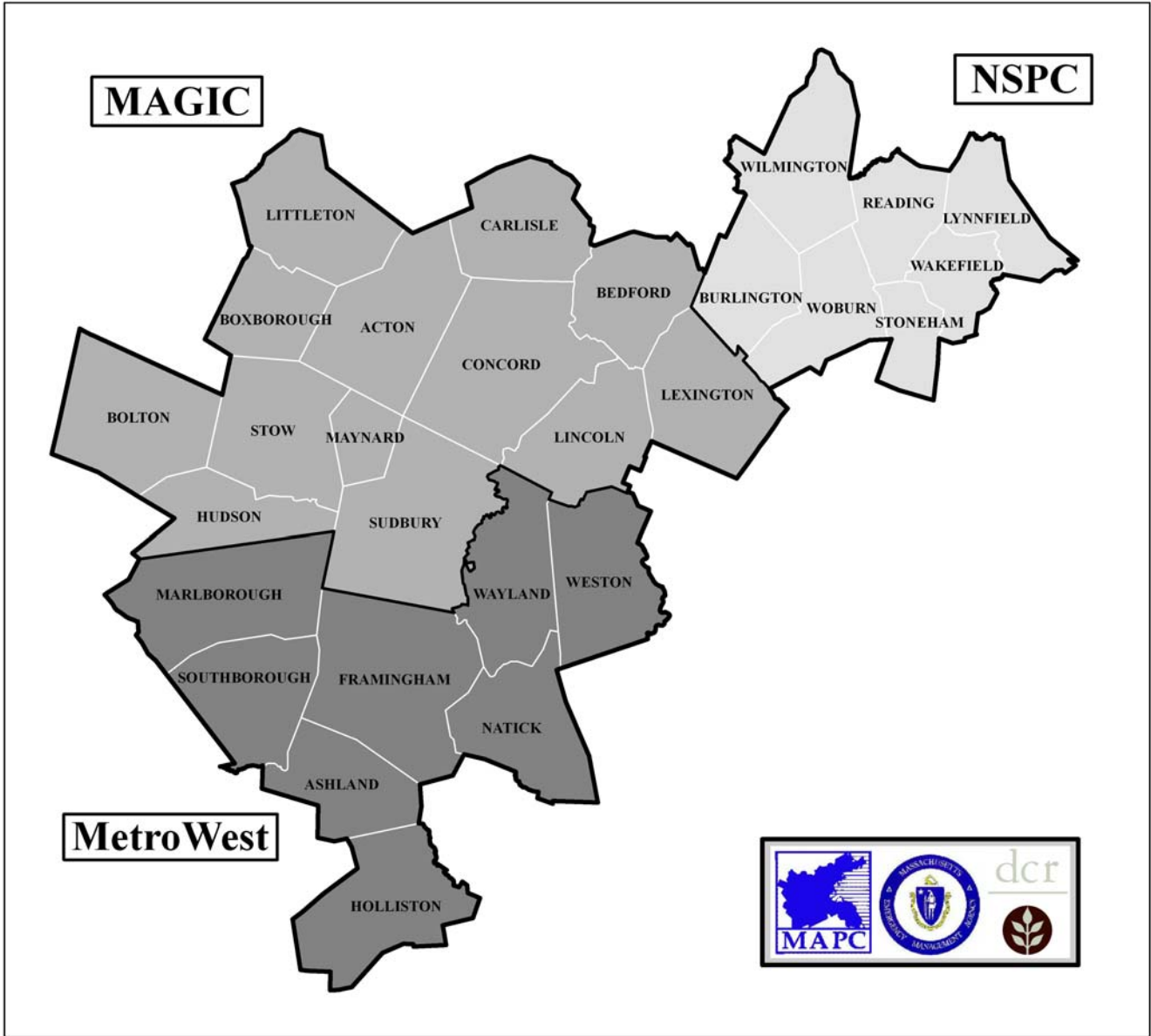
Sincerely,


Kevin M. Merli, Director
Mitigation Division


Enclosure

Cc: Richard Zingarelli, SHMO, MA Emergency Management Agency
Sarah Zingarelli, Hazard Mitigation Planner, MEMA
Donald E. Cusson, Director, Marlborough Emergency Management Department
The Honorable Nancy Stevens, Mayor, Marlborough City Hall

METRO BOSTON NORTH/WEST HAZARD MITIGATION PLAN MARLBOROUGH ANNEX



October 29, 2008

 Metropolitan Area Planning Council
60 Temple Place
Boston MA 02111

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ACKNOWLEDGEMENTS AND CREDITS

This plan was prepared for the City of Marlborough by the Metropolitan Area Planning Council (MAPC) under the direction of the Massachusetts Emergency Management Agency (MEMA) and the Massachusetts Department of Conservation and Recreation (DCR). The plan was funded by the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation (PDM) Grant Program.

MAPC Officers

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Massachusetts Emergency Management Agency

Director:	Don Boyce
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Department of Conservation and Recreation

Commissioner:	Rick Sullivan
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City of Marlborough,	Street Division
Assistant City Engineer:	Dick Baldelli

City of Marlborough,	Department of Public Works
City Engineer:	Tom Cullen

City of Marlborough,	Emergency Management Agency
Emergency Manager	Donald E. Cusson

City of Marlborough,	Conservation Commission
Conservation Administrator:	Priscilla Ryder

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I. INTRODUCTION

Planning Requirements under the Federal Disaster Mitigation Act

The Federal Disaster Mitigation Act, passed in 2000, requires that after November 1 2004, all municipalities that wish to continue to be eligible to receive FEMA funding for hazard mitigation grants, must adopt a local multi-hazard mitigation plan. This planning requirement does not affect disaster assistance funding.

Massachusetts has taken a regional approach and has encouraged the regional planning agencies to apply for grants to prepare plans for groups of communities. The Metropolitan Area Planning Council (MAPC) received a grant from the Federal Emergency Management Agency (FEMA) under the Pre-Disaster Mitigation (PDM) Program, to assist the City of Marlborough and twenty-seven other communities to develop a regional multiple-hazard mitigation plan. The regional plan and the local annex prepared under this grant, meets the requirements of the Disaster Mitigation Act.

What is Hazard Mitigation?

Natural hazard mitigation planning is the process of figuring out how to reduce or eliminate the loss of life and property damage resulting from natural hazards such as floods, earthquakes and hurricanes. Hazard mitigation means to permanently reduce or alleviate the losses of life, injuries and property resulting from natural hazards through long-term strategies. These long-term strategies include planning, policy changes, programs, projects and other activities.

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II. COMMUNITY PROFILE

Overview

The City of Marlborough is rapidly becoming known as a small city with a competitive edge. Bordered by Hudson on the north, Sudbury and Framingham to the east, Southborough to the south, and Berlin and Northborough on the west, Marlborough is 17 miles east of Worcester, and 27 miles west of Boston. Its central, easily accessible location makes it one of New England's most convenient locations for businesses and visitors. Tourists and meeting planners favor Marlborough for its thousand-plus hotel rooms, range of function facilities and proximity to the entire region's largest cities. Major employers like Marlborough's progressive management, pro-business administration and well maintained infrastructure.

For its residents, Marlborough offers a small town feel with the amenities of a city. Newcomers drawn by high tech employers enjoy a sense of community, first forged by the craftsmen who came to work in the city's shoe factories years ago and whose descendants remain as residents.

Together they enjoy an impressive array of local recreational and cultural activities that include a semi-professional football team, a local symphony orchestra, downhill skiing and a renowned public library, all within an hour's drive of Boston, Worcester, Foxborough, Providence, Cape Cod, the historical attractions of Concord and Lexington, and New Hampshire.

(Narrative supplied by community)

(Narrative based on information provided by the Massachusetts Historical Commission and is taken from the Community Profile on the website maintained by the Department of Housing and Community Development at <http://www.mass.gov/dhcd/iprofile/288.pdf>)

The City is governed by a Mayor and City Council. The 2000 population was 36,255 and there were 14,903 housing units.

The City maintains a website at <http://www.marlborough-ma.gov/gen/index>.

Existing Land Use

The most recent land use statistics available from the state are based on aerial photography done in 1999. Table 1 shows the acreage and percentage of land in 21 categories. If the four residential categories are aggregated, residential uses make up 34.11 % of the area of the City. The highest percentage land use is Forest at 35.02 % of the total area.

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Table 1
1999 Land Use

Land Use Type	Acres	%
Cropland	245.89	1.74
Pasture	70.40	0.50
Forest	4937.79	35.02
Non-forested wetlands	259.03	1.84
Mining	0.00	0.00
Open land	372.11	2.64
Participatory recreation	241.15	1.71
Spectator recreation	12.70	0.09
Water recreation	1.09	0.01
Multi-family residential	230.06	1.63
High density residential (less than ¼ acre lots)	537.36	3.81
Medium density residential (¼ - ½ acre lots)	2457.70	17.43
Low density residential (larger than ½ acre lot)	1585.50	11.24
Salt water wetlands	0.00	0.00
Commercial	867.99	6.16
Industrial	713.12	5.06
Urban open	381.41	2.70
Transportation	370.67	2.63
Waste disposal	63.41	0.45
Water	709.14	5.03
Woody Perennial	43.89	0.31
Total	14,100.43	

For more information on how the land use statistics were developed and the definitions of the categories, please go to <http://www.mass.gov/mgis/lus.htm>.

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Potential Future Land Uses

MAPC consulted with city staff to determine areas that have been recently or are likely to be developed in the future. These areas are shown on Map 2, “Potential Development” and are described below. The letters refer to the letters on Map 2.

- A. Regency at Assabet Ridge: 210 units, condos: being built
- B. North Robin Hill Road: 100+ apartments: being built
- C. Crane Meadow Road: 200+ apartments: built

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III. PUBLIC PARTICIPATION

Public participation occurred at two levels; the Metro Boston North/West Multiple Hazard Community Planning Team (regional committee) and the Marlborough Multiple Hazard Community Planning Team (local committee). In addition, the city held one meeting open to the general public to present the plan and hear citizen input.

Marlborough's Participation in the Regional Committee

On July 7, 2006, a letter was sent notifying the communities of the first meeting of the Metro Boston North/West Regional Committee and requesting that the Chief Elected Official designate two municipal employees and/or officials to represent the community. The following individuals were appointed to represent Marlborough on the regional committee:

Dick Baldelli	Assistant City Engineer
Donald Cusson	Emergency Manager

The Metro Boston North/West Regional Committee met on the following dates:

August 15, 2006
March 15, 2007
November 15, 2007
June 25, 2008

The Local Multiple Hazard Community Planning Team

In addition to the regional committee meetings, MAPC worked with the local community representatives to organize a local Multiple Hazard Community Planning Team for Marlborough (local committee). MAPC briefed the local representatives as to the desired composition of that team as well as the need for representation from the business community and citizens at large.

The Local Multiple Hazard Community Planning Team Meetings

On April 4, 2007 MAPC conducted the first meeting of the Marlborough Local Committee. The meeting was organized by Donald Cusson, Emergency Manager. The purpose of this meeting was to review existing mitigation measures, to develop hazard mitigation goals and to begin the discussion of potential mitigation measures. Table 2 lists the attendees at each meeting of the team. The agendas for these meetings are included in Appendix A. Other local meetings are noted in Table 3.

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Table 2	
Attendance at the Marlborough Local Committee Meetings	
Name	Representing
April 4, 2007	
Dick Baldelli	Assistant City Engineer
Nathaniel Bowen	GIS Administrator
November 28, 2007	
Don Cusson	Emergency Manager
Priscilla Ryder	Conservation Administrator
Tom Cullen	City Engineer
May 21, 2008	
Dick Baldelli	Assistant City Engineer
Priscilla Ryder	Conservation Administrator
Tom Cullen	City Engineer
Don Cusson	Emergency Manager
Tom Temple	Assistant DPW Commissioner

Table 3
Other Local Meetings

Date	Participants	Purpose
April 4, 2007	Tom Cullen, City Engineer	Data collection and review

The Public Meeting

The plan was introduced to the public at a meeting of the City Council on July 14, 2008. The meeting was held in the Marlborough City Hall and was publicized as a regular City Council meeting. The attendance list for the meeting can be found in Table 4.

Table 4
Attendance at the July 14, 2008 City Council Meeting

Name	Representing	Name	Representing
Arthur G. Vigeant	City Council, President	Peter Juairé	City Council
Steven Levy	City Council	Robert M. Seymour	City Council
Michael Ossing	City Council	Edward Clancy	City Council
Patricia Pope	City Council	Donald R. Landers	City Council
Joseph F. Delano	City Council	Donald Cusson	Emergency Manager
Paul Ferro	City Council	Nancy Stevens	Mayor
Martin Pillsbury	MAPC	Dick Baldelli	DPW
Sam Cleaves	MAPC		

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IV. OVERVIEW OF HAZARDS AND VULNERABILITY

Overview of Natural Hazards and Impacts

The Massachusetts Hazard Mitigation Plan 2004 (state plan) provides an in-depth overview of natural hazards in Massachusetts. The state plan indicates that Massachusetts is subject to the following natural hazards (listed in order of frequency); floods, heavy rainstorms, nor'easters, coastal erosion, hurricanes, tornadoes, urban and wildfires, drought and earthquakes.

Table 5 summarizes the hazard risks for Marlborough. This evaluation takes into account the frequency of the hazard, historical records and variations in land use. This analysis uses the same vulnerability assessment methodology used in the Commonwealth of Massachusetts State Hazard Mitigation Plan, October 2004.

**Table 5
Hazard Risks Summary**

Hazard	Frequency	Severity
Flooding	High	Serious
Winter storms	High	Serious
Hurricanes	Medium	Serious - extensive
Earthquakes	Low	Catastrophic
Tornadoes	Low	Extensive
Landslides	Low	Minor
Brush fires	Medium	Minor
Dam failures	Low	Serious

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Definitions used in the Commonwealth of Massachusetts State Hazard Mitigation Plan

Frequency

Very low frequency: events that occur less frequently than once in 1,000 years (less than 0.1% per year)

Low frequency: events that occur from once in 100 years to once in 1,000 years (0.1% to 1% per year);

Medium frequency: events that occur from once in 10 years to once in 100 years (1% to 10% per year);

High frequency: events that occur more frequently than once in 10 years (greater than 10% per year).

Severity

Minor: Limited and scattered property damage; no damage to public infrastructure (roads, bridges, trains, airports, public parks, etc.); contained geographic area (i.e. one or two communities); essential services (utilities, hospitals, schools, etc) not interrupted; no injuries or fatalities.

Serious: Scattered major property damage (more than 50% destroyed); some minor infrastructure damage; wider geographic area (several communities); essential services are briefly interrupted; some injuries and/or fatalities.

Extensive: Consistent major property damage; major damage public infrastructure damage (up to several days for repairs); essential services are interrupted from several hours to several days; many injuries and fatalities.

Catastrophic: Property and public infrastructure destroyed; essential services stopped, thousands of injuries and fatalities.

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Flood Hazards

The state plan indicates that Massachusetts is one of the 10 states that account for 76% of all repetitive loss buildings in the United States. Flooding was the most prevalent serious natural hazard identified by local officials in Marlborough. Flooding is caused by hurricanes, nor'easters, severe rainstorms and thunderstorms.

Regionally Significant Storms

There have been a number of major rain storms that have resulted in significant flooding in northeastern Massachusetts over the last fifty years. Significant storms include:

- August 1954
- March 1968
- January 1979
- April 1987
- October 1991 ("The Perfect Storm")
- October 1996
- June 1998
- March 2001
- April 2004
- May 2006
- April 2007

Wind-related hazards

Wind-related hazards include hurricanes and tornadoes as well as high winds during severe rainstorms and thunderstorms. As with many communities, falling trees that result in downed power lines and power outages are an issue in Marlborough.

Between 1858 and 2000, Massachusetts has experienced approximately 32 tropical storms, nine Category 1 hurricanes, five Category 2 hurricanes and one Category 3 hurricane. This equates to a frequency of once every six years. There has been one Category 1 hurricane that has tracked through Marlborough. A hurricane or storm track is the line that delineates the path of the eye of a hurricane or tropical storm. The hazard mapping indicates that the 100 year wind speed is 110 miles per hour. There have been no tornadoes recorded within the city limits.

Winter Storms

In Massachusetts, northeast coastal storms known as nor'easters occur 1-2 times per year. Winter storms are a combination hazard because they often involve wind, ice and heavy snow fall. The average annual snowfall for the city is 48 – 72 inches.

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Fire Related Hazards

Based on an interview with the Marlborough Emergency Manager, there were approximately 10 – 15 brush fires in 2006 and the city averages about this number annually. None resulted in any significant property damage. The areas with the highest incidence of brush fires are located adjacent to the Marlborough State Forest.

Geologic Hazards

Geologic hazards include earthquakes, landslides, sinkhole, subsidence, and unstable soils such as fill, peat and clay. Most city officials admitted that earthquakes were the hazard for which their community was least prepared. Although new construction under the most recent building codes generally will be built to seismic standards, there are still many structures which pre-date the most recent building code.

Regional Overview

According to the State Hazard Mitigation Plan, New England experiences an average of five earthquakes per year. From 1627 to 1989, 316 earthquakes were recorded in Massachusetts. Most have originated from the La Malbaie fault in Quebec or from the Cape Anne fault located off the coast of Rockport. The region has experienced larger earthquakes, of magnitude 6.0 to 6.5 in 1727 and 1755. Other notable earthquakes occurred here in 1638 and 1663. (Tufts). There have been no recorded earthquake epicenters within Marlborough.

Earthquake Impacts – Earthquakes are a hazard with multiple impacts beyond the obvious building collapse. Buildings may suffer structural damage which may or may not be readily apparent. Earthquakes can cause major damage to roadways, making emergency response difficult. Water lines and gas lines can break, causing flooding and fires. Another potential vulnerability is equipment within structures. For example, a hospital may be structurally engineered to withstand an earthquake, but if the equipment inside the building is not properly secured, the operations at the hospital could be severely impacted during an earthquake. Earthquakes can also trigger landslides.

Landslides

The entire city has been classified as having a low risk for landslides.

Critical Infrastructure in Hazard Areas

Critical infrastructure includes facilities that are important for disaster response and evacuation (such as emergency operations centers, fire stations, hospitals, etc.) and facilities where additional assistance might be needed during an emergency (such as nursing homes, elderly housing, day care centers, etc.). It also includes facilities that might pose a particular danger during a natural disaster such as a sewage treatment plant

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or chemical facility. These facilities are listed in Table 6 and are shown on all of the maps in Appendix B.

The purpose of mapping the natural hazards and critical infrastructure is to present an overview of hazards in the community and how they relate to critical infrastructure.

Flooding – Flooding is the most prevalent overall natural hazard in the city. There are 13 critical infrastructure sites listed within FEMA flood zones but no sites listed within locally identified areas of flooding.

Landslides - The entire city is considered to have a low risk for landslides and therefore, all critical infrastructures sites fall within this hazard category.

Earthquakes – The entire city has a low risk for earthquakes and therefore, all critical infrastructures sites fall within this hazard category.

Explanation of Columns in Table 6

Column 1: ID #: The first column in Table 6 is an ID number which appears on the maps that are part of this plan. See Appendix B.

Column 2: Site Name: The second column is the name of the site. If no name appears in this column, this information was not provided to MAPC by the community..

Column 3: Site Address

Column 4: Site Type

Column 5: Landslide Risk: The fourth column indicates the degree of landslide risk for that site. This information came from NESEC. The landslide information shows areas with either a low susceptibility or a moderate susceptibility to landslides based on mapping of geological formations. This mapping is highly general in nature. For more information on how landslide susceptibility was mapped, refer to <http://pubs.usgs.gov/pp/p1183/pp1183.html>.

Column 6: FEMA Flood Zone: The fifth column addresses the risk of flooding. A “No” entry in this column means that the site is not within any of the mapped risk zones on the Flood Insurance Rate Maps (FIRM maps). If there is an entry in this column, it indicates the type of flood zone as follows:

Column 7: Locally Identified Areas of Flooding: The locally identified areas of flooding were identified by city staff as areas where flooding occurs. These areas do not necessarily coincide with the flood zones from the FIRM maps. They may be areas that flood due to inadequate drainage systems or other local conditions rather than location within a flood zone. The numbers correspond to the numbers on Map 8, “Hazard Areas”.

Column 8: Average annual snowfall: The snowfall mapping indicates that there are two bands of snowfall in southeastern Massachusetts. An entry of “high” indicates an annual average of 48.1 – 72 inches of snow. An entry of “low” indicates a range of 36-48 inches.

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Table 6
Relationship of Critical Infrastructure to Hazard Areas

ID	NAME	TYPE	Within Locally Identified Area of Flooding	Landslide	Within FEMA Flood Zone	Average Annual Snow Fall
1	UMASS/Marlborough Hospital	Hospital	No	No	No	High
2	Marlborough Hills Nursing Home	Nursing Home	No	No	No	High
3	Bolton Manor Nursing Home	Nursing Home	No	No	No	High
4	Marlborough Animal Hospital	Veterinary Facility	No	No	No	High
5	CVS Pharmacy	Pharmacy	No	No	No	High
6	Walgreens	Pharmacy	No	No	No	High
7	Brooks Pharmacy	Pharmacy	No	No	No	High
8	Police Department	Police Station	No	No	No	High
9	Central Fire Station	Fire Station	No	No	No	High
10	Fire Station III	Fire Station	No	No	No	High
11	Pleasant Street Fire Station II	Fire Station	No	No	No	High
12	Marlborough High School	School	No	No	No	High
13	Marlborough Middle School	School	No	No	No	High
14	Kane Elementary School	School	No	No	No	High
15	Richer Elementary School	School	No	No	No	High
16	Assabet Valley Regional High School	School	No	No	No	High
17	Immaculate Conception School	School	No	No	No	High
18	New England Sports Center	Temporary Morgue	No	No	No	High
19	Navin Rink	Temporary Morgue	No	No	No	High
20	New Horizons	Assisted Living	No	No	No	High

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ID	NAME	TYPE	Within Locally Identified Area of Flooding	Landslide	Within FEMA Flood Zone	Average Annual Snow Fall
21	John Rowe Funeral Home	Funeral Home	No	No	No	High
22	Short Funeral Home	Funeral Home	No	No	No	High
23	Sullivan/Collins Funeral Home	Funeral Home	No	No	No	High
24	Slattery Funeral Home	Funeral Home	No	No	No	High
25	EDS/Marlborough High School	Emergency Dispensing Site	No	No	No	High
26	EDS/Marlborough Middle School	Emergency Dispensing Site	No	No	No	High
27	EDS/Assabet Valley Regional	Emergency Dispensing Site	No	No	No	High
28	City Hall	Town Hall	No	No	No	High
29	Walker Building	Municipal	No	No	No	High
30	Department of Public Works Facilities	Department of Public Works	No	No	No	High
31	Ken's Foods	Food Manufacturer	No	No	No	High
32	Carvel	Food Manufacturer	No	No	No	High
33	Seastar Seafood	Food Manufacturer	No	No	No	High
34	Council on Aging	Elderly Housing	No	No	No	High
35	Senior Housing	Elderly Housing	No	No	No	High
36	Senior Housing	Elderly Housing	No	No	No	High
37	Next Generation Day Care	Daycare	No	No	No	High
38	Bright Horizons Day Care	Daycare	No	No	No	High
39	Bright Horizons Day Care	Daycare	No	No	No	High
40	Kinder Care Learning Center	Daycare	No	No	No	High
41	Our Future Learning Ctr.	Daycare	No	No	No	High
42	Children's World Learning Center	Daycare	No	No	No	High
43	Bouvier Pharmacy	Pharmacy	No	No	No	High

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ID	NAME	TYPE	Within Locally Identified Area of Flooding	Landslide	Within FEMA Flood Zone	Average Annual Snow Fall
44	Marriott Courtyard Hotel	Hotel	No	No	No	High
45	Embassy Suites Hotel	Hotel	No	No	No	High
46	Holiday Inn Hotel	Hotel	No	No	No	High
47	Royal Plaza/Best Western	Hotel	No	No	No	High
48	Hampton Inn Hotel	Hotel	No	No	No	High
49	Homestead Studio Suites Hotels	Hotel	No	No	No	High
50	Solomon Pond Mall	Shopping Mall	No	No	No	High
51	Westerly Waste Water Treatment Plant	Wastewater Treatment Facility	No	No	No	High
52	Water Treatment Plant	Water Treatment Plant	No	No	No	High
53	Easterly Waste Water Treatment Plant	Wastewater Treatment Facility	No	No	No	High
54	Jaworek School	School	No	No	No	High
55	Assabet Valley Collaborative	School	No	No	No	High
56	Early Childhood Center	School	No	No	No	High
57	Glenhaven Academy - JRI	School	No	No	No	High
58	Hillside School	School	No	No	No	High
59	Intermediate Elementary	School	No	No	No	High
60	The Cottage Children's Center	Daycare	No	No	No	High
61	The Little Flower Learning Center	Daycare	No	No	No	High
62	New Covenant Christian	School	No	No	No	High
63	Wayside Academy	School	No	No	No	High
64	Marlborough Police Station	EOC	No	No	No	High
65	Marlborough Fire Headquarters	EOC	No	No	No	High
66	Adventure Club-Kane School	Daycare	No	No	No	High

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ID	NAME	TYPE	Within Locally Identified Area of Flooding	Landslide	Within FEMA Flood Zone	Average Annual Snow Fall
67	Discovery Club-Boys&Girls Club	Daycare	No	No	No	High
68	Discovery Club-Richer School	Daycare	No	No	No	High
69	Happy Hours Preschool	Daycare	No	No	No	High
70	Kids' Quarters	Daycare	No	No	No	High
71	Meadowbrook Child Garden Pre-Sch	Daycare	No	No	No	High
72	Our Lady Preschool of Learning Center	Daycare	No	No	No	High
73	Saint Anne Montessori School	Daycare	No	No	No	High
74	SMOC Family Child Care	Daycare	No	No	No	High
75	Marlborough Child Care and Head Start	Daycare	No	No	No	High
76	PS017-1	Sewer Pumping Station	No	No	No	High
77	PS085-2	Sewer Pumping Station	No	No	No	High
78	PS073-3	Sewer Pumping Station	No	No	No	High
79	PS046-4	Sewer Pumping Station	No	No	No	High
80	PS010-5	Sewer Pumping Station	No	No	No	High
81	PS084-6	Sewer Pumping Station	No	No	No	High
82	PS006-7	Sewer Pumping Station	No	No	No	High
83	PS092-8	Sewer Pumping Station	No	No	No	High
84	PS028-9	Sewer Pumping Station	No	No	X500	High
85	PS104-10	Sewer Pumping Station	No	No	No	High
86	PS017-12	Sewer Pumping Station	No	No	No	High
87	PS007-13	Sewer Pumping Station	No	No	No	High
88	PS080-14	Sewer Pumping Station	No	No	No	High
89	PS014-17	Sewer Pumping Station	No	No	No	High

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ID	NAME	TYPE	Within Locally Identified Area of Flooding	Landslide	Within FEMA Flood Zone	Average Annual Snow Fall
90	PS038-18	Sewer Pumping Station	No	No	No	High
91	PS018-19	Sewer Pumping Station	No	No	No	High
92	PS036-20	Sewer Pumping Station	No	No	No	High
93	PS051-21	Sewer Pumping Station	No	No	A	High
94	PS047-22	Sewer Pumping Station	No	No	No	High
95	PS074-23	Sewer Pumping Station	No	No	No	High
96	PS094-24	Sewer Pumping Station	No	No	No	High
97	PS105-25	Sewer Pumping Station	No	No	No	High
98	PS113-26	Sewer Pumping Station	No	No	No	High
99	PS031-27	Sewer Pumping Station	No	No	No	High
100	PS080-37	Sewer Pumping Station	No	No	No	High
101	PS088-40	Sewer Pumping Station	No	No	No	High
102	PS042-41	Sewer Pumping Station	No	No	No	High
103	PS042-42	Sewer Pumping Station	No	No	No	High
104	PS042-43	Sewer Pumping Station	No	No	No	High
105	PS063-44	Sewer Pumping Station	Tyler Dam	No	No	High
106	PS058-45	Sewer Pumping Station	No	No	No	High
107	PS049-46	Sewer Pumping Station	No	No	No	High

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Vulnerability Assessment

The purpose of the vulnerability assessment is to estimate the extent of potential damages from natural hazards of varying types and intensities. A vulnerability assessment and estimation of damages was performed for hurricanes, earthquakes and flooding. The methodology used for hurricanes and earthquakes was the HAZUS-MH software. The methodology for flooding was developed specifically to address the issue in many of the communities where flooding was not solely related to location within a floodplain.

Introduction to HAZUS-MH

HAZUS- MH (multiple-hazards) is a computer program developed by FEMA to estimate losses due to a variety of natural hazards. The following overview of HAZUS-MH is taken from the FEMA website. For more information on the HAZUS-MH software, go to <http://www.fema.gov/plan/prevent/hazus/index.shtm>

“HAZUS-MH is a nationally applicable standardized methodology and software program that contains models for estimating potential losses from earthquakes, floods, and hurricane winds. HAZUS-MH was developed by the Federal Emergency Management Agency (FEMA) under contract with the National Institute of Building Sciences (NIBS). Loss estimates produced by HAZUS-MH are based on current scientific and engineering knowledge of the effects of hurricane winds, floods and earthquakes. Estimating losses is essential to decision-making at all levels of government, providing a basis for developing and evaluating mitigation plans and policies as well as emergency preparedness, response and recovery planning..

HAZUS-MH uses state-of-the-art geographic information system (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of hurricane winds, floods and earthquakes on populations.”

There are three modules included with the HAZUS-MH software: hurricane wind, flooding, and earthquakes. There are also three levels at which HAZUS-MH can be run. Level 1 uses national baseline data and is the quickest way to begin the risk assessment process. The analysis that follows was completed using Level 1 data.

Level 1 relies upon default data on building types, utilities, transportation, etc. from national databases as well as census data. While the databases include a wealth of information on the nine communities that are a part of this study, it does not capture all relevant information. In fact, the HAZUS training manual notes that the default data is “subject to a great deal of uncertainty.”

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However, for the purposes of this plan, the analysis is useful. This plan is attempting to only generally indicate the possible extent of damages due to certain types of natural disasters and to allow for a comparison between different types of disasters. Therefore, this analysis should be considered to be a starting point for understanding potential damages from the hazards. If interested, communities can build a more accurate database and further test disaster scenarios.

Estimated Damages from Hurricanes

According to the State Hazard Mitigation Plan, between 1858 and 2000, there were 15 hurricanes. 60% were Category 1, 33% were Category 2 and 7% were Category 3. For the purposes of this plan, a Category 2 and a Category 4 storm was chosen to illustrate damages. The reason is to present more of a “worst case scenario” that would help planners and emergency personnel evaluate the impacts of storms that might be more likely in the future, as we enter into a period of more intense and frequent storms.

Table 7
Estimated Damages from Hurricanes

	Category 2	Category 4¹
Building Characteristics		
Estimated total number of buildings	9,303	9,303
Estimated total building replacement value (Year 2002 \$) (Millions of Dollars)	\$2,515	\$2,515
Building Damages		
# of buildings sustaining minor damage	2,595	601
# of buildings sustaining moderate damage	903	2,024
# of buildings sustaining severe damage	75	3,057
# of buildings destroyed	47	3,530
Population Needs		
# of households displaced	315	11,774
# of people seeking public shelter	71	2,595
Debris		
Building debris generated (tons)	176,445	605,249
Tree debris generated (tons)	158,800	278,414
# of truckloads to clear building debris	674	11,116
Value of Damages (Thousands of dollars)		
Total property damage	\$120,036.88	\$2,686,454.85
Total losses due to business interruption	\$1200.37	\$26,864.55
¹ No Category 4 or 5 hurricanes have been recorded in New England. However, a Category 4 hurricane was included to help the communities understand the impacts of a hurricane beyond what has historically occurred in New England.		

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Estimated Damages from Earthquakes

Methodology Used

In order to assess damages from earthquakes, the HAZUS-MH earthquake module was used. For more information, see the description of the HAZUS-MH software above. The HAZUS earthquake module allows users to define a number of different types of earthquakes and to input a number of different parameters. The module is more useful where there is a great deal of data available on earthquakes. In New England, defining the parameters of a potential earthquake is much more difficult because there is little historical data. The earthquake module does offer the user the opportunity to select a number of historical earthquakes that occurred in Massachusetts. For the purposes of this plan two earthquakes were selected: a 1963 earthquake with a magnitude of 5.0 and an earthquake with a magnitude of 7.0.

Table 8
Estimated Damages from Earthquakes

	Magnitude 5.0	Magnitude 7.0
Building Characteristics		
Estimated total number of buildings	9,303	9,303
Estimated total building replacement value (Year 2002 \$)(Millions of dollars)	\$2,515	\$2,515
Building Damages		
# of buildings sustaining slight damage	3	1,539
# of buildings sustaining moderate damage	0	592
# of buildings sustaining extensive damage	0	107
# of buildings completely damaged	0	12
Population Needs		
# of households displaced	0	152
# of people seeking public shelter	0	33
Debris		
Building debris generated (tons)	Not available	Not available
# of truckloads to clear building debris		
Value of Damages (Millions of dollars)		
Total property damage	\$0.12	\$84.94
Total losses due to business interruption	\$0.0048	\$15.29

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Estimated Damages from Flooding

Methodology Used

MAPC did not use HAZUS-MH to estimate flood damages in Marlborough. In addition to technical difficulties with the software, the riverine module is not a reliable indicator of flooding in areas where inadequate drainage systems contribute to flooding even when those structures are not within a mapped flood zone. In lieu of using HAZUS, MAPC developed a methodology to give a rough approximation of flood damages.

Marlborough is 22.13 square miles or 14,163.20 acres. Approximately 166 acres have been identified by local officials as areas of flooding. This amounts to 1.18 % of the land area in Marlborough. The number of structures in each flood area was estimated by applying the percentage of the total land area to the number of structures (9,303) in Marlborough; the same number of structures used by HAZUS for the hurricane and earthquake calculations. HAZUS uses a value of \$270,343 per structure for the building replacement value. This was used to calculate the total building replacement value in each of the flood areas. The calculations were done for a low estimate of 10% building damages and a high estimate of 50% as suggested in the FEMA September 2002 publication, "State and Local Mitigation Planning how-to guides". (Page 4-13). The range of estimates for flood damages is \$3,000,805 - \$15,004,035. These calculations are not based solely on location within the floodplain or a particular type of storm (i.e. 100 year flood).

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Table 9
Estimated Damages from Flooding

ID	Flood Hazard Area	Approximate Area in Acres	% of Total Land Area	# of Structures	Replacement Value	Low Estimate of Damages	High Estimate of Damages
1	Boundary Street Bridge	20.786	0.147	14	\$3,784,802	\$378,480	\$1,892,401
2	Tyler Dam	72.234	0.511	48	\$12,976,464	\$1,297,646	\$6,488,232
3	Culvert at Ripley and McGee Avenues	6.635	0.047	4	\$1,081,372	\$108,137	\$540,686
4	Glen Brook Neighborhood	6.365	0.045	4	\$1,081,372	\$108,137	\$540,686
5	Mowry Brook at Brook Village	6.486	0.046	4	\$1,081,372	\$108,137	\$540,686
9	Culvert at Route 85	5.779	0.041	4	\$1,081,372	\$108,137	\$540,686
10	Culvert at Maple Street (Route 85) and Framingham Road	7.749	0.055	5	\$1,351,715	\$135,171	\$675,857
12	Bigelow Street	7.645	0.054	5	\$1,351,715	\$135,171	\$675,857
13	Stow Road and Concord Road	7.142	0.051	5	\$1,351,715	\$135,171	\$675,857
14	Sasserville Way near Fitchburg Road	9.862	0.070	7	\$1,892,401	\$189,240	\$946,200
15	Causeway Street	2.430	0.017	2	\$540,686	\$54,069	\$270,343
16	Millham Street	13.273	0.094	9	\$2,433,087	\$243,309	\$1,216,544
	Total	166.386	1.178	111	\$30,008,073	\$3,000,805	\$15,004,035

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Future Development in Hazard Areas

The City of Marlborough has identified a number of parcels where development has been proposed, is underway or is expected to occur in the future. Table 10 shows the relationship of these parcels to two of the mapped hazards. This information is provided so that planners can ensure that development proposals meet all flood plain zoning and that careful attention is paid to drainage issues.

Table 10: Relationship of Potential Development to Hazard Areas		
Parcel	Landslide risk	Flood Zone
Regency at Assabet Ridge	Low	.2391% in X500
North Robin Hill Road	Low	No
Crane Meadow Road	Low	No

V. HAZARDS AND EXISTING MITIGATION MEASURES

Flood-Related Hazards

Overview of Water Resources and Flooding Background

(2003 Marlborough Open Space Plan)

Marlborough is fortunate to have no less than five large surface water impoundments within its limits, all serve distinct and different primary functions as well as provide secondary recreational and open space benefits.

Millham Reservoir and Lake Williams, totaling 150 acres, serve as the city's two drinking water supplies. Fort Meadow Reservoir, which covers 290 acres, is the city's only active recreational water body, providing swimming, boating and fishing opportunities. A portion of the Metropolitan District Commission's Sudbury Reservoir extends into Marlborough on the southeast corner and serves as a backup drinking water supply for the Boston area. Hager Pond, located on the east side of the community, is a privately owned body of water covering 24 acres and is the backdrop for the historic Wayside Country Store.

Another important water resource is the city's many rivers and streams, including twelve main streams. The largest of these is the Assabet River, which flows through the northeast portion of the city. This Class B river has long been a favorite of local canoeists and fishermen, both upstream and downstream of the flood control facility known as Tyler Dam. Two new boat access points along the river below the Tyler Dam are being proposed and should be constructed by spring 2003.

Beginning in 1974, the city took the first steps to protect its surface water supplies by acquiring over 200 acres of land abutting Millham Reservoir. This land was originally acquired for expansion of the reservoir itself; however, the cost to develop it for this purpose was later judged to outweigh the benefit of a very marginal estimated increase in supply. The land has remained undeveloped in order to protect the reservoirs watershed. Passive recreational use of these areas is not permitted due to water supply regulations.

In 1992, the city also acquired 122 acres of land immediately adjacent to Millham Reservoir when it purchased a portion of the property owned by Hillside School. Public access on this land is also not permitted due to state and federal water supply regulations.

In 1997 the City Council passed the Water Supply Protection District Ordinance which limits and controls development within the watersheds of Lake Williams and Millham Reservoir by prohibiting and/or limiting certain uses of these properties and requiring a 50 foot non-developable buffer zones along wetlands, streams and rivers within the watershed.

Although Marlborough does not have any local groundwater drinking supplies, the Massachusetts Department of Environmental Protection (DEP) has identified several areas

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as areas with high potential for aquifer locations. In spite of several studies, which investigated the feasibility of developing certain of these areas as municipal drinking water supplies, no site has been found to provide both adequate volume and water quality to meet municipal drinking water standards. Since these areas have been determined through studies

not to be significant for drinking water supplies, they have never been mapped on city resource maps. However, a copy of the USGS Aquifer Map is located in the city's Conservation office and the Department of Public Works GIS office.

Along the northern border the town of Hudson has two drinking water wells. The protected areas around these wells extend into the city limits. Any development in these areas should honor the protection of these water sources and consultation from the Town of Hudson should be solicited.

The city is divided into six major watersheds and includes Millham Reservoir watershed, Sudbury Reservoir watershed and Wachusett open channel, Ft. Meadow Reservoir watershed and Ft. Meadow Brook, and Hop Brook watershed. The Millham, Ft. Meadow Reservoirs and Hop Brook systems are all part of the Assabet River watershed.

The high flood hazard areas lie along the major tributaries. Along many of the significant streams a 50' or 30' set back requirement has been instituted through this zoning ordinance to eliminate building close to streams that have flooding potential.

Locally Identified Areas of Flooding

Information on flood hazard areas was taken from two sources. The first was the National Flood Insurance Rate Maps. The FIRM flood zones are shown on Map 3 in Appendix B. The second was discussions with local officials. The locally identified areas of flooding described below were identified by city staff as areas where flooding occurs. These areas do not necessarily coincide with the flood zones from the FIRM maps. They may be areas that flood due to inadequate drainage systems or other local conditions rather than location within a flood zone. The numbers correspond to the numbers on Map 8, "Hazard Areas". The numbers do not reflect priority order.

1. Boundary Street Bridge: road floods during 25-year storm event; road needs to be raised: being planned
3. Drainage from Lake Williams /I-495 Industrial Park: culvert at Ripley and McGee Avenue intersection is under-sized and needs to be replaced
4. Outlet culvert into downstream wetland from Millham Brook backs up and floods Glen Brook neighborhood in large rain storms

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5. Mowry Brook at Brook Village: floods apartments: culverts from East Main Street to Curtis Avenue need to be enlarged
9. Culvert at Route 85: needs to be replaced with larger culvert
10. Culvert at Maple Street (Route 85) and Framingham Road: needs to be upgraded to larger size
12. Flooding due to beavers: off Bigelow Street
13. Flooding due to beavers: intersection of Stow Road and Concord Road
14. Flooding due to beavers: Sasserville Way (new road) near Fitchburg Road
15. Flooding due to beavers: off Milham Street
16. Flooding due to beavers: beaver dam at Causeway Street

Repetitive Loss Structures

There are no repetitive loss structures in Marlborough. As defined by the Community Rating System (CRS) of the National Flood Insurance Program (NFIP), a repetitive loss property is any property which the NFIP has paid two or more flood claims of \$1,000 or more in any given 10-year period since 1978. For more information on repetitive losses see <http://www.fema.gov/business/nfip/replps.shtm>

Existing Multi-Hazard Mitigation Measures

There are several mitigation measures that impact more than one hazard. These include the Comprehensive Emergency Management Plan (CEMP), the Massachusetts State Building Code and participation in a local Emergency Planning Committee.

Comprehensive Emergency Management Plan (CEMP) – Every community in Massachusetts is required to have a Comprehensive Emergency Management Plan. These plans address mitigation, preparedness, response and recovery from a variety of natural and man-made emergencies. These plans contain important information regarding flooding, dam failures and winter storms. Therefore, the CEMP is a mitigation measure that is relevant to many of the hazards discussed in this plan.

The Emergency Management Coordinator indicated that the CEMP is up to date.

Enforcement of the State Building Code – The Massachusetts State Building Code contains many detailed regulations regarding wind loads, earthquake resistant design, flood-proofing and snow loads.

Participation in the Marlborough Emergency Management Planning Committee (LEPC) Marlborough has its own Local Emergency Planning Committee.

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Existing Flood Hazard Mitigation Measures

Participation in the National Flood Insurance Program (NFIP) – FEMA maintains a database on flood insurance policies and claims. This database can be found on the FEMA website at <http://www.fema.gov/business/nfip/statistics/pcstat.shtm>

The reporting period covers through June 30, 2008. The following information is provided for the City of Marlborough.

Flood insurance policies in force (as of June 30, 2008)	21
Coverage amount of flood insurance policies	\$4,777,000
Premiums paid	\$1,378,951
Total losses (all losses submitted regardless of the status)	8
Closed losses (Losses that have been paid)	7
Open losses (Losses that have not been paid in full)	0
CWOP losses (Losses that have been closed without payment)	1
Total payments (Total amount paid on losses)	\$13,989.95

Street sweeping – Every street gets swept once a year and downtown streets get swept twice a week. The street sweeping is done by the city.

Catch basin cleaning – The city has a total of 500 catch basins. The basins are cleaned on a rolling basis each year so that each basin is cleaned at least once every other year. Clogging of catch basins in the downtown area sometimes causes water backups and leads to more frequent cleaning as needed. Approximately 95% of the city’s catch basins and drainage outfalls are now mapped by the Department of Public Works, Street Division, which also tracks catch basin and outfall cleaning and maintenance.

Roadway treatments – The city uses a 50 /50 mixture of sand and salt for winter road treatments.

Subdivision Rules and Regulations – The subdivision rules and regulations contain a number of requirements that address flood hazard mitigation. Some of these provisions also relate to other hazards.

- All subdivision drainage must be designed to meet the latest DEP Stormwater Management Regulations, must create and create no adverse downstream impacts.

Language from the Marlborough Subdivision Rules and Regulations is as follows:

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SECTION A. DESIGN GUIDELINES

1) Reduce, to the extent reasonably possible:

- (a) volume of cut and fill;
- (b) area over which existing vegetation will be disturbed, especially if within 200 feet (200') of a river, pond, or stream, or having a slope of more than 15%;
- (c) number of mature trees removed;
- (d) extent of waterways altered or relocated;
- (e) erosion and siltation;
- (f) flood damage;
- (g) number of driveways exiting onto existing streets, or ways, rather than onto newly built or proposed subdivision roadways.

F. PROTECTION OF NATURAL FEATURES

Due regard shall be shown for all natural features, such as large trees, wooded areas, water courses, scenic points, historic spots, and similar community assets, which, if preserved, will add attractiveness and value to the subdivision. Whenever feasible, shade trees twelve inches (12"), in diameter or larger shall not be removed.

G. LOT DRAINAGE

Lots shall be prepared and graded in such a manner that development of one shall not cause detrimental drainage on another; if provision is necessary to carry drainage to or across a lot, an easement or drainage right-of-way of adequate width and proper side slope shall be provided. Storm drainage shall be designed in accord with specifications of the Commissioner of Public Works.

APPENDIX H DRAINAGE DESIGN

Drainage Design:

The following methods shall be used to perform the hydraulic and hydrologic calculations for the subdivision:

Watershed parameters - "TR55, Urban Hydrology for Small Watersheds", U.S. Soil Conservation Service, USDA.

Existing and proposed runoff hydrographs - "TR20 - Computer Program for Project Formulation Hydrology", U.S. Soil Conservation Service, USDA.

Design Storm Criteria

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Generally post development flows must be equal to or less than pre-development flows measured at each analysis point.

Hydrologic analyses: 10 year and 100 year recurrence intervals, Type II, 24 hour, rainfall distribution.

Hydraulic analyses: 25 year storm recurrence interval, rational formula.

Alternative methodologies and design criteria shall only be allowed upon written approval by the City Engineer.

Zoning Regulations

- A stormwater and erosion control ordinance is being drafted as of July 2008.
- Wetlands Setback: In acting upon Notices of Intent and Determination of Applicability, the Conservation Commission will presume that any alteration or construction within 20 ft. of a wetland boundary would have a significant adverse impact on the wetlands, and such alteration or construction shall not be permitted unless the applicant demonstrates that (1) such activity would not have such an impact, or (2) public benefits, such as health or safety, outweighs any such impact, or (3) the activity involves the maintenance of existing structures, or (4) the activity is the installation of the stormwater outlet structure.
- Drainage standards are considered effective. Current city policy requires that all development and redevelopment projects must meet the state DEP Stormwater Policy, regardless of its proximity to a wetland. Projects within the Millham or Sudbury River watershed areas, which cover about 75% of the city, must treat the first one inch of runoff versus just 0.5 inches of runoff for other areas.
- The Site Plan Review ordinance requires the Site Plan to show adequate measures to prevent pollution of surface or ground water, to minimize erosion, sedimentation, increased rate of runoff and potential for flooding.
- Development in the Water Supply Protection District limits lot coverage by building type, requires previously developed lots to reduce impervious surface to meet lot coverage standards and establishes a 50-foot no-touch zone for wetland resource area projects.
- Shared parking in mixed use area is allowed, 3 % of parking lots over 50 spaces must be landscaped islands and 33% of lot spaces may be designed for compact cars

Language from the Floodplain and Wetland Protection District is as follows:

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§200-19. Floodplain and Wetland Protection District.

A. Purpose. The Floodplain and Wetland Protection District and the regulations herein have been established with the following purposes intended:

- (1) To protect the public health and safety, persons and property against flooding and the hazard of floodwater inundation.
- (2) To control and regulate the development of land and construction of buildings thereon and structures therein within the Floodplain and Wetland Protection District, particularly in relation to the use of swampland, marshes and areas along watercourses, ponds and lakes and land subject to seasonal and/or periodic flooding.
- (3) To protect the public from the burden of extraordinary financial expenditures for flood control and relief and to protect against unanticipated costs resulting from erosion, siltation, pollution or contamination of drainage ways and surface or ground water resources of the City or neighboring communities.
- (4) To preserve the capacity of floodplain, watershed or wetland areas to absorb, transmit and store runoff and to assure the retention of sufficient floodway area to convey flows which can reasonably be expected to occur.

B. Location.

- (1) For the purpose of this Section, the Floodplain and Wetland Protection Districts shall be considered superimposed on the other districts existing in the same area as shown on the Zoning District Map of the City of Marlborough, Massachusetts, and any buildings, structure or use of land included in the Floodplain and Wetland Protection District shall also be deemed to be within the particular district in which it is located as shown on said Zoning Map and subject to all the regulations and requirements thereof, in addition to those set forth in this Section.
- (2) The boundaries, elevations and setback requirements of the Floodplain and Wetland Protection District shall be as shown on a map entitled "City of Marlborough, Massachusetts Floodplain and Wetland Protection District 1982" and shall also include all special flood hazard areas designed as Zone A, A-1-A30 on the City of Marlborough Flood Insurance Rate Maps dated January 6, 1982, and these maps, as well as the accompanying Marlborough Flood Insurance Study, are hereby, by this reference, made apart of the Zoning Chapter.

C. Prohibited Uses. The following uses are prohibited within the Floodplain and Wetland Protection District.

- (1) The storage of buoyant, flammable, explosive or toxic material in a floodplain or wetland.
- (2) The dumping of waste, rubbish, demolition or hazardous materials in a floodplain or wetland area.
- (3) The addition, removal or transfer of such quantities of material, including earth, soil, trees, stumps or vegetation, that would reduce the water storage capacity of the floodplain or wetland, obstruct the flow of water in a floodway or otherwise adversely affect the natural hydrology of the

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area, except as may be a part of a plan for public flood control, municipal drainage or utility system or organized mosquito control district.

(4) The digging or drilling of a well intended as a source of domestic water, except for public water supply wells adequately sealed against the infiltration of surface water.

(5) The construction of an on-site sewage disposal system in the floodplain or designated wetland area.

(6) Any encroachment in the regulatory floodway, as shown on the Floodway Flood Boundary Map that would increase the water surface elevation of the one-hundred year flood.

D. Special Permit Required.

(1) In a Floodplain and Wetland Protection District, no building or structure shall be constructed, altered or modified in its present use, and no land shall be filled, excavated or otherwise changed in grade, except pursuant to a Special Permit authorized by the Board of Appeals as hereinafter provided. Any application for such Permit shall be submitted in quintuplicate (five [5]) to the Board of Appeals and shall be accompanied by a plan of the premises in question showing:

(a) The boundaries and dimensions of the area.

(b) The location, dimensions and elevation above mean sea level of existing and proposed buildings and structures thereon.

(c) The existing contours in two-foot intervals of the land and of any proposed changes therefrom.

(d) Such other information as is deemed necessary to the Board of Appeals to indicate the complete physical characteristics of the area and the proposed construction and/or grading thereof.

(2) The portion of any lot in this district may be used to meet lot area requirements for the residential districts over which the Floodplain and Wetland Protection District is superimposed, provided that such portion does not constitute more than fifty percent (50%) of the minimum lot area required in the residential district. Land in the Floodplain and Wetland Protection District may not be used to meet more than fifteen percent (15%) of the minimum lot area requirements in Business, Commercial or Industrial Districts.

E. Reference to Other Boards. Within ten (10) days after receipt of the application for a Special Permit as herein provided, the Board of Appeals shall transmit copies thereof, together with copies of the accompanying plan, to the Board of Health, Planning Board, Engineering Department and the Conservation Commission. Such Boards and Commission may, at their discretion, investigate the application and report in writing their recommendations to the Board of Appeals. The Board of Appeals shall not take final action on such application until it has received a report thereon from the above Boards and Commission, or until such Boards and Commission have allowed forty-five (45) days to elapse after receipt of said application without submission of a report.

F. Other Jurisdictions.

(1) If approval for filling the land must be obtained from the Commonwealth, or the United States

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Government or any agency or subdivision thereof, or an Order of Conditions is necessary from the Marlborough Conservation Commission in accordance with MGL C.131 §40, then such approval and any conditions imposed thereon shall be filed with the Board of Appeals with the application.

(2) If, in the opinion of the Board of Appeals, such application for approval by other jurisdictions is in sufficient detail and provides the necessary information to furnish the criteria for their decision, then the same application and plan may be used for filing with the Board of Appeals for approval under the Floodplain and Wetland Protection District regulations.

G. Criteria of Approval. The Board of Appeals may issue a Special Permit hereunder, subject to other provisions of this Zoning Chapter, if it finds that the proposed construction and use and/or proposed change in grade will not derogate from the intent and purpose of this district nor endanger the health and safety of the public nor the legitimate use of other land in the City. In deciding application for a Special Permit under this Section, but without limiting the generality of the foregoing, the Board shall assure to a degree consistent with a reasonable use of the premises for purposes permitted in the use district in which located, that the proposed construction, use and/or change of grade will not obstruct or divert flood flow, reduce natural storage or increase stormwater runoff to the extent of raising high water levels on any other land to any significant degree; the proposed system of drainage and/or private sewage disposal will not cause siltation, pollution or otherwise endanger public health; the proposed construction shall have street or other appropriate access that shall be at least one (1) foot above base flood elevation; and structures designed for human occupancy shall have lowest floor, including basement, heating, electrical and sanitary sewer systems, at least two (2) feet above base flood elevation. Fill deposited to bring the lowest floor to the required elevation shall extend to at least fifteen (15) feet beyond the limits of the structure thereon.

H. Conditions of Permit. In granting a Special Permit hereunder, the Board of Appeals shall impose conditions specifically designed to safeguard the health and safety of occupants of the premises and of other land in and adjacent to the district and to ensure conformity with the provisions thereof. It shall also be the duty of the Board of Appeals to ascertain that the requirements of the FEMA flood insurance program have been met in that:

(1) Within Zones A1-A30 of the Flood Insurance Rate Maps of the City of Marlborough, all new construction and substantial improvements, the cost of which equals or exceeds fifty percent (50%) of the market value of the structure, of residential and nonresidential structures shall have the lowest floor, including basement, elevated to two (2) feet above the base flood elevation (the one-hundred-year flood elevation designed on the FIRM) or in the case of nonresidential structures, be flood proofed, watertight to the base flood level.

(2) Within Zone A, where the base flood elevation is not provided on the FIRM, the Building Inspector shall obtain and review any already existing base flood elevation data. If the data is reasonable, it shall be used to require compliance with Subsection H(1) above.

(3) Where watertight flood proofing of a structure is permitted, a registered professional engineer or architect shall certify that the methods used are adequate to withstand the flood depths, pressures, velocities, impact and uplift forces and other factors associated with the one-hundred-year flood.

I. Determination of Levels.

(1) For the purpose of this Section, the term "base flood elevation" refers to the flood having a one-percent (1%) chance of being equaled or exceeded in any given year, commonly referred to as the "one-hundred year flood." Where, in the opinion of the Board of Appeals, engineering studies are

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needed to determine the high water level on a particular premise and/or the effect of a proposed building, structure or grading on flood flow, natural safety of any building, structure or grading on flood flow, natural safety of any building or structure, such engineering study shall be at the expense of the petitioner.

(2) If any land in the Floodplain and Wetland Protection District is proven to the satisfaction of the Zoning Board of Appeals, after the question has been referred to and a recommendation received from the City Engineer, Planning Board, Board of Health and Conservation Commission, as being in fact above the base flood elevation, and that the use of such land will not be detrimental to the public health, safety and/or welfare, the Board of Appeals may, after a public hearing, with due notice issue a Special Permit for any use allowed in the underlying district, in which case all other Zoning Chapter and state regulations applicable to such land use shall apply.

(3) The establishment of a Floodplain and Wetland Protection District hereunder shall not constitute a representation that all land outside of said district will be free from flooding.

Dam Failures

- 2. Tyler Street Dam: This dam is owned by the Department of Conservation and Recreation and is classified as a high hazard dam due to expected elevated impacts if a breach were to occur. The dam is 38.5 feet high and normally impounds 650 acre-feet of water, with a maximum impoundment of 2,060 acre-feet of water. It was last inspected in May, 2008 and found to be in satisfactory condition.
- 6. Hager Street Dam: This is a privately owned dam. The dam is 14 feet high and has a normal impoundment of 144 acre-feet and a maximum impoundment of 400 acre-feet. Last inspected in 1998, the dam is classified as being in poor condition. It is considered a high hazard dam by the Department of Conservation and Recreation due to an increased downstream impact if a breach in the dam took place.
- 7. Fort Meadow Dam and Spillway: City owned, the Fort Meadow Dam is located in the Concord (Assabet) River Basin in the City of Marlborough. Flagg Brook and two smaller, unnamed brooks flow into the tree basins that make up the Fort Meadow Reservoir along with 24 street drain inlets at various locations surrounding the reservoir. The dam consists of an earthen embankment approximately 325 feet long and 30 feet high at the eastern end of the reservoir. A public beach and bath house are located on the crest of the embankment. The spillway to the reservoir is located 1,000 feet north of the dam in the town of Hudson, on land owned by the City of Marlborough. The Fort Meadow Reservoir has maximum structural height of approximately 30 feet and a maximum storage capacity of 4,800 acre-feet. The Fort Meadow Reservoir is classified as a large size structure. It appears that failure of the dam may cause loss of life and damage to some homes, property and secondary roadways. Failure of the dam would result in the flooding of a municipal parking lot and many homes on Hosmer Street, Lakeshore Drive and Causeway Street, with the high potential for loss of life and the excessive economic loss. The dam is classified as a high hazard dam.

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- 8. Lake Williams Dam and Spillway: The Lake Williams Dam, owned by the MA Department of Conservation and Recreation, was originally constructed around 1882 across a shallow valley at the outlet of a naturally formed lake and consists of an earthen embankment, a concrete/mortared stone spillway, and a low level outlet. The maximum height of the embankment is approximately eleven (11) feet, and the length of the dam is approximately 270 feet. The upstream face of the dam's embankment is a 3H: 1V slope and the downstream face is a vertical rubble masonry wall. The dam has a maximum structural height of approximately 11 feet and a maximum storage capacity of 500 acre-feet. It is classed as an intermediate sized dam. Located upstream of Millham Brook, a breach in the dam at maximum pool may cause loss of life and damage to homes, property, the I-495 highway embankment and secondary roadways. The Lake Williams Dam is classified as a high hazard dam.

Existing Dam Failure Mitigation Measures

The Comprehensive Emergency Management Plan – The CEMP addresses dam safety. The City CEMP is up to date.

Permits required for construction – State law requires a permit for the construction of any dam.

DCR dam safety regulations – All dams are subject to the Division of Conservation and Recreation's dam safety regulations.

Wind-Related Hazards

There were 5 tropical storms that tracked through Marlborough in 1896 and 1997. A hurricane or storm track is the line that delineates the path of the eye of a hurricane or tropical storm. However, the city does experience the impacts of the wind and rain of hurricanes and tropical storms regardless of whether the storm track passed through the city. The hazard mapping indicates that the 100 year wind speed is 110 miles per hour. There have been no tornadoes recorded within the City limits.

High winds are generally not considered a significant problem in Marlborough but strong gusts can cause a downed power line or tree.

Existing Wind Hazard Mitigation Measures

Massachusetts State Building Code – The city enforces the Massachusetts State Building Code whose provisions are generally adequate to mitigate against most wind damage. The code's provisions are the most cost-effective mitigation measure against tornadoes given the extremely low probability of occurrence. If a tornado were to occur, the potential for severe damages would be extremely high.

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Tree-trimming program – The city owns and uses its own equipment to remove and chip downed trees as needed. National Grid has a tree trimming program for its power line corridors help minimize power line disruptions from downed trees.

Winter-Related Hazards

The average annual snowfall for the entire city is 48 – 72 inches. While winter storms are not necessarily considered a major natural hazard in Marlborough, the city does often operate under emergency operations mode while they are occurring and are considered to be a high priority mitigation item.

Existing Winter Hazard Mitigation Measures

Snow disposal – The city does not have any snow disposal sites. The DPW coordinates with the Fire Department to clear roads as requested or in an emergency. The city conducts general plowing and Mass Highway clears portions of Route 20 and Fitchburg Street.

Fire-Related Hazards

The Marlborough Fire Department responds to approximately 10-15 brush fires annually. None of these fires result in significant property damage. Ninety percent of the city is served by fire hydrants. The most common cause of these fires are spontaneous combustion associated with the use of bark mulch for landscaping, burning cigarette disposal and children playing with matches. The area with the highest incidence of brush fires is the Marlborough State Forest.

Existing Fire Hazard Mitigation Measures

The Fire Department does not have Forest Fire Division but responds to brush fires with different apparatus than for a conventional house fire. It uses a 1986 Humvee 4x4 pickup trucks with a 107-gallon skid pump attachment for remote fires. The Department is authorized to take water from any water source in Marlborough in an emergency and participates in MA Fire District Region 14.

Permits Required for Outdoor Burning – The Fire Department requires a written permit for outdoor burning and outdoor burning is allowed only from January – April.

Subdivision Review – The Fire Department is involved in reviewing all subdivision plans.

Geologic Hazards

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Most municipal officials acknowledged that earthquakes were the hazard for which their community was least prepared. There have been no recorded earthquake epicenters within Marlborough. Although new construction under the most recent building codes generally will be built to seismic standards, much of the development in the city predates the most recent building code.

The entire city is classified as having a low risk for landslides. City officials did not identify any problems with areas of geologic instability such as sinkholes or subsidence.

Existing Geologic Hazard Mitigation Measures

Massachusetts State Building Code – The State Building Code contains a section on designing for earthquake loads (780 CMR 1612.0). Section 1612.1 states that the purpose of these provisions is “to minimize the hazard to life to occupants of all buildings and non-building structures, to increase the expected performance of higher occupancy structures as compared to ordinary structures, and to improve the capability of essential facilities to function during and after an earthquake”. This section goes on to state that due to the complexity of seismic design, the criteria presented are the minimum considered to be “prudent and economically justified” for the protection of life safety. The code also states that absolute safety and prevention of damage, even in an earthquake event with a reasonable probability of occurrence, cannot be achieved economically for most buildings.

Section 1612.2.5 sets up seismic hazard exposure groups and assigns all buildings to one of these groups according to a Table 1612.2.5. Group II includes buildings which have a substantial public hazard due to occupancy or use and Group III are those buildings having essential facilities which are required for post-earthquake recovery, including fire, rescue and police stations, emergency rooms, power-generating facilities, and communications facilities.

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Table 11
Existing Mitigation Measures

Type of Existing Protection	Description	Area Covered	Effectiveness /Enforcement	Improvements/ Changes Needed
MITIGATION MEASURES RELATING TO MULTIPLE HAZARDS				
Comprehensive Emergency Management Plan (CEMP)	Every community in Massachusetts is required to have a Comprehensive Emergency Management Plan. These plans address mitigation, preparedness, response and recovery from a variety of natural and man-made emergencies.	City-wide.	Emphasis is on emergency response.	None.
Massachusetts State Building Code	The Massachusetts State Building Code contains many detailed regulations regarding wind loads, earthquake resistant design, flood-proofing and snow loads.	City-wide.	Most effective for new construction.	None.
Participation in the Local Emergency Planning Committee (LEPC)	Marlborough has its own LEPC.	City-wide	Provides a forum for cooperation on issues related to natural and man-made disaster.	None.

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Table 11
Existing Mitigation Measures

Type of Existing Protection	Description	Area Covered	Effectiveness /Enforcement	Improvements/ Changes Needed
FLOOD RELATED HAZARDS				
Participation in the National Flood Insurance Program (NFIP)	Homeowners in the floodplain can purchase flood insurance.	Areas identified on the FIRM maps.	There are 21 policies in force.	Encourage all eligible homeowners to obtain insurance.
Street sweeping	Every street gets swept once a year with downtown streets cleaned twice per week in season. The work is performed by the city.	City-wide.	Effective.	None.
Catch basin cleaning	The city's 500 catch basins are cleaned on a 2.5 year cycle, with approximately 175 basins cleaned yearly.	City-wide.	Effective.	None.
Roadway treatments	The city uses a mixture of sand and salt on the roads.	City roads.	Effective	None.

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Table 11
Existing Mitigation Measures

Type of Existing Protection	Description	Area Covered	Effectiveness /Enforcement	Improvements/ Changes Needed
Drainage infrastructure and preventive practices to reduce clogging and ensure proper functioning. Some areas of downtown are prone to clogging and are checked by the Street Division regularly.	Drainage projects have been incorporated into the city's Capital Improvement Program since 1990. and the city has replaced over 100 catch basins over the last decade using permitting mitigation funding	City wide.	Effective.	Additional resources to fund infrastructure maintenance and repair.
Subdivision Rules and Regulations	All subdivision drainage must be designed to meet the latest DEP Stormwater Management Regulations, must create and create no adverse downstream impacts.	City-wide.	Effective.	None.
Zoning Regulations	<ul style="list-style-type: none"> • A stormwater and erosion control ordinance is being drafted as of July 2008. • Wetlands Setback: In acting upon Notices of Intent and Determination of Applicability, 	City-wide or areas shown on the zoning and FIRM maps as floodplain	Effective.	Adopt draft Stormwater Bylaw. Consider feasibility of creating a Stormwater Utility. Consider

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Table 11
Existing Mitigation Measures

Type of Existing Protection	Description	Area Covered	Effectiveness /Enforcement	Improvements/ Changes Needed
	<p>the Conservation Commission will presume that any alteration or construction within 20 ft. of a wetland boundary would have a significant adverse impact on the wetlands, and such alteration or construction shall not be permitted unless the applicant demonstrates that (1) such activity would not have such an impact, or (2) public benefits, such as health or safety, outweighs any such impact, or (3) the activity involves the maintenance of existing structures, or (4) the activity is the installation of the stormwater outlet structure.</p> <ul style="list-style-type: none"> • Drainage standards are considered effective. Current city policy requires that all development and redevelopment projects must meet the state DEP Stormwater Regulations, 	.		adopting parking maximums.

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Table 11
Existing Mitigation Measures

Type of Existing Protection	Description	Area Covered	Effectiveness /Enforcement	Improvements/ Changes Needed
	<p>regardless of its proximity to a wetland. Projects within the Millham or Sudbury River watershed areas, which cover about 75% of the city, must treat the first one inch of runoff versus just 0.5 inches of runoff for other areas.</p> <ul style="list-style-type: none"> • The Site Plan Review ordinance requires the Site Plan to show adequate measures to prevent pollution of surface or ground water, to minimize erosion, sedimentation, increased rate of runoff and potential for flooding. • Development in the Water Supply Protection District limits lot coverage by building type, requires previously developed lots to reduce impervious surface to meet lot coverage standards and establishes a 50- 			

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**Table 11
Existing Mitigation Measures**

Type of Existing Protection	Description	Area Covered	Effectiveness /Enforcement	Improvements/ Changes Needed
	foot no-touch zone for wetland resource area projects. • Shared parking in mixed use area is allowed, 3 % of parking lots over 50 spaces must be landscaped islands and 33% of lot spaces may be designed for compact cars			
Dam Failures				
Comprehensive Emergency Management Plan (CEMP)	The CEMP addresses dam safety issues.	City-wide.	Emphasis is on emergency response.	None.
State permits required for dam construction	State law requires a permit for the construction of any dam.	State-wide.	Most effective for ensuring initial construction meets the code.	Improvements needed to the statewide system for dam inspections..
DCR dam safety regulations	The state has enacted dam safety regulations mandating inspections	State-wide.	Enforcement is an issue.	Staffing and budgeting needs

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Table 11
Existing Mitigation Measures

Type of Existing Protection	Description	Area Covered	Effectiveness /Enforcement	Improvements/ Changes Needed
	and emergency action plans.			to be addressed.
Tyler Street Dam	This dam is owned by the Department of Conservation and Recreation and is classified as a high hazard dam. Last inspected in 2008 and found to be in satisfactory condition.	Normally impounds 650 acre-feet of water, with a maximum impoundment of 2,060 acre-feet of water.	Effective.	Establish regular inspection and maintenance program (DCR).
Hager Street Dam	This is a privately owned dam. Last inspected in 2002, the dam is classified as being in poor condition but breach would impact less than five households.	The dam has a normal impoundment of 144 acre-feet and a maximum impound-	Somewhat effective.	Coordinate with owner(s) to make necessary repairs and establish a regular inspection and maintenance schedule.

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Table 11
Existing Mitigation Measures

Type of Existing Protection	Description	Area Covered	Effectiveness /Enforcement	Improvements/ Changes Needed
		ment of 400 acre-feet.		
Fort Meadow Dam and Spillway	Fort Meadow Dam and Spillway: City owned, the Fort Meadow Dam was last inspected in 2006 and is considered to be in satisfactory condition.	The Fort Meadow Reservoir has maximum structural height of approximately 30 feet and a maximum storage capacity of 4,800 acre-feet.	Effective.	Continue regular inspection and maintenance plan.
Lake Williams Dam and Spillway	State owned: Division of Conservation and Recreation (DCR)	Lake Williams The dam has a maximum structural	Effective.	Establish regular inspection and maintenance plan.

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**Table 11
Existing Mitigation Measures**

Type of Existing Protection	Description	Area Covered	Effectiveness /Enforcement	Improvements/ Changes Needed
		height of approximately 11 feet and a maximum storage capacity of 500 acre-feet.		
WIND-RELATED HAZARDS				
Comprehensive Emergency Management Plan (CEMP)	The City has developed a CEMP that addresses hurricane/tornado concerns.	City-wide.	Effective primarily for emergency response; less geared towards mitigation.	The CEMP is considered to be up to date.
The Massachusetts State Building Code	The City enforces the Massachusetts State Building Code.	City-wide.	Effective for most situations except severe storms	None.
Tree trimming program	The City owns and uses equipment	City-wide.	Effective.	None.

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Table 11
Existing Mitigation Measures

Type of Existing Protection	Description	Area Covered	Effectiveness /Enforcement	Improvements/ Changes Needed
	to trim or remove trees as needed, in addition to the work done by National Grid in power line corridors. .			
WINTER-RELATED HAZARDS				
There are no specific measures beyond regular salting and sanding of the roads and local plowing.	General snow removal by the city. MA Highway clears parts of Route 20 and Fitchburg Street.	City-wide.	Effective.	Heavy equipment upgrades needed.
BRUSH FIRE RELATED HAZARDS				
Permits required for outdoor burning.	The Fire Department requires a written permit for outdoor burning. The permit must be obtained from the Fire Dept.	City-wide.	Effective.	None.
Subdivision Review	The Fire Department is involved in reviewing all subdivision plans.	City-wide.	Effective.	None.

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Table 11
Existing Mitigation Measures

Type of Existing Protection	Description	Area Covered	Effectiveness /Enforcement	Improvements/ Changes Needed
GEOLOGIC HAZARDS				
The Massachusetts State Building Code	The City enforces the Massachusetts State Building Code.	City-wide.	Effective for most situations.	None.

VI. HAZARD MITIGATION GOALS AND OBJECTIVES

The members of the Marlborough Local Multiple Hazard Community Planning Team reviewed the following hazard mitigation goals and objectives and endorsed them for the Marlborough Annex to the Metro North/West Hazard Mitigation Plan:

1. Prevent and reduce the loss of life, injury, public health impacts and property damages resulting from all major natural hazards.
2. Identify and seek funding for measures to mitigate or eliminate each known significant flood hazard area.
3. Integrate hazard mitigation planning as an integral factor in all relevant municipal departments, committees and boards.
4. Prevent and reduce the damage to public infrastructure resulting from all hazards.
5. Encourage the business community, major institutions and non-profits to work with the City to develop, review and implement the hazard mitigation plan.
6. Work with surrounding communities, state, regional and federal agencies to ensure regional cooperation and solutions for hazards affecting multiple communities.
7. Ensure that future development meets federal, state and local standards for preventing and reducing the impacts of natural hazards.
8. Take maximum advantage of resources from FEMA and MEMA to educate City staff and the public about hazard mitigation.

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VII. POTENTIAL MITIGATION MEASURES

What is hazard mitigation?

Hazard mitigation means to permanently reduce or alleviate the losses of life, injuries and property resulting from natural and human-made hazards through long-term strategies. These long-term strategies include planning, policy changes, programs, projects and other activities. FEMA currently has three mitigation grant programs: the Hazards Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation program (PDM), and the Flood Mitigation Assistance (FMA) program. The three links below provide additional information on these programs.

<http://www.fema.gov/government/grant/hmgp/index.shtm>

<http://www.fema.gov/government/grant/pdm/index.shtm>

<http://www.fema.gov/government/grant/fma/index.shtm>

Process for Setting Priorities for Mitigation Measures

The decision on priorities was made at a meeting of the local committee. The method used was to reach consensus through discussion, rather than taking a vote. Priority setting was based on local knowledge of the hazard areas, cost information and an assessment of benefits.

MAPC staff attended the FEMA Benefit-Cost Analysis Training Course in 2005 and also during training offered in 2007. Information from this training was shared with local officials in order to help them understand the role of a benefit/cost analysis in developing and evaluating potential mitigation projects.

Based on information gained from the Benefit-Cost Analysis trainings and a review of the STAPLEE criteria (a checklist for evaluating social, technical, administrative, political, legal, economic and environmental issues) MAPC asked the local committee to take into consideration factors such as the number of homes and businesses affected, whether or not road closures occurred and what impact closures had on delivery of emergency services and the local economy, anticipated project costs, whether the city had the technical and administrative capability to carry out the mitigation measures, whether any environmental constraints existed, and whether the city would be able to justify the costs relative to the anticipated benefits.

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High Priority Mitigation Measures- not listed in order of priority

Flooding: Drainage Infrastructure Maintenance and Repair

Conduct a feasibility study to consider the adoption of a Stormwater Utility to fund maintenance and improvement of the city's drainage, stormwater treatment and flood prevention capacity.

Flooding: Land Protection and Acquisition

Acquire the Shoestring Hill parcel and complete the Flagg Swamp parcel swap from the Massachusetts Highway Department to Massachusetts Fish and Wildlife.

Flooding: Site Specific

Glen Brook backs up and floods the surrounding neighborhood during large storm events. Installing new drainage lines on Ripley Street would prevent this.

Modify the drainage culverts to increase capacity from East Main Street to Curtis Avenue. At present, Mowry Brook floods the Brook Village neighborhood during moderate to large storm events.

Replace the stormwater culvert located at Route 85 (Maple Street) with a larger capacity culvert. This project is currently at the 25% design stage.

Dams

Establish a regular inspection and maintenance plan for the Hager Street Dam.

Establish a regular inspection and maintenance plan for the Tyler Street Dam.

Earthquake and Multiple Hazards

Acquire two, 500 Kw, multi-fuel generators for sewer pump station back up.

Acquire new ladder and pumper fire trucks. This is currently pending before City Council.

Brush and Forest Fires

Acquire a new, 4x4, 2-ton forest fire truck with 200 gallon pumper tank.

Winter Storms and Infrastructure Maintenance Capacity

Fund both a feasibility study and preliminary design to construct a new DPW Facility Garage that would include new road salt sheds and fueling depot.

For winter storm, maintenance and emergency capacity, acquire 2 new one-ton trucks, replace 5 three-quarter ton pickups, replace 2 ten-wheel dump trucks with sanders/plows/wing plows, acquire 2 new loaders, and replace 4 six-wheel dump trucks.

Multiple Hazards: Communications Equipment

Add additional band width and two-way radio repeater for Fire, Police and DPW.

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Multiple Hazards: Power Outages

For power outage backup capacity in multiple hazards, acquire:

- Six new 200 Kw, fixed generator for all schools except Middle School,
- One 200 Kw, fixed, multi-fuel generator for City Hall
- One 500 Kw, fixed, multi-fuel generator for DPW Facility

Medium Priority Mitigation Measures

Reducing Impacts from New Development

Complete and adopt Stormwater Ordinance.

Consider amending the Floodplain and Wetland Zoning Protection overlays to ensure appropriate development in floodplain and other low lying areas.

Flooding: Site Specific

Redesign and raise the road section that floods on the Boundary Street Bridge.

Replace the drainage culvert at the intersection of Route 85 and Framingham Road with a larger culvert. This project is at the 25% design stage.

Beaver Dam Flooding Mitigation

Remove dams, relocate beavers and install anti-damming devices as needed at the following locations:

- Area off Bigelow Street
- Intersection of Stow and Concord Roads
- Sasserville Way near Fitchburg Road
- Area off Milham Street
- Causeway Street

Flooding: Wetlands Protection and Stormwater Storage Capacity

Develop a city-based, GIS wetlands mapping capacity that would include all local wetlands delineations.

High Winds

Develop a tree inventory and maintenance program.

Flooding: Land Protection and Acquisition

Consider funding an outreach campaign to adopt the Community Preservation Act.

Erosion and Pollution Prevention

Increase education and outreach on erosion, stormwater and best management practices to local contractors and residents.

Earthquakes: Unreinforced Masonry Buildings

Investigate options to make all public safety buildings earthquake resistant.

Unreinforced, older style masonry buildings are particularly vulnerable to being damaged in the event of an earthquake.

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Low Priority Mitigation Measures

Dam: Fort Meadow Dam and Spillway

Establish a regular inspection and maintenance plan.

Flooding: Drainage System Record Keeping

Complete the digitizing of city stormwater outfalls and begin GIS-based system to track cleaning and maintenance of drainage system.

Introduction to Potential Mitigation Measures (Table 12)

Description of the Mitigation Measure – The description of each mitigation measure is brief and cost information is given only if cost data were already available from the community. The cost data represent a point in time and would need to be adjusted for inflation and for any changes or refinements in the design of a particular mitigation measure.

Priority – The designation of high, medium or low priority was done at the meeting of the Local Multiple Hazard Community Planning Team meeting. The designations reflect discussion and a general consensus developed at the meeting but could change as conditions in the community change.

Implementation Responsibility – The designation of implementation responsibility was done by MAPC based on a general knowledge of what each municipal department is responsible for. It is likely that most mitigation measures will require that several departments work together and assigning staff is the sole responsibility of the governing body of each community.

Time Frame – The time frame was based on a combination of the priority for that measure, the complexity of the measure and whether or not the measure is conceptual, in design, or already designed and awaiting funding. Because the time frame for this plan is five years, the timing for all mitigation measures has been kept within this framework. The identification of a likely time frame is not meant to constrain a community from taking advantage of funding opportunities as they arise.

Potential Funding Sources – This column attempts to identify the most likely sources of funding for a specific measure. The information on potential funding sources in this table is preliminary and varies depending on a number of factors. These factors include whether or not a mitigation measure has been studied, evaluated or designed, or is still in the conceptual stages. MEMA and DCR assisted MAPC in reviewing the potential eligibility for hazard mitigation funding. Each grant program and agency has specific eligibility requirements that would need to be taken into consideration. In most instances, the measure will require a number of different funding sources. Identification of a potential funding source in this table does not guarantee that a project will be eligible

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for, or selected for funding. Upon adoption of this plan, the local committee responsible for its implementation should begin to explore the funding sources in more detail.

Additional information on funding sources – The best way to determine eligibility for a particular funding source is to review the project with a staff person at the funding agency. The following websites provide an overview of programs and funding sources.

Army Corps of Engineers (ACOE) – The website for the North Atlantic district office is <http://www.nae.usace.army.mil/>. The ACOE provides assistance in a number of types of projects including shoreline/stream bank protection, flood damage reduction, flood plain management services and planning services.

Massachusetts Emergency Management Agency (MEMA) – The grants page <http://www.mass.gov/dem/programs/mitigate/grants.htm> has a useful table that compares eligible projects for the Hazard Mitigation Grant Program and the Flood Mitigation Assistance Program.

United States Department of Agriculture – The USDA has programs by which communities can get grants for fire fighting needs. See the link below for some example.

<http://www.rurdev.usda.gov/rd/newsroom/2002/cfg.html>

Abbreviations Used in Table 12

FEMA Mitigation Grants includes:

FMA = Flood Mitigation Assistance Program.

HMGP = Hazard Mitigation Grant Program.

PDM = Pre-Disaster Mitigation Program

ACOE = Army Corps of Engineers.

MHD = Massachusetts Highway Department.

EOT = Executive Office of Transportation.

DCR = Department of Conservation and Recreation

DHS/EOPS = Department of Homeland Security/Emergency Operations

EPA/DEP (SRF) = Environmental Protection Agency/Department of Environmental Protection (State Revolving Fund)

USDA = United States Department of Agriculture

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Table 12 Marlborough Potential Mitigation Measures						
Hazard Area	Mitigation Measure	Priority	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
High Priority						
<i>Flooding: drainage infrastructure maintenance and repair</i>	Feasibility study to consider the adoption of a Stormwater Utility	High	Planning/DPW/Engineering	2008 – 2010	\$15,000	Marlborough/ FEMA
<i>Flooding: land protection and acquisition</i>	Acquire Shoestring Hill parcel and complete Flagg Swamp parcel swap from MHD to MA Fish and Wildlife	High	Conservation and Open Space Committee	2008 – 2012	TBD	Marlborough/ DCR
<i>Flooding: Glen Brook</i>	Install new drain lines on Ripley Street	High	Engineering/ DPW	2008 - 2011	\$200,000	Marlborough
<i>Flooding: Mowry Brook at Brook Village</i>	Modify culverts from East Main Street to Curtis Avenue	High	Engineering/ DPW	2008 – 2011	\$125,000	Marlborough/ FEMA
<i>Flooding: Culvert at Route 85</i>	Replace with larger culvert: at 25 % design stage	High	Engineering/ DPW	2008- 2011	\$125,000	Marlborough/ FEMA
<i>Dam: Hager Street Dam</i>	Establish regular maintenance plan	High	Private dam	Ongoing	TBD	Dam owner
<i>Dam: Tyler Dam</i>	Establish regular maintenance plan	High	DCR	Ongoing	TBD	DCR
<i>Earthquakes and Multiple Hazard</i>	Acquire two 500 Kw mobile, multi-fuel	High	DPW	2008 – 2010	\$250,000 each	Marlborough/ FEMA

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Table 12
Marlborough Potential Mitigation Measures

Hazard Area	Mitigation Measure	Priority	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
	generators for pump station back up					
<i>Earthquake and Multiple Hazard</i>	Acquire new ladder and pumper fire trucks	High: pending with City Council	Fire	2008 – 2011	Ongoing	Marlborough/ FEMA
<i>Brush Fires</i>	Acquire new 4x4, 2-ton forest fire truck with 200 gallon pumper tank	High	Fire	2008 – 2011	\$75,000	Marlborough/ FEMA
<i>Winter Storms</i>	New DPW Facility Garage, rehab salt sheds, gas/diesel fueling depot	High	DPW	2008 – 2013	Feasibility Study: \$50,000 Preliminary Design: \$200,000	Marlborough /FEMA
<i>Winter Storms</i>	Replace 2 one-ton trucks, replace 5 three-quarter ton pickups, replace 2 ten-wheel dump trucks with sanders/plows/wing plows, acquire 2 new loaders, replace 4 six-wheel dump trucks	High	DPW	2008 – 2013	one-ton trucks: \$30,000 each ¾ ton trucks: \$25,000 each ten-wheel dump truck: \$200,000 each loaders: \$165,000 each six-wheel	Marlborough/ FEMA

THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN
THE MARLBOROUGH ANNEX

Table 12 Marlborough Potential Mitigation Measures						
Hazard Area	Mitigation Measure	Priority	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
					dump truck: \$160,000 each	
<i>Multiple Hazard: Communications Equipment</i>	Add additional band width and two-way radio repeater for Fire/Police/DPW	High	Fire/Police/DPW	2008 – 2012	Band width: \$300,000 Repeater: \$200,000	Marlborough/ FEMA
<i>Multiple Hazards: Power Outages</i>	<ul style="list-style-type: none"> • Acquire: 6 new 200 Kw, fixed generator for all schools except Middle School • 1 200 Kw, fixed, multi-fuel generator for City Hall • 1 500 Kw, fixed, multi-fuel generator for DPW Facility 	High	Fire	2008 – 2011	\$175,000 each 200 Kw generator \$175,000 each for each 500 Kw	Marlborough/ FEMA
Medium Priority						
<i>Reducing impacts from new</i>	Complete and adopt stormwater ordinance	Medium	Planning/ Conservation	2008	Ongoing by consultant:	Marlborough

THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN
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Table 12
Marlborough Potential Mitigation Measures

Hazard Area	Mitigation Measure	Priority	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
<i>development</i>					\$10,000 total	
<i>Flooding: Boundary Street Bridge</i>	Redesign and raise road section that floods	Medium	Engineering/ DPW	2008 - 2011	NA	MHD: 2009 TIP project
<i>Beaver dams: Flooding off Bigelow Street</i>	Remove dams and relocate beavers/install pipes	Medium	DPW	As needed	\$1,500 per incident	Marlborough
<i>Beaver dams: Intersection of Stow and Concord Roads</i>	Remove dams and relocate beavers/install pipes	Medium	DPW	As needed	\$1,500 per incident	Marlborough
<i>Beaver dams: Flooding at Sasserville Way near Fitchburg Road</i>	Remove dams and relocate beavers/install pipes	Medium	DPW	As needed	\$1,500 per incident	Marlborough
<i>Beaver dams: off Milham Street</i>	Remove dams and relocate beavers/install pipes	Medium	DPW	As needed	\$1,500 per incident	Marlborough
<i>Beaver dams: Causeway Street flooding</i>	Remove dams and relocate beavers/install pipes	Medium	DPW	As needed	\$1,500 per incident	Marlborough
<i>High winds</i>	Develop tree inventory and maintenance program	Medium	DPW	2008 – 2012	Plan and Inventory: \$30,000 Implementation: \$2,000 per year	Marlborough

THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN
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Table 12
Marlborough Potential Mitigation Measures

Hazard Area	Mitigation Measure	Priority	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
<i>Flooding: regulatory</i>	Consider amending Floodplain and Wetland Zoning Protection overlays to ensure appropriate development in floodplain areas	Medium	Planning/ Conservation	2008 – 2010	\$10,000	Marlborough
<i>Flooding: wetlands protection and stormwater storage capacity</i>	Develop a city-based, GIS wetlands mapping capacity that would include all local wetlands delineations	Medium	Conservation	2008 -2011	Ongoing	Marlborough/ FEMA
<i>Flooding: land protection and acquisition</i>	Adopt Community Preservation Act: outreach campaign	Medium	Conservation	2008 -2012	\$5,000	Marlborough
<i>Flooding: Culvert at Maple Street (Route 85) and Framingham Road</i>	Replace with larger culvert: at 25% design stage	Medium	Engineering/ DPW	2008 - 2011	\$250,000	Marlborough/ FEMA
<i>Erosion and Pollution Prevention</i>	Increase education and outreach on erosion, stormwater and best management practices to local contractors and residents.	Medium	Conservation	2008 – 2010	\$5,000 per year	Marlborough/ FEMA/DCR

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Table 12
Marlborough Potential Mitigation Measures

Hazard Area	Mitigation Measure	Priority	Implementation Responsibility	Time Frame	Estimated Cost	Potential Funding Sources
<i>Earthquake: Unreinforced Masonry Buildings</i>	Investigate options to make all public safety buildings earthquake resistant	Medium	Public Facilities	2008 – 2011	\$35,000	Marlborough/ FEMA
Low Priority						
<i>Dam: Fort Meadow Dam and Spillway</i>	Establish regular maintenance plan	Low	DPW	Ongoing	\$5,000 per year	Marlborough
<i>Flooding: Drainage system record keeping</i>	Complete digitizing of stormwater outfall and begin GIS-based system to track cleaning and maintenance of drainage system	Low	Engineering/ DPW	2008 – 2011	Ongoing : \$5,000 per year	Marlborough/ FEMA

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VIII. REGIONAL AND INTER-COMMUNITY CONSIDERATIONS

Some hazard mitigation issues are strictly local. The problem originates primarily within the municipality and can be solved at the municipal level. Other issues are inter-community issues that involve cooperation between two or more municipalities. There is a third level of mitigation which is regional; involving a state, regional or federal agency or an issue that involves three or more municipalities.

Regional Partners

In many communities, mitigating natural hazards, particularly flooding, is more than a local issue. The drainage systems that serve these communities are a complex system of storm drains, roadway drainage structures, pump stations and other facilities owned and operated by a wide array of agencies including but not limited to the City of Marlborough, the Department of Conservation and Recreation (DCR), the Massachusetts Water Resources Authority (MWRA), and Massachusetts Highway Department (MHD) and the Massachusetts Bay Transportation Authority (MBTA). The planning, construction, operations and maintenance of these structures are integral to the flood hazard mitigation efforts of communities. These agencies must be considered the communities regional partners in hazard mitigation. These agencies also operate under the same constraints as communities do including budgetary and staffing constraints and numerous competing priorities. In the sections that follow, the plan includes recommendations for activities to be undertaken by these other agencies. Implementation of these recommendations will require that all parties work together to develop solutions.

Inter-Community Considerations

Regional Issues

At this time, the Marlborough Multiple Hazard Community Planning Team did not site specific regional issues impacting the city but did agree that all communities within the Metro Boston North/West Multiple Hazard Community Planning Region share common concerns including the following:

- Maintenance and drainage from state highways
- Inspection and maintenance of state and privately owned dams
- Coordinated response to wildfires on state and federally owned properties
- Emergency Planning and Community Right to Know (EPCRA) filers (local Local Emergency Planning Committees(LEPC) would have a list and significant Hazardous Waste Sites that could impact a community during a disaster
- Transportation of hazardous materials through communities by rail or truck

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IX. PLAN ADOPTION AND MAINTENANCE

Plan Adoption

The Marlborough Annex of the Metro Boston North/West Regional Multi-Hazard Mitigation Plan was adopted by the City Council on ___TBD_____. See Appendix C for documentation.

Plan Maintenance

Regional Implementation Group

In order to ensure that the regional plan is monitored, evaluated and updated, the Metrowest Hazard Mitigation Community Planning Team which was established for the planning process will continue to meet on an as-needed basis to function as the Regional Implementation Group for the regional plan.

This group will select a chair that is willing to provide regional leadership, oversee the implementation schedule detailed below and provide administrative support to the process. An alternative approach would be for each community to secure funding to hire a consultant or MAPC to provide support for the process described below. Because the plan was prepared by MAPC, having MAPC continue to monitor and prepare an updated plan would ensure a level of continuity and consistency that would benefit the communities. Contingent on funding being available, MAPC could take on this role.

Local Implementation Groups

MAPC worked with the representatives from the regional committee to convene one meeting of community representatives and interested parties to complete the draft annex. In some cases, these groups were previously established Local Emergency Planning Committees (LEPCs) and in other cases, these were ad hoc groups pulled together to review and comment on the draft annex. These groups will continue to meet on an as-needed basis to function as the Local Implementation Groups.

In the case of Marlborough, the Local Implementation Group will be the same individuals who participated in the Local Multi-Hazard Community Planning Team. Additional members will be added to the local implementation group from businesses, non-profits and institutions.

Implementation Schedule

Yearly Survey and Annual Report – Once a year the chair of the Regional Implementation Group will prepare and distribute a survey to all of the local implementation groups. The survey will poll the local groups on any changes, revisions and accomplishments from the local and regional perspective and will also survey the communities to determine if any new hazards or problem areas have been identified.

THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN THE MARLBOROUGH ANNEX

This information will be used to prepare an annual report or addendum to the regional plan and the annexes. The Local Implementation Groups will have primary responsibility for updating the annexes.

The Regional Implementation Group will meet after all communities have responded to the survey to review any changes in regional goals or mitigation measures and to be briefed on any changes that may have occurred in the Federal Disaster Mitigation Act or hazard mitigation guidelines.

Yearly Review of Regional Mitigation Measures – The Regional Implementation Group will meet twice a year (at a minimum) to review the list of regional mitigation measures and begin to develop a priority list for implementation.

Develop Fourth Year Update Subcommittee – At the start of the fourth year after initial plan adoption, the chair of the Regional Implementation Group will convene a subcommittee to prepare an update of the plan. At this point, the Regional Implementation Group may decide to undertake the update themselves, contract with the Metropolitan Area Planning Council to update the plan or to hire another consultant.

As the Regional Implementation Group prepares for a full update of the regional plan and annexes, an evaluation of the plan's effectiveness will be undertaken. This will include the following:

- The membership of the Regional Implementation Group and local committees.
- Issues related to integration of the plans with local and regional plans and procedures.
- An analysis of the relevance of the hazard mitigation goals.
- The successfulness of the plan in accomplishing mitigations measures.

Prepare and Adopt New Community Annexes and Regional Plan – However the Regional Implementation Group decides to update the plan, the group will need to review the current disaster mitigation plan guidelines for any changes. The plan update subcommittee will present the full Regional Implementation Group with an update of the annexes to the Regional Plan. The updates of the Annexes and Regional Plan are forwarded to MEMA and DCR for review and to FEMA for approval.

Integration of the Plans with other Planning Initiatives

Upon approval of the regional plan and annexes by MEMA, each local committee will provide all interested parties and implementing departments with a copy of the plan and will initiate a discussion regarding how the plan can be integrated into that department's ongoing work. At a minimum, the plan will be reviewed and discussed with:

THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN
THE MARLBOROUGH ANNEX

Engineering Department
Highway Department
Department of Public Works
Parks and Recreation Department
Planning and Community Development Department
Conservation Commission
Board of Health

Other groups that will be coordinated with include large institutions (hospitals, colleges), Chambers of Commerce, land conservation organizations and watershed groups. The plans will also be posted on a community's website with the caveat that each community will review the plan for sensitive information that would be inappropriate for public posting. The posting of the plan on a web site will include a mechanism for citizen feedback such as an e-mail address to send comments.

In addition, the plan will be reviewed with state agencies such as MEMA and DCR and regional agencies such as the MWRA.

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X. LIST OF REFERENCES

In addition to the specific reports listed below, much of the technical information for this annex came from meetings with city department heads and staff.

City of Marlborough Zoning Ordinance

City of Marlborough Subdivision Rules and Regulations

Marlborough Open Space and Recreation Plan, 2003- 2008

City of Marlborough Master Plan, 2002

Flood Insurance Study, City of Marlborough, MA Federal Emergency Management Agency, Revised July 16, 1990.

Emergency Action Plans for Lake Williams and Fort Meadow Dams, November, 2007

Commonwealth of Massachusetts, MacConnell Land Use Statistics, 1999

Federal Emergency Management Agency, Flood Insurance Rate Maps for Marlborough, MA

MA Executive Office of Environmental Affairs, Buildout Analysis for Marlborough, MA 2000

Metropolitan Area Planning Council, Geographic Information Systems Lab

Metropolitan Area Planning Council, Regional Plans and Data

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**APPENDIX A
MEETING AGENDAS**

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THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN
THE MARLBOROUGH ANNEX



Cristine McCombs
Director



Stephen H. Burrington
COMMISSIONER



Marc D. Draisen
Executive Director

**METRO NORTH/WEST
PRE-DISASTER
MITIGATION PLAN**

MetroWest

Ashland
Framingham
Holliston
Natick
Southborough
Wayland
Weston
MAGIC
Acton
Bedford
Bolton
Boxborough
Carlisle
Concord
Hudson
Lexington
Lincoln
Littleton
Maynard
Stow

NORTH SUBURBAN

Burlington
Marlborough
Reading
Stoneham
Wakefield
Wilmington
Woburn

The Commonwealth of Massachusetts
MITT ROMNEY, GOVERNOR

Massachusetts Emergency Management Agency
400 WORCESTER ROAD, FRAMINGHAM, MA 01702-5399 508-820-2000 FAX 508-820-1404

Department of Conservation and Recreation
251 CAUSEWAY STREET, SUITE 600-900, BOSTON, MA 02114-2104 617-626-1250 FAX 617-626-1351

Metropolitan Area Planning Council
60 TEMPLE PLACE, 6TH FLOOR, BOSTON, MA 02111 617-451-2770 FAX 617-482-7185

MetroWest
Hazard Mitigation Community Planning Team
WEDNESDAY, AUGUST 15, 2006 9:30 AM
Natick Town Hall
Selectmen's Room, 2nd Floor
13 East Central Street, Natick

AGENDA

- 9:30 WELCOME & INTRODUCTIONS (*Please sign contact sheet*)
- 9:45 OVERVIEW OF FEDERAL DISASTER MITIGATION ACT & PRE-DISASTER MITIGATION PLANNING
- *Presentation, Questions & Discussion*
--*Martin Pillsbury, Manager of Regional Planning, MAPC*
- 10:15 GETTING STARTED: THE METRO NORTH/WEST PRE-DISASTER MITIGATION PLAN - NORTH SUBURBAN SUBREGION
- *Review of Scope of Work & Schedule*
-- *Sam Cleaves, MAPC Senior Planner*
 - *Questions & Discussion - Local Issues & Priorities*
- 11:00 PREVIEW OF MAPPING AND DATABASES FOR THE PLAN
- *Examples from the North Shore & Metro Boston PDM Plans*
--*Alan Bishop, GIS Manager, MAPC*
- 11:20 NEXT STEPS / MEETING SCHEDULE
- 11:30 ADJOURN

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THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN
THE MARLBOROUGH ANNEX



Ken McBride
Acting Director



Priscilla E. Geigis
Acting Commissioner



Marc D. Draisen
Executive Director

The Commonwealth of Massachusetts
Deval Patrick, Governor

Massachusetts Emergency Management Agency
400 Worcester Road, Framingham, MA 01702-5399 508-820-2000

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Metropolitan Area Planning Council
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MetroWest

Hazard Mitigation Community Planning Team
Second Regional Meeting
TUESDAY, MARCH 13, 2007, 10:00 AM

Morse Institute Library, Community Room
14 East Central Street, Natick

MetroWest
Ashland
Framingham
Holliston
Marlborough
Natick
Southborough
Sudbury
Wayland
Weston

MAGIC
Acton
Bedford
Bolton
Boxborough
Carlisle
Concord
Hudson
Lexington
Lincoln
Littleton
Maynard
Stow

NORTH SUBURBAN

Burlington
Lynnfield
Reading
Stoneham
Wakefield
Wilmington
Woburn

10:00 WELCOME, INTRODUCTIONS & OVERVIEW OF AGENDA

10:10 REVIEW OF HAZARD MAPPING AND CRITICAL INFRASTRUCTURE
DATA COLLECTION

- *Allan Bishop, GIS Manager, will present the draft regional hazard map and a sample community map,*
- *Draft local hazard maps will be distributed on CD ROM to all towns*
- *Update on Critical Facilities data base and process for local review and QA/QC of draft hazard maps and data*

11:00 UPDATE ON LOCAL PLANS

- *Donna Jacobs and Sam Cleaves will discuss local and regional issues emerging in the planning process*
- *Review next steps in mapping localized hazard areas*
- *Martin Pillsbury will review plan approval requirements*

11:20 QUESTIONS AND DISCUSSION WITH TEAM MEMBERS

11:30 NEXT STEPS / MEETING SCHEDULE / ADJOURN

THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN
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DON BOYCE
Director



Rick Sullivan
Commissioner



Marc D. Draisen
Executive Director

**METRO NORTH/WEST
HAZARD MITIGATION PLAN**

MetroWest

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Metropolitan Area Planning Council
60 TEMPLE PLACE, 6TH FLOOR, BOSTON, MA 02111 617-451-2770 FAX 617-482-7185

MetroWest
Hazard Mitigation Community Planning Team
Second Regional Meeting
THURSDAY, NOVEMBER 15, 2007, 9:30 AM
Natick Town Hall
Selectmen's Room, 2nd Floor
13 East Central Street, Natick

9:30 WELCOME, INTRODUCTIONS & OVERVIEW OF AGENDA

- *Martin Pillsbury, Project Manager*

**9:40 REVIEW OF HAZARD MAPPING AND CRITICAL INFRASTRUCTURE
DATA COLLECTION**

- *Allan Bishop, GIS Manager, will present the draft regional hazard map and a sample community map,*
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10:30 UPDATE ON LOCAL PLANS

- *Sam Cleaves and Donna Jacobs will discuss local and regional issues emerging in the planning process*
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10:45 QUESTIONS AND DISCUSSION WITH TEAM MEMBERS

11:00 NEXT STEPS / MEETING SCHEDULE / ADJOURN

THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN
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DON BOYCE
Director



Rick Sullivan
Commissioner



Marc D. Draisen
Executive Director

**METRO NORTH/WEST
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Metropolitan Area Planning Council
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MetroWest
Hazard Mitigation Community Planning Team
Wednesday, June 25, 2008, 10:00 AM
Natick Town Hall
Selectmen's Room, 2nd Floor
13 East Central Street, Natick

AGENDA

10:00 WELCOME & INTRODUCTIONS (*Please sign contact sheet*)

10:05 REVIEW OF THE REGIONAL HAZARD MITIGATION MAP SERIES

Martin Pillsbury will present an overview of the regional Hazard Mitigation maps (copies will be distributed on CD-ROM)

10:25 REGIONAL GOALS AND OBJECTIVES, ISSUES, RECOMMENDATIONS

Sam Cleaves and Donna Jacobs will facilitate a discussion of goals and objectives, regional issues, and recommendations for the North/West Regional Hazard Mitigation Plan.

11:00 OVERVIEW OF FEMA BENEFIT-COST ANALYSIS FOR GRANTS

Martin Pillsbury will present an overview of FEMA's requirements for Benefit-Cost Analysis for grant applications for mitigation projects.

11:25 REVIEW OF NEXT STEPS:

- Complete remaining local annexes and public meetings
- Plan review and approval by MEMA & FEMA
- Plan Adoption by the towns (Selectmen/City Council)
- Final Approval letter issued by FEMA

THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN
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First Marlborough Multi-Hazard Mitigation Planning Team Meeting

April 4, 2007
Marlborough DPW Department
9:30 -11:00 AM

Agenda

1. Welcome and introductions
2. Project Overview and Information Collected to Date
3. Survey Handout and Ortho Map Markup of Hazardous Areas/Conversation:
 - What floods? How often? Any mitigation studies done? What mitigation studies have been done or planned for? High or low priority?
 - Other hazards: Brush fires, dams, earthquakes, high winds? What areas?
 - Map known future development areas? Type, size, status of permitting
4. Next Steps: Follow up with individuals as needed, continue information gathering, set local group Goals and Objectives meeting and check information gathered to date

Project Overview - MAPC received a grant to prepare natural hazards *Pre-Disaster Mitigation Plans* for the communities of Ashland, Framingham, Marlborough, Marlborough, Marlborough, Southborough, Marlborough, Wayland and Weston. MAPC is working with the nine communities to develop a plan to mitigate potential damages of natural hazards such as floods, winter storms, hurricanes, earthquakes and wild fires, before such hazards occur. The federal *Disaster Mitigation Act of 2000* requires that all municipalities adopt a *Pre-Disaster Mitigation Plan* for natural hazards in order to remain eligible for FEMA Disaster Mitigation Grants.

This FEMA planning program is separate from new or ongoing homeland security initiatives, and is focused solely on addressing natural hazards, although some of the data collected for this plan may be useful for other aspects of emergency planning as well.

THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN
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Marlborough Predisaster Mitigation Planning Meeting

Second Local Work Group Meeting

November 28, 2007

Marlborough DPW Building

10 -11:30 am

Agenda

1. Welcome, Introductions
2. Introduce Marlborough's Hazard Mitigation Planning map series and digitized ortho photo showing Areas of Concern—check for accuracy and edit as needed
3. Review and edit Marlborough Mitigation Matrix as needed
4. Set draft goals for Hazard Mitigation Plan
5. Next steps: 1)submit draft plan to Work Group by 1/15 for comment; 2) public meeting in February

Project Overview - MAPC received a grant to prepare natural hazards *Pre-Disaster Mitigation Plans* for the communities of Ashland, Framingham, Sudbury, Marlborough, Natick, Southborough, Wayland and Weston. MAPC is working with the nine communities to develop a plan to mitigate potential damages of natural hazards such as floods, winter storms, hurricanes, earthquakes and wild fires, before such hazards occur. The federal *Disaster Mitigation Act of 2000* requires that all municipalities adopt a *Pre-Disaster Mitigation Plan* for natural hazards in order to remain eligible for FEMA Disaster Mitigation Grants.

This FEMA planning program is separate from new or ongoing homeland security initiatives, and is focused solely on addressing natural hazards, although some of the data collected for this plan may be useful for other aspects of emergency planning as well.

THE METRO BOSTON NORTH/WEST MULTI-HAZARD MITIGATION PLAN
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The Marlborough Multi-Hazard Mitigation Planning Team

3rd Meeting
May 21, 2008
City Hall
140 Main Street
10 – 11:30 AM

1. Potential Mitigation Measures and Table 12
 - Identify all potential mitigation measures
 - Evaluate potential mitigation measures using the STAPLE/E Criteria
 - Complete Table 12
2. Review inter-community and regional concerns.
3. Discuss the public meeting requirement and schedule a meeting time.

Project Overview - MAPC received a grant to prepare natural hazards *Pre-Disaster Mitigation Plans* for the communities of Ashland, Framingham, Marlborough, Marlborough, Marlborough, Southborough, Marlborough, Wayland and Weston. MAPC is working with the nine communities to develop a plan to mitigate potential damages of natural hazards such as floods, winter storms, hurricanes, earthquakes and wild fires, before such hazards occur. The federal *Disaster Mitigation Act of 2000* requires that all municipalities adopt a *Pre-Disaster Mitigation Plan* for natural hazards in order to remain eligible for FEMA Disaster Mitigation Grants.

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THE MARLBOROUGH ANNEX

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**APPENDIX B
HAZARD MAPPING**

The MAPC GIS (Geographic Information Systems) Lab produced a series of maps for each community. Some of the data came from the Northeast States Emergency Consortium (NESEC). More information on NESEC can be found at <http://www.serve.com/NESEC/>. Due to the various sources for the data and varying levels of accuracy, the identification of an area as being in one of the hazard categories must be considered as a general classification that should always be supplemented with more local knowledge. The documentation for some of the hazard maps was incomplete as well.

The map series consists of four panels with two maps each plus one map taken from the State Hazard Mitigation Plan.

Map 1.	Population Density
Map 2.	Potential Development
Map 3.	Flood Zones
Map 4.	Earthquakes and Landslides
Map 5.	Hurricanes and Tornadoes
Map 6.	Average Snowfall
Map 7.	Composite Natural Hazards
Map 8.	Hazard Areas

Map 1: Population Density – This map uses the US Census block data for 2000 and shows population density as the number of people per acre in seven categories with 60 or more people per acre representing the highest density areas.

Map 2: Potential Development – This map shows potential future developments, and critical infrastructure sites. MAPC consulted with city staff to determine areas that were likely to be developed or redeveloped in the future.

Map 3: Flood Zones – The map of flood zones used the FEMA Q3 Flood Zones as its source. For more information, refer to http://www.fema.gov/fhm/fq_q3.shtm. The definitions of the flood zones are described in Appendix III and in more detail at http://www.fema.gov/fhm/fq_term.shtm. The flood zone map for each community also shows repetitive loss sites, critical infrastructure and municipally owned and protected open space. As defined by the Community Rating System (CRS) of the National Flood Insurance Program (NFIP), a repetitive loss property is any property, which the NFIP has paid two or more flood claims of \$1,000 or more in any given 10-year period since 1978. For more information on repetitive losses see <http://www.fema.gov/nfip/replps.shtm>.

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Map 4: Earthquakes and Landslides – This information came from NESEC. For most communities, there was no data for earthquakes because only the epicenters of an earthquake are mapped.

The landslide information shows areas with either a low susceptibility or a moderate susceptibility to landslides based on mapping of geological formations. This mapping is highly general in nature. For more information on how landslide susceptibility was mapped, refer to <http://pubs.usgs.gov/pp/p1183/pp1183.html>.

Map 5: Hurricanes and Tornadoes – This map shows a number of different items. The map includes the storm tracks for both hurricanes and tropical storms. This information must be viewed in context. A storm track only shows where the eye of the storm passed through. In most cases, the effects of the wind and rain from these storms were felt in other communities even if the track was not within that community. This map also shows the location of tornadoes with a classification as to the level of damages. What appears on the map varies by community since not all communities experience the same wind-related events. These maps also show the 100 year wind speed.

Map 6: Average Snowfall - - This map shows the average snowfall, repetitive loss structures and open space. It also shows storm tracks for nor'easters, if any storms tracked through the community.

Map 7: Composite Natural Hazards - This map shows four categories of composite natural hazards for areas of existing development. The hazards included in this map are 100 year wind speeds of 110 mph or higher, low and moderate landslide risk, FEMA Q3 flood zones (100 year and 500 year) and hurricane surge inundation areas. Areas with only one hazard were considered to be low hazard areas. Moderate areas have two of the hazards present. High hazard areas have three hazards present and severe hazard areas have four hazards present.

Map 8: Hazard Areas – For each community, locally identified hazard areas are overlaid on an aerial photograph dated April, 2001. The critical infrastructure sites and repetitive loss sites are also shown. The source of the aerial photograph is Mass GIS.

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APPENDIX C
DOCUMENTATION OF PLAN ADOPTION

DRAFT

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