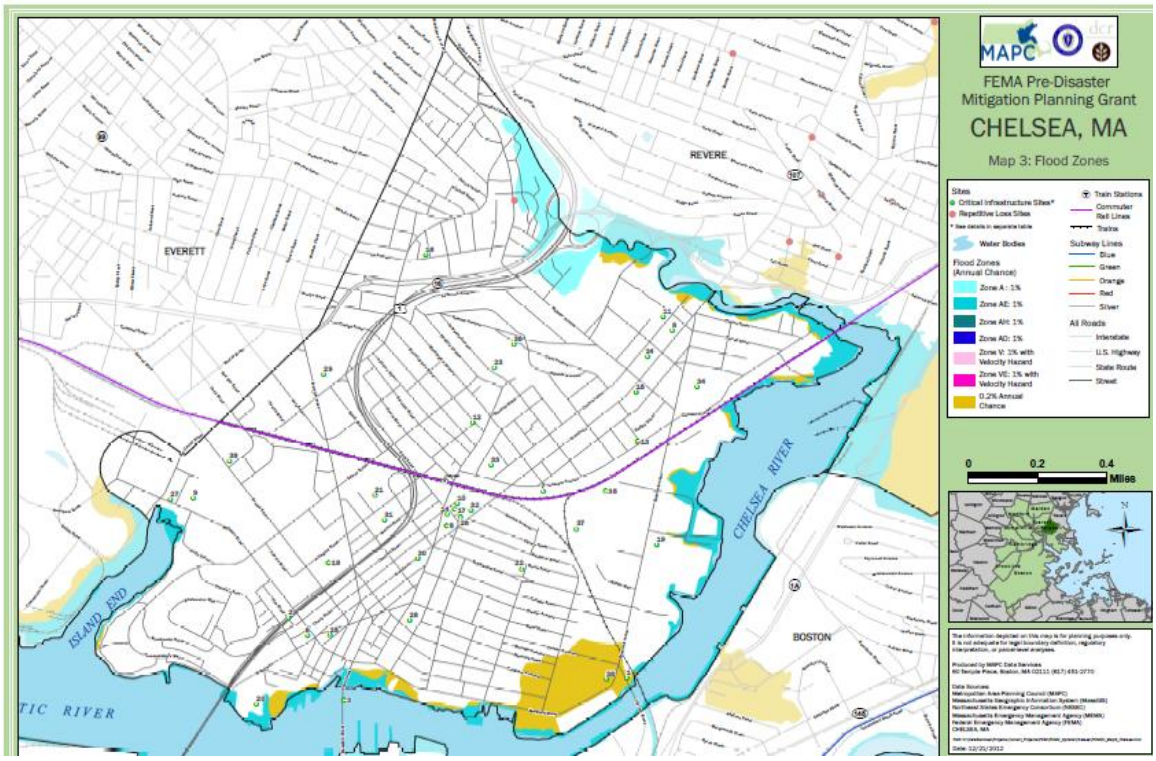
CITY OF CHELSEA
HAZARD MITIGATION PLAN
2014 UPDATE



MAPC
METROPOLITAN AREA PLANNING COUNCIL

Draft for Review by MEMA & FEMA
Draft for City Review May 16, 2014

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CITY OF CHELSEA HAZARD MITIGATION PLAN
2014 UPDATE

ACKNOWLEDGEMENTS AND CREDITS

This plan was prepared for the City of Chelsea 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.

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CITY OF CHELSEA HAZARD MITIGATION PLAN
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Hazard Mitigation planning is a proactive effort to identify actions that can be taken to reduce the dangers to life and property from natural hazard events. In the communities of the Boston region of Massachusetts, hazard mitigation planning tends to focus most on flooding, the most likely natural hazard to impact these communities. The Federal Disaster Mitigation Act of 2000 requires all municipalities that wish to be eligible to receive FEMA funding for hazard mitigation grants, to adopt a local multi-hazard mitigation plan and update this plan in five year intervals.

Planning Process

Planning for the Chelsea Hazard Mitigation Plan update was led by the Chelsea Local Hazard Mitigation Planning Committee, composed of staff from a number of different City Departments. This committee discussed where the impacts of natural hazards most affect the City, goals for addressing these impacts, and hazard mitigation measures that would benefit the City.

Public participation in this planning process is important for improving awareness of the potential impacts of natural hazards and to build support for the actions the City takes to mitigate them. Three advertised public meetings were held, the first on April 23, 2013 with the Chelsea Planning Board, the second and third on June 18, 2013 and April 22, 2014 with the Planning Board. The draft Plan also was posted on the City's website for public review and comment for a ten day period following the two public meetings. Both meetings included a description of the hazard mitigation planning process, an overview of the plan and proposed mitigation actions, as well as directions on how the public could access the draft plan on the City website and make comments. The public was given time to ask questions and comment at all public meetings.

Risk Assessment

The plan update provides risk assessment for the following natural hazards in Chelsea: flooding, dam failure, wind including hurricanes and tropical storms, tornados, and Nor'easters, severe winter weather including snow and blizzards, geologic including earthquakes and landslides, and other natural hazards including Wildland/brush fires, urban fires, drought, extreme temperatures and tsunamis.

Hazard Mitigation Goals

1. Prevent and reduce the loss of life, injury 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.

    - Continue to use the CIP as a tool for accomplishing mitigation projects.
    - Ensure that the Planning Department considers hazard mitigation in its review and permitting of new development.
    - Review zoning regulations to ensure that the ordinance incorporates all reasonable hazard mitigation provisions.
    - Ensure that the Building Department has the resources to continue to enforce building regulations.

4. Prevent and reduce the damage to public infrastructure resulting from all hazards.

    - Begin to assess the vulnerability of municipal buildings and infrastructure to damage from an earthquake.
    - Maintain existing mitigation infrastructure in good condition.

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.

    - Continue to participate in the Mystic Region LEPC.

7. Ensure that future development meets federal, state and local standards for preventing and reducing the impacts of natural hazards.

8. Educate the public about natural hazards and mitigation measures that can be undertaken by property-owners.

    - Provide information on hazard mitigation activities in the languages most frequently spoken in Chelsea.

9. Take maximum advantage of resources from FEMA and MEMA to educate City staff and the public about hazard mitigation.

Highlighted Potential Hazard Mitigation Actions

- Complete a 2008 Natural Hazard Mitigation Plan priority project to eliminate flooding by upgrading Spruce Street stormwater drainage and Combined Sewer

Overflow separation project as mitigation included in the new FBI Headquarters/ hotel complex at the intersection of Carter and Beach Streets.

- Correct flooding in the Willow Street neighborhood: install new pump station.
- Correct flooding in the area where Eastern Avenue intersects Route 1: increase stormwater infiltration to reduce stormwater flows and install pump station.

Plan Review and Update Process

The process for reviewing and updating Chelsea's Hazard Mitigation Plan is summarized in Table 1 below.

Table 1 Plan Review and Update

Chapter	Reviews and Updates
III – Public Participation	The Chelsea Local Committee placed an emphasis on public participation for the update of the Hazard Mitigation Plan, discussing strategies to enhance participation opportunities at the first local committee meeting. During plan development, the plan was presented to the Planning Board and the Conservation Commission in public meetings. The plan was also available on the City's website for public comment.
IV – Risk Assessment	MAPC gathered the most recently available hazard and land use data and met with City staff to identify changes in local hazard areas and development trends. City staff reviewed critical infrastructure with MAPC staff in order to create an up-to-date list. MAPC also used the most recently available version of HAZUS and assessed the potential impacts of flooding using the latest data.
V - Goals	The Hazard Mitigation Goals were reviewed and endorsed by the Local Hazard Mitigation Committee.
VI – Existing Mitigation Measures	The list of existing mitigation measures was updated to reflect current mitigation activities in the City.
VII & VIII – Hazard Mitigation Strategy	Mitigation measures from the 2008 plan were reviewed and assessed as to whether they were completed, on-going, or deferred. The Local Committee determined whether to carry forward measures into the 2014 plan or delete them. The 2014 Hazard Mitigation Strategy reflects both new measures and measures carried forward from the 2008 plan. The Committee re-prioritized all of these measures based on current conditions
IX – Plan Adoption & Maintenance	This section of the plan was updated with a new on-going plan implementation review and five year update process that will assist the City in incorporating hazard mitigation issues into other City planning and regulatory review processes and better prepare the City to update the plan in 2019.

As indicated in more detail on Table 20, Chelsea made considerable progress on implementing mitigation measures identified in the 2008 Hazard Mitigation Plan. Many of the measures identified in that plan are now considered on-going aspects of the regular work of City staff from the department head level to the regular work of Public Works staff. Individual projects have been incorporated into the City's Capital Improvement Plan. Moving forward into the next five year plan implementation period there will be many more opportunities to incorporate hazard mitigation into the City's decision making processes. Though not formally done in the 2008 Plan, the City will document any actions taken within this iteration of the Natural Hazard Mitigation on challenges met and actions successfully adopted as part of the ongoing work of the biannual survey and four year update to be conducted by the Hazard Mitigation Implementation Team, as described in Section IX, Plan Adoption and Maintenance. The Hazard Implementation Team did not meet regularly, conduct a bi-annual survey or four year update as described in Section IX perhaps due to the absence of any one City department having being designated to follow up and implement the plan and coordinate plan review and updating.

II. 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 and update this plan in five year intervals. 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 their member 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 Chelsea and eight other metro Boston communities to update their local Hazard Mitigation Plans, which were first adopted in 2008 as part of a Metro Boston Multi-Jurisdictional Hazard Mitigation Plan.

The local Hazard Mitigation Plan updates produced under this grant are designed to individually meet the requirements of the Disaster Mitigation Act for each community while listing regional concerns and hazards that impact the town or City creating the plan.

A public, regional meeting of the Metro Boston Multiple Hazard Community Planning Team was held April 13, 2012 to re-introduce participating communities to the hazard mitigation planning process and to identify inter-community hazard mitigation issues.

See Appendix C for a list of those submitting comments on the draft Plan.

What is a Hazard Mitigation Plan?

Natural hazard mitigation planning is the process of determining how to systematically 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.

Previous Federal/State Disasters

The City of Chelsea has experienced 17 natural hazards that triggered federal or state disaster declarations since 1991. These are listed in Table 2 below. The vast majority of these events involved flooding.

Table 2 Previous Federal/State Disaster Declarations

DISASTER NAME (DATE OF EVENT)	TYPE OF ASSISTANCE	DECLARED AREAS
Hurricane Bob (August 1991)	FEMA Public Assistance Project Grants	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk (16 projects)
No-Name Storm (October 1991)	FEMA Public Assistance Project Grants	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk
	FEMA Individual Household Program	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk (10 projects)
December Blizzard (December 1992)	FEMA Public Assistance Project Grants	Counties of Barnstable, Dukes, Essex, Plymouth, Suffolk
	Hazard Mitigation Grant Program	Counties of Barnstable, Dukes, Essex, Plymouth, Suffolk (7 projects)
March Blizzard (March 1993)	FEMA Public Assistance Project Grants	All 14 Counties

DISASTER NAME (DATE OF EVENT)	TYPE OF ASSISTANCE	DECLARED AREAS
January Blizzard (January 1996)	FEMA Public Assistance Project Grants	All 14 Counties
May Windstorm (May 1996)	State Public Assistance Project Grants	Counties of Plymouth, Norfolk, Bristol (27 communities)
October Flood (October 1996)	FEMA Public Assistance Project Grants	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
	FEMA Individual Household Program	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
	Hazard Mitigation Grant Program	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk (36 projects)
1997	Community Development Block Grant-HUD	Counties of Essex, Middlesex, Norfolk, Plymouth, Suffolk
June Flood (June 1998)	FEMA Individual Household Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
	Hazard Mitigation Grant Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester (19 projects)
(1998)`	Community Development Block Grant-HUD	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
March Flood (March 2001)	FEMA Individual Household Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
	Hazard Mitigation Grant Program	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester (16 projects)
February Snowstorm (Feb 17-18, 2003)	FEMA Public Assistance Project Grants	All 14 Counties
January Blizzard (January 22-23, 2005)	FEMA Public Assistance Project Grants	All 14 Counties

DISASTER NAME (DATE OF EVENT)	TYPE OF ASSISTANCE	DECLARED AREAS
Hurricane Katrina (August 29, 2005)	FEMA Public Assistance Project Grants	All 14 Counties
May Rainstorm/Flood (May 12-23, 2006)	Hazard Mitigation Grant Program	Statewide
April Nor'easter (April 15-27, 2007)	FEMA Public Assistance Project Grants	Barnstable, Berkshire, Dukes, Essex, Franklin, Hampden, Hampshire, Plymouth
	Hazard Mitigation Grant Program	Statewide
Flooding (March, 2010)	FEMA Public Assistance FEMA Individuals and Households Program SBA Loan	Bristol, Essex, Middlesex, Suffolk, Norfolk, Plymouth, Worcester
	Hazard Mitigation Grant Program	Statewide

(Source: database provided by MEMA)

FEMA Funded Mitigation Projects

Over the last 20 years the City of Chelsea has received funding from FEMA for one mitigation project under the Hazard Mitigation Grant Program. These projects totaled $879,913.75, with $754,913.75 covered by FEMA grants and $125,000 by local funding. The project is summarized in Table 3 below.

Table 3 FEMA-Funded Mitigation Projects
(Utilizing the Hazard Mitigation Grant Program)

Project Title	Scope of Work	Total Cost	Federal Funding	Local Funding
Crescent Ave. Flood Mitigation	Construct storm sewer tie-in to MWRA storm drain.	$879,913.75	$754,913.75	$125,000.00

(Source: database provided by MEMA)

Community Profile

Just 2.19 square miles, Chelsea lies next to the scenic Boston Harbor on the Mystic and Chelsea Rivers. A glorious view of Boston's nearby skyline can be enjoyed from the waterfront and from numerous hills and high points throughout the City.

Settled in 1624, Chelsea is an old City with a rich and proud history. The Industrial Revolution transformed the once pastoral suburb into a bustling manufacturing center. Chelsea flourished and its ambitious, ethnically diverse population boomed. Undaunted by a massive fire in 1908 and again in 1973, the citizens and business people of Chelsea rebuilt their City each time with a remarkable zeal and determination. Growth resumed; prosperity returned. Hundreds of thriving businesses were proud to call Chelsea their home. Although noticeable industrial, Chelsea has many other important assets -tree-lined streets with affordable, well-kept homes, ballparks, playgrounds, excellent schools and a bustling, friendly downtown, plus three National Register Districts.

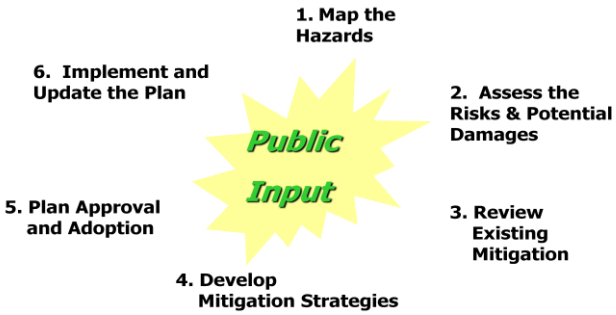
Major highways and active rail lines traverse the City; commuter bus and train services are readily available, too. Logan International Airport, the eighth busiest airport in the world, is just five minutes away. Area import/export operations are facilitated by a well-marked network of commercial roads that services the airport.

In August of 1995, the City implemented a new City Charter (the Charter), which vested policy and legislative authority in an eleven member City Council and placed strong executive and administrative powers in an appointed City Manager. The implementation of the new Charter followed four years after a State-appointed Receiver with broad administrative, fiscal and political authority administered the affairs of the City. The population according to the 2010 Census was 35,080 and there were 12,337 housing units. (MA Department of Community Development)

The City maintains a website at http://www.chelseama.gov

III. PLANNING PROCESS AND PUBLIC PARTICIPATION

MAPC employs a six step planning process based on FEMA's hazard mitigation planning program focusing on local needs and priorities but maintaining a regional perspective matched to the scale and nature of natural hazard events. Public participation is a central component of this process, providing critical information about the local occurrence of hazards while also serving as a means to build a base of support for hazard mitigation activities. This process is illustrated and described below.



1. Map the Hazards – MAPC relies on data from a number of different federal, state, and local sources in order to map the areas with the potential to experience natural hazards. This mapping represents a multi-hazard assessment of the municipality and is used as a set of base maps for the remainder of the planning process. A particularly important source of information is the knowledge drawn from local municipal staff on where natural hazard impacts have occurred, which is collected. These maps can be found in Appendix B.

2. Assess the Risks & Potential Damages – Working with local staff, critical facilities, infrastructure, vulnerable populations, and other features are mapped and contrasted with the hazard data from the first step to identify those that might represent particular vulnerabilities to these hazards. Land use data and development trends are also incorporated into this analysis. In addition, MAPC develops estimates of the potential impacts of certain hazard events on the community.

3. Review Existing Mitigation – Municipalities in the Boston Metropolitan Region have an active history in hazard mitigation as many have adopted flood plain zoning districts, wetlands protection programs, and other measures as well as enforcing the State building code, which has strong provisions related to hazard resistant building requirements. All current municipal mitigation measures must be documented.

4. Develop Mitigation Strategies – MAPC works with the local municipal staff to identify new mitigation measures, utilizing information gathered from the hazard identification, vulnerability assessments, and the community's existing mitigation

efforts to determine where additional work is necessary to reduce the potential damages from hazard events. Additional information on the development of hazard mitigation strategies can be found in Chapter VII.

5. Plan Approval & Adoption – Once a final draft of the plan is complete it is sent to MEMA for the state level review and, following that, to FEMA for approval. Typically, once FEMA has approved the plan the agency issues a conditional approval with the condition being adoption of the plan by the municipality. More information on plan adoption can be found in Chapter IX and documentation of plan adoption can be found in Appendix D.

6. Implement & Update the Plan – Implementation is the final and most important part of any planning process. Hazard Mitigation Plans must also be updated on a five year basis making preparation for the next plan update an important on-going activity. Chapter IX includes more detailed information on plan implementation.

Public participation occurred at four levels; the Metro Boston Multiple Hazard Community Planning Team (regional committee) and the Chelsea Multiple Hazard Community Planning Team (local committee). In addition, the City held three advertised meetings open to the general public to present the plan and hear citizen input. Following the presentation of the draft plan at the three public meetings, the draft was placed on the City website for ten days for public comment and questions.

Chelsea's Participation in the Regional Committee

On February 28, 2012, a letter was sent notifying the communities of the first meeting of the Metro Boston Regional Committee and requesting that the Chief Elected Official designate a minimum of two municipal employees and/or officials to represent the community. The following individuals were appointed to represent Chelsea on the regional committee:

Allan I. Alpert	Emergency Management Director
John DePriest, AICP	Planning Director

The regional committee serves as an opportunity for neighboring communities to discuss hazard mitigation issues of shared concern. The Metro Boston Regional Committee met on April 13, 2012. At that meeting, representatives from each of the nine Metro Boston communities beginning the process of reviewing and revising their 2008 Natural Hazard Mitigation Plans were re-introduced to the following items:

- The Massachusetts State Hazard Mitigation Plan and the FEMA hazard mitigation planning and grant process;
- The concept of each community engaging staff and the public to update its current Natural Hazard Mitigation Plan;
- FEMA plan overview and requirements and plan eligibility;

- Review of the overall scope of work and plan revision schedule
- Question and of Discussion of local issues, inter-community and Metro Boston Region hazard mitigation issues and how to address.

In addition, as the same group of MAPC staff is working on each community's plan, these issues of shared concern, and other issues that may arise between neighboring communities, are discussed in greater detail in local committee meetings and resulting actions reflected in the identified mitigation measures, as noted in Chapter VIII.

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 Chelsea (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 26, 2012 and April 1, 2014 MAPC conducted meetings of the Chelsea Local Committee. The meetings were organized by John DePriest, Planning Director and Maggie Schmitt, Assistant Planning Director. The purpose of the meetings was to review the existing plan and mitigation goals, including gathering information on local hazard mitigation issues, updating existing mitigation practices, and determining the status of mitigation measures from the 2008 plan. The meetings also included discussion of new or modified mitigation measures and a process for public involvement and outreach. Table 4 lists the attendees at each meeting of the team. The agenda for these meeting is included in Appendix A.

Table 4
Attendance at the Chelsea Local Committee Meetings

Name	**Representing**
April 26, 2012	
Luis Prado	Health and Human Services Director
Emily Loomis	Chelsea Neighborhood Developers, Director of Real Estate
Allan I. Alpert	Emergency Management Director
John DePriest	Director of Planning and Development
David Forbes	Community Development
Robert Houghton	Deputy Fire Chief
Joe Cooney	Building Inspector

Table 4 **Attendance at the Chelsea Local Committee Meetings**	
Andrew DeSantis	Assistant DPW Director
April 1, 2014	
Maggie Schmitt	Assistant Director of Planning and Development
Ryan Lundergan	Planning and Project Manager
John DePriest	Director of Planning and Development
John Gelcich	Planning and Land Use Administrator
Andrew DeSantis	Assistant DPW Director

Public Meetings

The plan was introduced to the public at three public meetings, both while the draft plan was being completed. The public had an opportunity to provide input to the planning process during two meetings of the Chelsea Planning Board on April 23, 2013 and April 22, 2014 both held in the Chelsea City Hall. The draft plan process was also presented for public comment at a meeting of the Chelsea Conservation Commission on June 18, 2013 at the City Hall.

Both the Planning Board and Conservation Commission meetings were advertised as public meetings. The attendance list for each meeting can be found in Table 5. In addition to staff, approximately ten people attended the Planning Board meetings and five at the Conservation Commission meeting. In addition, the plan was made available on the City's website for public review for ten days. MAPC staff announced at both the Planning Board and Conservation Commission public meetings that the draft plan would be available for comments and questions for a ten day posting period and encouraged Board members and public attendees to read the plan and submit comments.

Table 5
Attendance at Public Meetings

Name	**Representing**
Planning Board Public Meeting, April 22, 2014	
Shuvam Bhaumik	Chelsea Planning Board
Paul Nachtwey	Chelsea Planning Board
Patricia Ridge	Chelsea Planning Board
Tuck Willis	Chelsea Planning Board
Henry Wilson	Chelsea Planning Board
Sam Cleaves	MAPC
Maggie Schmitt, John Gelcich	Chelsea Planning Staff

Members of the public	
Planning Board Public Meeting, April 23, 2013	
Paul Nachtwey	
Patricia Ridge	Chelsea Planning Board
Tuck Willis	Chelsea Planning Board
Henry Wilson	Chelsea Planning Board
Sam Cleaves	Chelsea Planning Board
Maggie Schmitt	Chelsea Planning Board
Members of the public	MAPC
	Chelsea Planning Staff
Conservation Commission Public Meeting, April 16, 2013	
Stephen Sarikas	Chelsea Conservation Commission
Judith Dyer	Chelsea Conservation Commission
Alan Orloff	Chelsea Conservation Commission
Doyle Tobin	Chelsea Conservation Commission
Sam Cleaves, MAPC	MAPC
John DePriest	Chelsea Planning Staff
Members of the public	

Other Opportunities for Public Involvement

The draft plan was posted on the City's website for 10 days for public comment. The posting was announced at both the Planning Board and Conservation Committee meetings. MAPC suggested that the Chelsea NHM Team identify and contact local organizations and individuals that they feel could provide input and let them know that the draft plan was available on the City website for comments and questions.

IV. RISK ASSESSMENT

The risk assessment analyzes the potential natural hazards that could occur within the City of Chelsea as well as the relationship between those hazards and current land uses, potential future development, and critical infrastructure. This section also includes a vulnerability assessment that estimates the potential damages that could result from certain large scale natural hazard events.

Update Process

In order to update Chelsea's risk assessment, MAPC gathered the most recently available hazard and land use data and met with City staff to identify changes in local hazard areas and development trends. City staff reviewed critical infrastructure with MAPC staff in order to create an up-to-date list. MAPC also used the most recently available version of HAZUS (described below) and assessed the potential impacts of flooding using the latest data.

Overview of Hazards and Impacts

The 2013 Massachusetts Hazard Mitigation 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: flooding, dam failure, wind including hurricanes and tropical storms, tornados, and Nor'easters, severe winter weather including snow and blizzards, geologic including earthquakes and landslides, and other natural hazards including Wildland/brush fires, urban fires, drought, extreme temperatures and tsunamis. Previous state and federal disaster declarations since 1991 are summarized in Table 1.

Table 6 summarizes the hazard risks for Chelsea. This evaluation takes into account the frequency of the hazard, historical records, and variations in land use. This analysis is based on the vulnerability assessment in the Commonwealth of Massachusetts State Hazard Mitigation Plan, 2013. The statewide assessment was modified to reflect local conditions in Chelsea using the definitions for hazard frequency and severity listed below Table 6.

Table 6
Hazard Risks Summary

Hazard	Frequency in State	Likely Severity in State	Likely Severity in Chelsea
Flooding			
Inland/Riverine	High	Serious	Serious
Coastal Hazards	High	Serious	Serious
Urban Flooding	High	Minor	Minor
Dam Failure	Very Low	Extensive	N/A
Wind			
Hurricanes/Tropical Storms	Medium	Serious	Serious
Tornados	Medium	Serious	Serious
Nor'easter	High	Minor	Minor
Severe Winter Weather			
Snow and Blizzard	High	Minor	Minor
Geologic			
Earthquakes	Very Low	Serious	Same as state
Landslides	Low	Minor	Same as state
Other Natural Hazards			
Wildland Fires	Medium	Minor	Same as state
Major Urban Fires	Low	Minor	Serious
Extreme Temperature	Medium	Minor	Minor
Tsunami	Very low	Extensive	Extensive

Source, Massachusetts State Hazard Mitigation Plan, 2013, modified for Chelsea

Flooding Related Hazards

Flooding was the most prevalent serious natural hazard identified by local officials in Chelsea. Sea level rise as well as more intense storms brought on by global climate change has the potential to increase the frequency and extent of flooding from all of these causes.

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 Chelsea. Flooding is caused by hurricanes, nor'easters, severe rainstorms and thunderstorms and is often worsened by coastal storm surges and high tides. The majority of flooding in the City is urban flooding caused by deficiencies in the drainage system rather than location within the flood plain.

Overview of City-Wide Flooding

Chelsea is subject to three kinds of flooding: *coastal flooding* where wind and tide leads to flooding along tidal waterways: *inland/riverine flooding* where the rate of precipitation and/or amount of stormwater runoff overwhelms the capacity of natural or structured drainage systems causing overflows; *urban flooding* in which precipitation causes the water table to rise and leads to flooding of low-lying areas such as streets and underpasses. These types of flooding are often combined as storm events lead to large amounts of draining stormwater, which is blocked by the inland push of wind and tide driven water.

The City is entirely within the Mystic River watershed but is further divided into two sub-basins. The eastern half of Chelsea drains to the Chelsea Creek Sub-basin, with the western half of the City draining to the Island End River Sub-basin. All of these waterways have the potential to flood sections of the City. In areas, years of shoreline modifications, land reclamation, stream piping, and development have severely altered the natural flow of water in Chelsea. Stormwater drainage from developed areas occurs primarily through the manmade system of storm drains.

Coastal Hazards

Coastal flooding is associated with severe coastal storms that, through the combination of winds and tides, drive tidal waters to higher levels than normally experienced, leading to the inundation of low lying land areas and the overtopping of sea walls. Also, the high tide and storm surge can limit the ability of stormwater to drain from inland waterways. Coastal flood and storm surge records for Suffolk County are shown in Table 7 below. Some of Chelsea's flooding is directly related to this type of flooding including the Willow Street and Eastern Avenue sites identified in this plan.

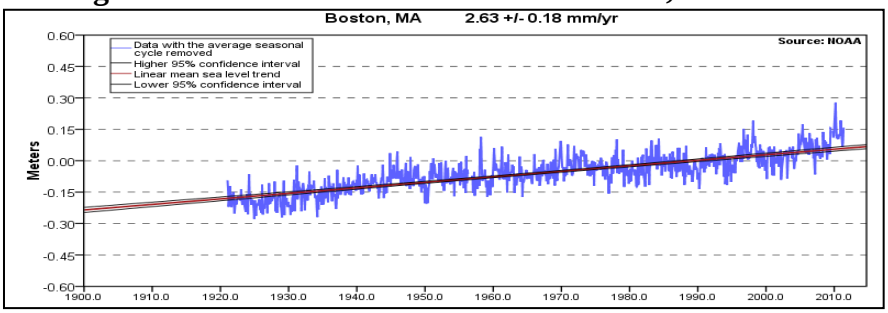
Table 7 - Coastal Flood/Storm Surge Records

Date	Type	Deaths	Injuries	Property Damage
12/13/1993	Coastal Flood	0	0	50K
12/16/1993	Coastal Flood	0	0	0
12/20/1995	Coastal Flood	0	0	0
3/5/2001	Coastal Flood	0	0	15.0M
11/6/2002	Storm Surge	0	0	10K
1/4/2003	Storm Surge	0	0	550K
12/6/2003	Storm Surge	0	0	50K
1/23/2005	Storm Surge	0	0	825K
5/24/2005	Storm Surge	0	0	95K
1/31/2006	Coastal Flood	0	0	155K
2/12/2006	Storm Surge/Tide	0	0	80K
4/15/2007	Coastal Flood	0	0	5K
4/16/2007	Coastal Flood	0	0	5K
4/17/2007	Coastal Flood	0	0	20K
10/18/2009	Coastal Flood	0	0	0
1/2/2010	Coastal Flood	0	0	0

3/14/2010	Coastal Flood	0	0	0
12/27/2010	Coastal Flood	0	0	50K

Climate change impacts: Sea-level rise and storm surges
A higher sea level increases the frequency and extent of coastal flooding. In the past 100 years, the relative change in sea level in Boston Harbor, located adjacent to Chelsea, has been a rise of about one foot (Figure 1). The change is relative, because it consists of two components: a rise in the absolute sea level and a sinking of the land. In the past 100 years, these two factors have been roughly equal, and, for the most part, represent long-term processes that have been underway since the end of the last Ice Age, approximately 14,000 years ago.

Figure 1 – Boston/Chelsea Sea Level Trends, 1920-2011



Source: National Oceanic and Atmospheric Administration (NOAA)

Climate change is accelerating the rate of global (absolute) sea-level rise (SLR) primarily by warming the oceans, causing the water already in them to expand, and by warming the land and air, causing ice on land (glaciers, ice sheets) to melt and flow into the ocean. A recent report as part of the U.S. National Climate Assessment states that there is "very high confidence (>9 in 10 chance) that global mean sea level will rise at least 0.2 meters (8 inches) and no more than 2.0 meters (6.6 feet) by 2100."[1] The low end of this range represents a continuation of the current trend, which has a relatively small contribution from melting ice. The higher end includes greater contributions from melting ice, for which there is an increasing amount of data, though still not enough to resolve some uncertainties. The report presents four scenarios of sea-level rise that could be used depending on the time frame of projects and the level of risk that communities are willing to accept. Whatever the actual amount of sea-level rise by the end of the century, the oceans will likely continue to rise after that.

Table 8- Global Sea-Level Rise Scenarios[2]

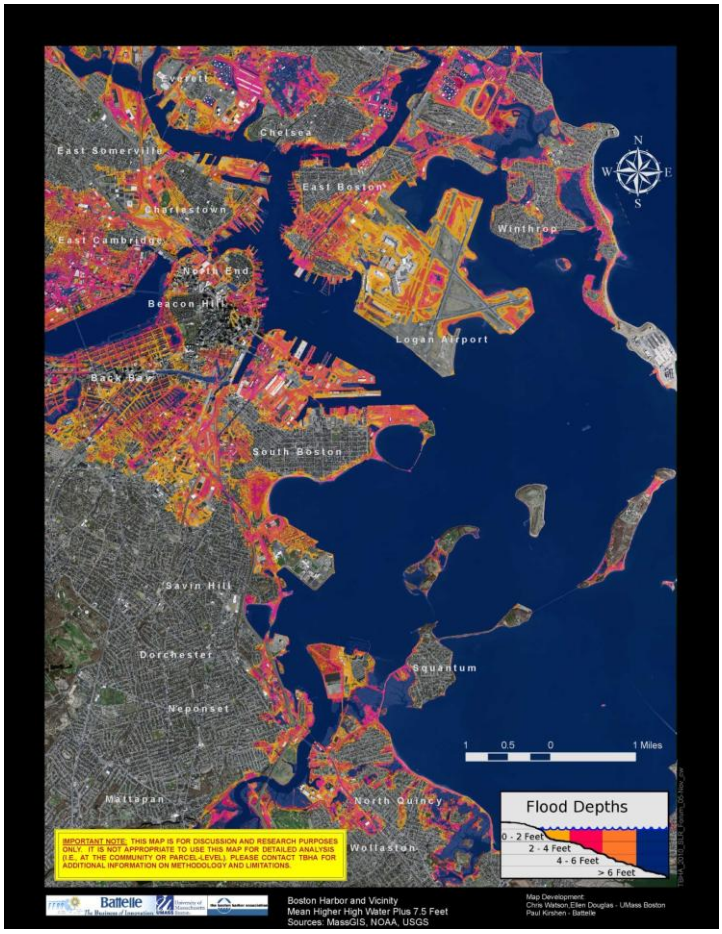
Scenario	SLR by 2100 (m)*	SLR by 2100 (ft)*
Highest	2.0	6.6
Intermediate-High	1.2	3.9
Intermediate-Low	0.5	1.6
Lowest	0.2	0.7

* Using mean sea level in 1992 as a starting point.

[1] Parris, Adam, et al. *Global Sea Level Rise Scenarios for the United States National Climate Assessment*, NOAA Technical Report OAR CPO-1, National Oceanic and Atmospheric Administration, December 2012.
[2] ibid.

In addition to the rise of the global average, changes to the distribution of water around the globe will vary the amount of absolute sea-level rise that different localities experience. Changes in the temperature and salinity of water will affect ocean currents, and the melting of ice will alter the Earth's gravitational field. Both of these mechanisms could cause Boston (and the Northeast coast overall) to see sea-level rise that, in the higher scenarios, is more than a foot greater than the global average. Early evidence of the predicted ocean-current effect was published in June 2012.[3]

Figure 2 - Projected Flooding of Boston Harbor and vicinity with water at 7.5 feet above mean higher high water[4]



Source: Chris Watson and Ellen Douglas, U. Mass Boston, and Paul Kirshen, Battelle Laboratories

With average global sea-level rise approaching four feet under an intermediate-high scenario, another foot or so from local sea-level effects, and another half-foot of relative sea-level rise due to continuing land subsidence, the Boston and surrounding coastal

[3] Sallenger Jr, A. , K. Doran, P. Howd, "Hotspot of accelerated sea-level rise on the Atlantic coast of North America," Nature Climate Change (2012) 2, 884–888, doi:10.1038/nclimate159724, June 2012. See also, Parris et al., supra., for a summary of all contributing factors.

[4] Chris Watson, Ellen Douglas, and Paul Kirshen, The Boston Harbor Association, http://tbha.org/boston-harbor-sea-level-rise-maps, 2010.

communities may need to evaluate the effects of five feet or more of sea-level rise, compared to 1990 levels, by the end of the century.
Higher sea levels mean that, first, any given coastal storm will cause greater flooding than it would have at a lower sea level, and, second, that smaller, more frequent storms will cause the same amount of flooding that larger, less frequent storms used to (these are two different ways at looking at the same phenomenon.) Figure 4 shows an estimate of the amount of flooding that would be caused by a five-foot storm surge hitting Boston and adjacent communities like Chelsea at high tide on top of 2.5-feet of sea-level rise (total water level, 7.5 feet above current mean higher high water). The area of flooding is much greater than today's 100-year floodplain, its rough, contemporary equivalent. Conversely, the flooding caused by the current 100-year storm—with a one-percent chance of occurring in a given year—will have about a 30-percent annual chance of occurring after one foot of sea-level rise.[5]

Inland/Riverine and Urban Flooding

Inland/riverine flooding occurs when water overflows the banks of an existing stream or river. These flood events can cause serious damage to structures and property and can threaten the lives and safety of area residents. Large amounts of impervious area in the City's watershed increase the frequency and severity of flooding because storm water is prevented from absorbing into the ground and flows overland directly into the waterway, increasing the volume of flow. This type of flooding most often occurs within the mapped floodplain areas.

Based on the current FEMA Flood Insurance Rate Maps (FIRM, 2010) available for Boston, the following areas are in 100-year flood hazard zones, which FEMA defines as an area with a 1% annual chance of flooding.

- The low lying wetland areas bordering the upper Chelsea Creek area, particularly in the Clinton Street and Garfield Avenue neighborhoods
- Land along Chelsea Creek parallel to Crescent Avenue, Eastern Avenue and Marginal Street
- Along the Mystic River adjacent to Beacham Street

These are designated flood hazard areas in Chelsea, primarily along Chelsea Creek a section of the Mystic River. This includes areas depicted on Map 3 as being in the 100 or 500-year flood zones.

Based on data from the National Weather Service, National Climatic Data Center, FEMA disaster declarations, the Suffolk County FIS, and local data sources, historic flood events from 1950 through 2011 for Suffolk County, which includes Chelsea, were compiled and are summarized in Table 9.

[5] Ellen Douglas, personal communication, 2008.

Table 9- Riverine Flood Events*

Location	Date	Property Damage
Suffolk County	5/13/2006	$0
Suffolk County	3/14/2010	$10.7M
Suffolk County	8/25/2010	$0

**excludes events classified as Coastal Flood or Urban/Small Stream Flood* Source: Boston HIRA

The Floods of March 2010

The most severe recent flooding occurred during the major storm of March 2010, when the Suffolk County broke the record of 11 inches of rain set in 1953. During the month of March of 2010, a new total of 14.83 inches of rainfall accumulation was officially recorded by the National Weather Service (NWS).

The weather pattern that caused these floods consisted of early springtime prevailing westerly winds that moved three successive storms, combined with tropical moisture from the Gulf of Mexico, across New England. Torrential rain falls lasting ten days caused March 2010 to be the wettest month on record for Suffolk County and Chelsea. Historically, NWS determined that March 2010 was the fourth wettest of any month since 1872.

Potential Flood Hazard Areas

The frequency and locations of flood hazard events in Chelsea can be estimated based on a number of sources of information. One of these is the National Flood Insurance Rate Maps. The FIRM flood zones are shown on Map 3. A new series of updated FIRM maps has recently been prepared by FEMA, and are expected to be released in 2014/2015. The new maps may result in some areas being designated in flood hazard zones that have not previously been so designated.

Another indicator of flood risk is the number of repetitive loss structures. As defined by the Community Rating System (CRS) of the National Flood Insurance Program (NFIP), a repetitive loss property is any property for 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.

There is one repetitive loss property in Chelsea, the same number as in 2008. This includes one 2-4 family home. From 1978 to 2014, this one property experienced a total of 3 losses, resulting in $25,558.53 in claims for both building losses and contents losses. Table 10 shows the breakdown of structure type by number and amount of losses over this period.

Table 10
Repetitive Loss Properties Summary

	Number of Claims	Building Losses	Contents Losses	Total Losses Paid
2-4 Family	3	$14,561.03	$10,997.50	$25,558.53
TOTAL	**3**	**$14,561.03**	**$10,997.50**	**$25,558.53**

Source: Federal Emergency Management Agency, National Flood Insurance Program

Another source of information on flood risk is discussion with local officials and residents. The Locally Identified Area of Flooding described below were identified by City staff as areas where flooding is known to occur. This area does not necessarily coincide with the flood zones from the FIRM maps. It may be an area that floods 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.

Locally Identified Areas of Flooding

1. *Vale Street neighborhood*: flooding due to insufficient drain line receiving storm water from Everett and ultimately draining to clogged Island End culvert- High priority project.

2. *Willow Street between Congress and Maverick Streets*: This is a low elevation area where fresh water runoff is unable to drain due to high tide and surge blocking the storm drain. This area needs a new pump station and has an estimated cost of $2-3 million dollars. The flooding does not impact residential properties but may affect redevelopment of the vacant 30,000 SF abandoned Nancy Sales building in the area.

3. *Eastern Avenue at Webster Street neighborhood*: A low elevation area that floods when high tides combine with high precipitation events to back up storm line drainage. Mitigation may include reducing stormwater runoff using Green Infrastructure in upper watershed/drainage areas to reduce flows to the site, in addition to another pump station for the area. Total cost anticipated to be $5-6 million, to be paid by Chelsea.

4. *Drainage ditch next to Chelsea Housing Authority*: Clogged drainage ditch floods during high precipitation events. This ditch is owned and maintained by MA DOT, is located in Revere but causes localized flooding in Chelsea—regional problem

Dam Failure

Dam failure can occur as a result of structural failure, independent of a hazard event, or as the result of the impacts of a hazard event such as flooding associated with storms or an earthquake. In the event of a dam failure, the number of fatalities and amount of property damages depends on the amount of warning provided to the population and the

number of people and value of property in the path of the dam's floodwaters. Dam failure in general is infrequent but has the potential for severe impacts.

There are no dams located within the City of Chelsea. Because there are no dams located within Chelsea, the City did not include mitigation actions in its 2008 plan.

Wind Related Hazards

Wind related hazards include hurricanes and tornadoes as well as high winds during severe rainstorms and thunderstorms. Wind-related hazards include hurricanes and tornados as well as high winds during severe rainstorms and thunderstorms. The typical wind speed in the Boston area ranges from around 11 miles per hour to 14 over the course of the year, but independent of storm events, gusts of up to 40 mph can occur. As with many communities tree loss and falling limbs, including downed power lines, are a serious hazard in Chelsea.

Hurricanes

The region has been impacted by hurricanes throughout its history, starting with the Great Colonial Hurricane of 1635. Between 1858 and 2000, Massachusetts has experienced approximately 32 tropical storms, nine Category 1 hurricanes, five Category 2 hurricanes, and two Category 3 hurricanes. Hurricanes that have occurred in the region since 1938 include the following listed in Table 11:

Table 11. Hurricane Records for Eastern Massachusetts

Hurricane Event	Date
Great New England Hurricane*	September 21, 1938
Great Atlantic Hurricane*	September 14-15, 1944
Hurricane Doug	September 11-12, 1950
Hurricane Carol*	August 31, 1954
Hurricane Edna*	September 11, 1954
Hurricane Diane	August 17-19, 1955
Hurricane Donna	September 12, 1960
Hurricane Gloria	September 27, 1985
Hurricane Bob	August 19, 1991
Hurricane Earl	September 4, 2010
Tropical Storm Irene	August 28, 2011
Hurricane Sandy	October 29-30, 2012

*Category 3 Source: National Oceanic and Atmospheric Administration (NOAA)

There have been no recorded tropical storms or hurricanes that have tracked through Chelsea. A hurricane or tropical storm track is the line that delineates the path of the eye of the hurricane or storm. The City also feels the impacts of the wind and rain of other coastal storms and hurricanes, regardless of whether the track passes through the City. Information on hurricanes is shown on Map 8 in Appendix B.

There have been no significant changes to address hurricane emergency response since 2008. The two major mitigation measures in place are adherence to the Massachusetts State Building Code and the City's Comprehensive Emergency Management Plan which addresses hurricane hazards although primarily from a response perspective.

Hurricane intensity is measured according to the Saffir/Simpson scale, which categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential. These are combined to estimate potential damage. The following gives an overview of the wind speeds, surges, and range of damage caused by different hurricane categories:

Scale No. (Category)	Winds(mph) Storm	Surge (ft)	Potential Damage
1	74 – 95	4 - 5	Minimal
2	96 – 110	6 - 8	Moderate
3	111 – 130	9 - 12	Extensive
4	131 – 155	13 - 18	Extreme
5	> 155	>18	Catastrophic

Source: NOAA

Tornados

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

Tornados tend to be uncommon in eastern Massachusetts and there have been no recorded tornadoes in the City of Chelsea. On average, six tornados touch down somewhere in the northeast region every year. Tornados are most common in the summer, June through August, and most form in the afternoon or evening. Tornados are associated with strong thunderstorms.

Between 1950 and 2011, no tornados were recorded in Suffolk County; however, 101 tornados occurred within 50 miles of central Boston. Two of these were rated as an F3 and were within 36 miles of central Boston. A 1971 F1 tornado in the Town of Newton injured six people and caused one death (HIRA). The strongest tornado in Massachusetts history was the Worcester Tornado in 1953 (NESEC). A tornado caused significant damage in Springfield, resulting in 4 deaths in June of 2011.

On July 18, 2012 the National Weather Service in Taunton issued a Tornado Warning for Suffolk and Essex Counties. At 2:09 PM a waterspout was observed in Boston Harbor from Logan International Airport.

There have been no changes since the 2008 NHM Plan to address tornadoes in Chelsea beyond maintaining emergency shelter in the event that they were needed.

The City has adopted the Massachusetts State Building Code. The code's provisions are the most cost-effective mitigation measure against tornados given the extremely low probability of occurrence. The City does maintain American Red Cross certified emergency shelters at the Chelsea Senior High School, Williams Middle School, and the Mary C. Burke School Complex if they were needed in case of evacuations due to tornadoes.

If a tornado were to occur in Chelsea, damages would be most likely be high due to the prevalence of older construction and the density of development.

Tornado damage severity is measured by the Fujita Tornado Scale, in which wind speed is not measured directly but rather estimated from the amount of damage. As of February 01, 2007, the National Weather Service began rating tornados using the Enhanced Fujita-scale (EF-scale), which allows surveyors to create more precise assessments of tornado severity. The EF-scale is summarized below:

Fujita Scale			Derived		Operational EF Scale	
F Number	Fastest ¼ mile (mph)	3-second gust (mph)	EF Number	3-second gust (mph)	EF Number	3-second gusts (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over -200

Nor'easters

A classic nor'easter is a strong low pressure system that forms over land or is positioned just off the coastal waters of New England. Nor'easters are relatively common in the winter months in New England, occurring one to two times a year, and are notorious for producing heavy snow, rain and tremendous waves that crash onto Atlantic beaches causing beach erosion and structural damage. The characteristics of a nor'easter produce strong northeasterly winds blowing in from the ocean ahead of the storm and over the coastal areas. These strong northeast winds typically cause coastal flooding, coastal erosion and gale to hurricane force winds. The storm radius of a nor'easter can be as

much as 1,000 miles (see Figure 3) and these storms feature sustained winds of 10 to 40 mph with gusts of up to 70 mph.

In Massachusetts, northeast coastal storms known as nor'easters occur 1-2 times per year, typically in January or February. Winter storms are a combination hazard because they often involve wind, ice and heavy snow fall. The impact of heavy snowfall is to impair the flow of vehicles needed for day-to-day commuting, local businesses and public safety response. The average annual snowfall for the City is 48.1 – 72.0 inches.

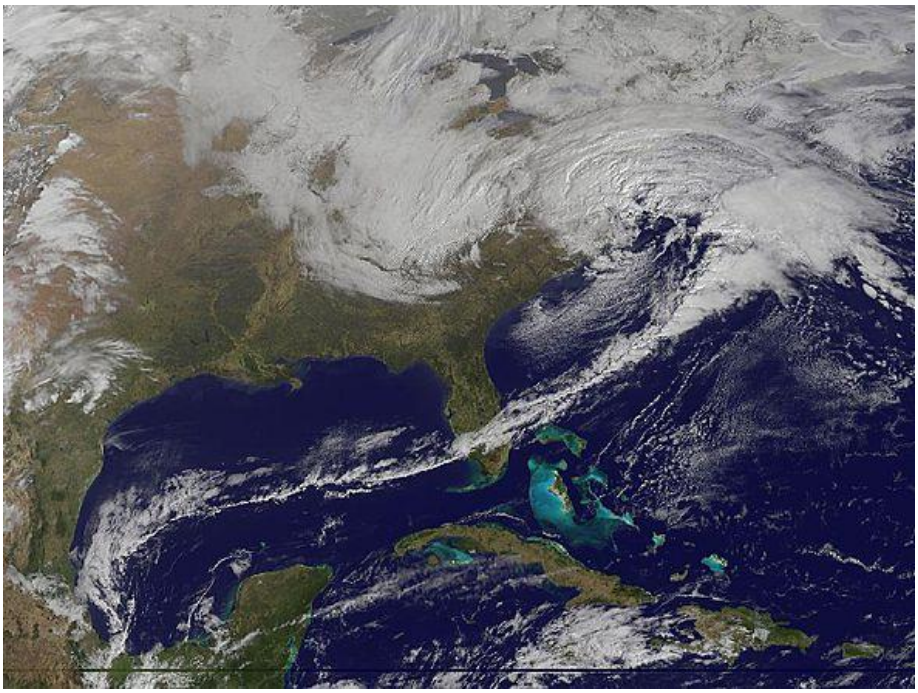


Figure 3-Source: The Geostationary Operational Environmental Satellite Program (GOES), a joint effort of NASA and NOAA..

The Blizzard of February 2013

On Friday, February 8, 2013, two major storm systems combined off the North Atlantic coast forming severe Nor'east blizzard conditions for the Boston area and Chelsea. The low pressure and central pressure systems created an intense winter Nor'east blizzard cyclone of historic proportions with a signature classic shaped comma being well defined. Very intense convective snow fell north of the low pressure system creating a 48 hour snow storm. The City of Chelsea was under a Blizzard Warning. Along the coast, the City of Chelsea was under a Coastal Flood Warning a Hurricane Force Wind Watch was in effect for coastal waters of Eastern Massachusetts. The strongest winds were off shore. The City of Chelsea experienced a gust of 76 mph.

The Nor'east Coastal Snow storm of March 2013

On March 6, 2013, a slow moving strong mid-Atlantic storm developed into a very powerful coastal nor'easter located 323 miles off of Nantucket. The City of Chelsea was

under a Winter Storm Warning, Coastal Flood Warning, and Wind Advisory. The nor'easter stalled off the coast which significantly increased snow fall amounts for the Suffolk County area. The snowfall recorded at Logan Airport was 13.1 inches; Brighton at 15.0; Jamaica Plain at 18.0 and West Roxbury at 14.8. Sustained 38 mph winds were recorded at Boston ASOS Logan Airport with peak winds gusts of 48 mph. The impact of extremely long duration and onshore northeast winds contributed to coastal inundation causing DCR to close coastal roadways and Morrissey Boulevard during the astronomical high tide cycles.

The most significant winter storm in recent history was the "Blizzard of 1978," which resulted in over 3 feet of snowfall and multiple day closures of roadways, businesses, and schools. Historically, severe winter storms have occurred in the following years:

Blizzard of 1978	February 1978
Blizzard	March 1993
Blizzard	January 1996
Severe Snow Storm	March 2001
Severe Snow Storm	December 2003
Severe Snow Storm	January 2005
Severe Snow Storm	April, 2007
Severe Snow Storm	December 2010
Severe Snow Storm	January 2011
Blizzard of 2013	February 2013

The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service (Kocin and Uccellini, 2004) characterizes and ranks high impact northeast snowstorms. These storms have large areas of 10 inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers. The NESIS categories are summarized below:

Severe Winter Weather

Winter snow storms and extended cold weather are frequent hazards in New England. The impact of heavy snowfall is to impair the flow of vehicles needed for day-to-day commuting, local businesses and public safety response. In addition, infrastructure, including critical utilities, may be impacted by winter storms and power outages and hazards to navigation and aviation can occur. During winter storms, there is an increased risk of fire due to loss of electricity and the associated use of portable heaters, gas stoves, candles, and other flammable sources of heat and light. Fire during winter storms presents a great danger because water supplies may freeze and it may be difficult for

firefighting apparatus to get to a fire. The added impacts from heavy snow and ice can affect transportation infrastructure and negatively impact both the local and regional economies.

Automobile and other transportation accidents are the leading cause of death during winter storms with exhaustion caused by over-exertion as the second leading cause.

Chelsea has experienced several record breaking storms since the 1978 storm and has developed training, techniques and practices to efficiently deal with these events.

Category	NESIS	Value Description
1	1—2.499	Notable
2	2.5—3.99	Significant
3	4—5.99	Major
4	6—9.99	Crippling
5	10.0+	Extreme

Source: Massachusetts State Hazard Mitigation Plan, 2013

Since 1958 Massachusetts has experienced two Category 5 Extreme snow storms, nine Category 4 (Crippling) storms, and 13 Category 3 (Major) snow storms.

Because a major feature of winter storms is the tendency for higher tides with associated flooding, the same mitigation measures in place for flooding are all important for mitigating the impacts of winter storms. However, the rapid melting of snow after major storms, combined with rainfall, is more of a common flooding threat.

The DPW works to clear roads as requested by emergency service providers and carries on general snow removal operations. MA Department of Transportation removes snow from Routes 16 and 1A and private snow removal is done at the Admiral's Hill condominiums. Since 2008, the City has also reduced its use of sand, opting for more salt, which reduces siltation into local water resources and reduces the sand which must be swept from the streets once winter has passed.

The City continues to ban on-street parking at nights during snow storm events and during snow removal to ensure that streets can be plowed and public safety vehicle access is maximized. Coordination with state agencies on plowing and snow removal is an ongoing issue with the City and future mitigation strategies are offered within the NHM plan.

Information on winter storm related hazards can be found on Map 6 in Appendix B.

Geologic Hazards

Earthquakes

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.

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 University).

There have been no recorded earthquakes in Chelsea. Information on earthquakes is included on Map 4 in Appendix B. Historical records of some of the more significant earthquakes in the region are shown in Table 12.

Table 12
Historical Earthquakes in Massachusetts or Surrounding Area, 1727-2012

Location	Date	Magnitude*
MA - Cape Ann	11/10/1727	5
MA - Cape Ann	12/29/1727	NA
MA – Cape Ann	2/10/1728	NA
MA – Cape Ann	3/30/1729	NA
MA – Cape Ann	12/9/1729	NA
MA – Cape Ann	2/20/1730	NA
MA – Cape Ann	3/9/1730	NA
MA - Boston	6/24/1741	NA
MA - Cape Ann	6/14/1744	4.7
MA - Salem	7/1/1744	NA
MA - Off Cape Ann	11/18/1755	6
MA – Off Cape Cod	11/23/1755	NA
MA - Boston	3/12/1761	4.6
MA - Off Cape Cod	2/2/1766	NA
MA - Offshore	1/2/1785	5.4
MA – Wareham/Taunton	12/25/1800	NA
MA - Woburn	10/5/1817	4.3
MA - Marblehead	8/25/1846	4.3

Table 12
Historical Earthquakes in Massachusetts or Surrounding Area, 1727-2012

Location	Date	Magnitude*
MA - Brewster	8/8/1847	4.2
MA - Boxford	5/12/1880	NA
MA - Newbury	11/7/1907	NA
MA - Wareham	4/25/1924	NA
MA – Cape Ann	1/7/1925	4
MA – Nantucket	10/25/1965	NA
MA – Boston	12/27/74	2.3
VA –Mineral	8/23/11	5.8
MA - Nantucket	4/12/12	4.5
ME - Hollis	10/17/12	4.0

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

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

Source: Nevada Seismological Library (NSL), 2005

The City has several privately owned, un-reinforced, older masonry buildings which would be vulnerable in a severe earthquake. All schools however, with the exception of the older Clarke Avenue School, are of modern, earthquake resistant construction. City Hall, an older brick structure, is the other primary City-owned building that would be at risk during an earthquake.

The City enforces the MA State Building Code which is adequate in ensuring that new construction meets seismic standards. Chelsea also has a mobile command post that includes a 5000 Kw generator, 3 portable 3,000 Kw generators, and two mobile light towers to assist with emergency power loss response in case of an earthquake. City officials feel that it would be useful to map the Cape Ann fault to increase public awareness of that significant earthquakes have occurred in the North Shore area historically, that the City could be subject to earthquake damage and that it should be included in capital facilities planning.

There have been no significant mitigation measures to address earthquake hazards since the 2008 Hazard Mitigation Plan, primarily because of the lower historical risk of a serious earthquake within the eastern Massachusetts region and because most mitigation resources are directed to flooding and coastal storm related issues.

Landslides

Landslides can result from human activities that destabilize an area or can occur as a secondary impact from another natural hazard such as flooding. In addition to structural damage to buildings and the blockage of transportation corridors, landslides can lead to sedimentation of water bodies.

The entire City has been classified as having a moderate risk for landslides. There have been no known landslides in Chelsea. The Chelsea Hazard Mitigation Community Planning Team did not indicate that landslides pose a significant risk to Chelsea and did not take actions regarding this hazard in the 2008 Plan.

Other Natural Hazards

Fire Related Hazards

Wildfires

A wildfire is any uncontrolled fire that occurs in a suburban or a wilderness area. A wildfire differs greatly from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to unexpectedly change direction, and its ability to jump gaps such as roads, rivers and fire breaks. Wildfire season can begin in March and usually ends in late November. The majority of wildfires typically occur in April and May, when the majority of vegetation is void of any appreciable moisture, making them highly flammable. Once "green-up" takes place in late May to early June, the fire danger usually is reduced somewhat .Protecting structures from fire poses special problems, and can stretch firefighting resources to the limit. If heavy rains follow a fire, other natural disasters can occur, including landslides, mudflows, and floods. If the wild fire destroys the ground cover, then erosion becomes one of several potential problems. There are three different classes of wild fires:

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

The Chelsea Fire Department responds to 20-25 brush, and grass fires of varying sizes annually. The City considers all fires to be a serious natural hazard. No outdoor burning is permitted in Chelsea. The most common cause of these infrequent fires has been

vandalism igniting spartina marsh grasses and phragmites. Since 2008, the City has continued to respond to wildland fires in the same manner as structural urban fires, as they die in 2008. The following areas of City were identified as having the highest potential for brush fires. The numbers correspond to the numbers on Map 8, "Hazard Areas":

5. Mill Creek area- phragmites

6. Island End Road area- phragmites

7. Locke Street area- phragmites

8. Prattville- phragmites near housing project

9. Library and Willow Street area

10. Northeastern Fuel Tank site area- phragmites

11. Mill Creek Condo area- open area with brush

Major Urban Fires

A major urban fire or conflagration is a large destructive, often uncontrollable, fire that spreads substantial destruction. Although fires can start from numerous causes, major fires are often the result of other hazards, such as storms, earthquakes, gas leaks, transportation accidents, hazardous material spills, criminal activity (arson), or terrorism. Small structural fires, which occur more frequently, can result from mundane events such as cooking, smoking, equipment/appliance malfunctions, etc.

Nationally, the leading causes of urban fires are arson, open flames, and cooking. The leading causes of fire deaths are smoking, arson, and heating, with urban fires causing the most fire deaths and injuries. Between 70 and 80 percent of deaths result from residential fires. People under the age of 5 and over the age of 55 have a much higher death rate than the average population, accounting for more than one-third of all deaths nationally.

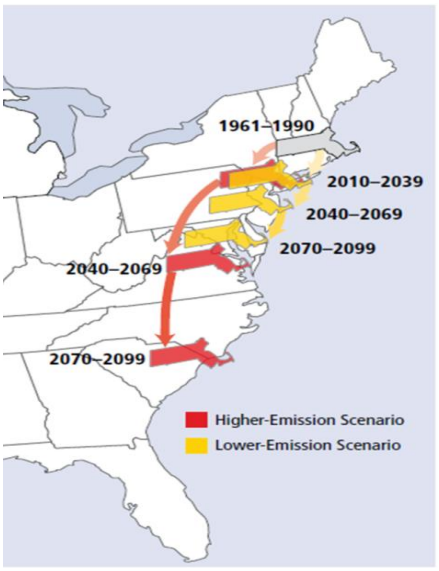
Over the past several years, structure fires account for the majority of fire deaths, injuries, and property loss within the Commonwealth. In Massachusetts, 83 percent of building fires and 69 percent of fire deaths in 2010 took place in residential occupancies, with more fire deaths occurring in one-and two-family homes than in all other residential occupancies combined. Cooking and heating were the leading cause of fires in one-and two-family homes. Cooking was the leading cause of fires overall in every residential occupancy. Though frequent, cooking fires are not among the most deadly; in 2010, the improper or unsafe disposal of smoking materials was the leading cause (40 percent) of residential fire deaths. In 2011, electrical fires were the leading cause of residential fire deaths. This was the first time since the Massachusetts Division of Fire Safety started keeping records that smoking was not the leading cause of home fire deaths.

Chelsea averaged about 300 urban structural fires annually over the last five years with the most common type being residential building fires. Included within that total is an average of ten fires per year caused by arson. Within the last five years, there has been one resident fatality and three injuries due to urban fires. Urban fires and their prevention are a high priority for the City. The leading causes of urban structural fires include cigarettes, candles, incense and space heaters.

Extreme Temperature

Recent temperature trends suggest greater potential impacts to come due to climate change. In the report "Confronting Climate Change in the U.S. Northeast," (2007), the Union of Concerned Scientists presented temperature projections to 2099 based on two scenarios, one with lower carbon dioxide emissions, and the other with high emissions.

Figure 4 - Extreme Temperature Scenarios



Between 1961 and 1990, Boston and surrounding communities like Chelsea experienced an average of 11 days per year over 90°F. That could triple to 30 days per year by 2095 under the low emissions scenario, and increase to 60 days per year under the high emissions scenario. Days over 100°F could increase from the current average of one day per year to 6 days with low emissions or 24 days with high emissions By 2099, Massachusetts could have a climate similar to Maryland's under the low emissions scenario, and similar to the Carolinas' with high emissions (Figure 4, Source: Union of Concerned Scientists). Furthermore, the number of days with poor air quality could quadruple in the metro Boston area by the end of the 21st century under higher emissions scenario, or increase by half under the lower emissions scenario. This would have significant impacts on public health, particularly for those individuals with asthma and other respiratory system conditions, which typically affect the young and the old more severely. Extreme temperature was added as natural hazard by the state in 2013. Chelsea does maintain a web page with links to the US Center for Disease Control to how to deal with extreme temperatures.

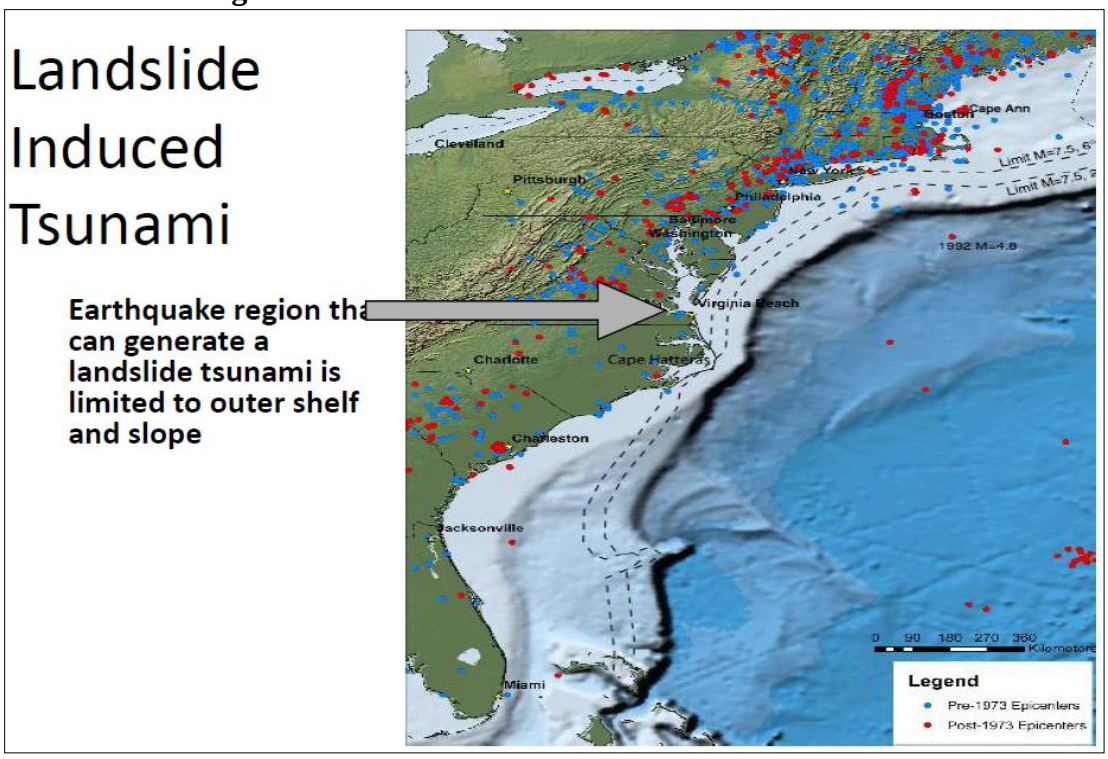
Atlantic Based Tsunami

The Federal Emergency Management Agency defines tsunami as a series of enormous seismic sea waves created by an underwater disturbance caused by geologic activity in the form of earthquakes, volcanic eruptions, underwater landslides or meteorites striking the Earth. A tsunami can move hundreds of miles per hour in the open ocean and smash into land with waves as high as 100 feet or more. Earthquake induced movement of the ocean floor most often generates tsunamis. If a major earthquake or landslide occurs close to shore, the first wave in a series could reach the shore in a few minutes, even before a warning is issued. Coasts that are at greater risk are areas less than 25 feet above sea level and within a mile of the shoreline.

Tsunami wave action over the shore is variable and mainly dependent of the combination of both submarine and land topography in the area and the orientation of the arriving waves. The extent of damage and impact from tsunami depends upon the source and severity of onset on the tide cycle. As such Chelsea is vulnerable to coastal inundation from tsunami.

According to the West Coast and Alaska Tsunami Warning Center (WCATWC), an Atlantic based tsunami threat level for the US east coast is low when compared to the US Pacific and Caribbean coasts. Although the probability is low, a tsunami threat does exist and it is not out of the realm of possibility for the Atlantic. Geophysics specialists and geologists from the U.S. Geologic Survey and the Woods Hole Oceanographic Institute have researched Georges Bank Lower Slope of the western North Atlantic and the relationship there between submarine landslides and earthquakes (see Figure 5). "The US Atlantic coast would be particularly vulnerable to devastation from tsunami because of the high density of population and infrastructure along its low lying coastal areas and estuaries." Dr. Uri S ten Brink, et.al., Marine Geology 264, 2009, p.65)

Figure 5 - Atlantic Based Tsunami Potential Threat



Further, Dr. ten Brink confirms that **"**the likelihood that a tsunami will hit this coast is fairly low. However, the most likely source will be a landslide that happens underwater at an area of about 215 miles offshore from Chelsea in an area known as the Continental Slope. This is the area that separates the very wide and shallow shelf. The shelf is about 100 to 150 meters deep from the deep ocean." The US Geologic Survey is researching the probability of a landslide on the Continental Shelf.

The City of Chelsea's justification to include Atlantic-based Tsunami on the east coast is based upon one of three possible scenarios for the City. First, a submarine landslide off the continental slope 215 miles off shore of the City of Chelsea. Such an underwater avalanche occurred in 1929, when a 7.2 magnitude earthquake created large waves that killed 28 people in Newfoundland. Second, there is a subduction zone in the Caribbean called the Puerto Rico Trench that could create an east coast tsunami. Third scenario is from earthquake and volcanic activity in the form of a submarine landslide in the Canary Islands. One possible scenario involves the potential collapse of the western flank of the Cumbre Vieja Volcano located at La Palma, Canary Islands land sliding into the ocean since this volcano is one of the more active volcanoes in the Canary Islands. Potentially generating a giant wave which scientists have termed a mega tsunami, the wave would radiate out across the Atlantic Ocean and inundate the eastern seaboard of North America including the American, the Caribbean, and northern coasts of South America some six to eight hours later. The impact from such an event is being analyzed as to how high the waves would actually become once crossing the Atlantic Ocean to the Chelsea and Eastern Massachusetts.

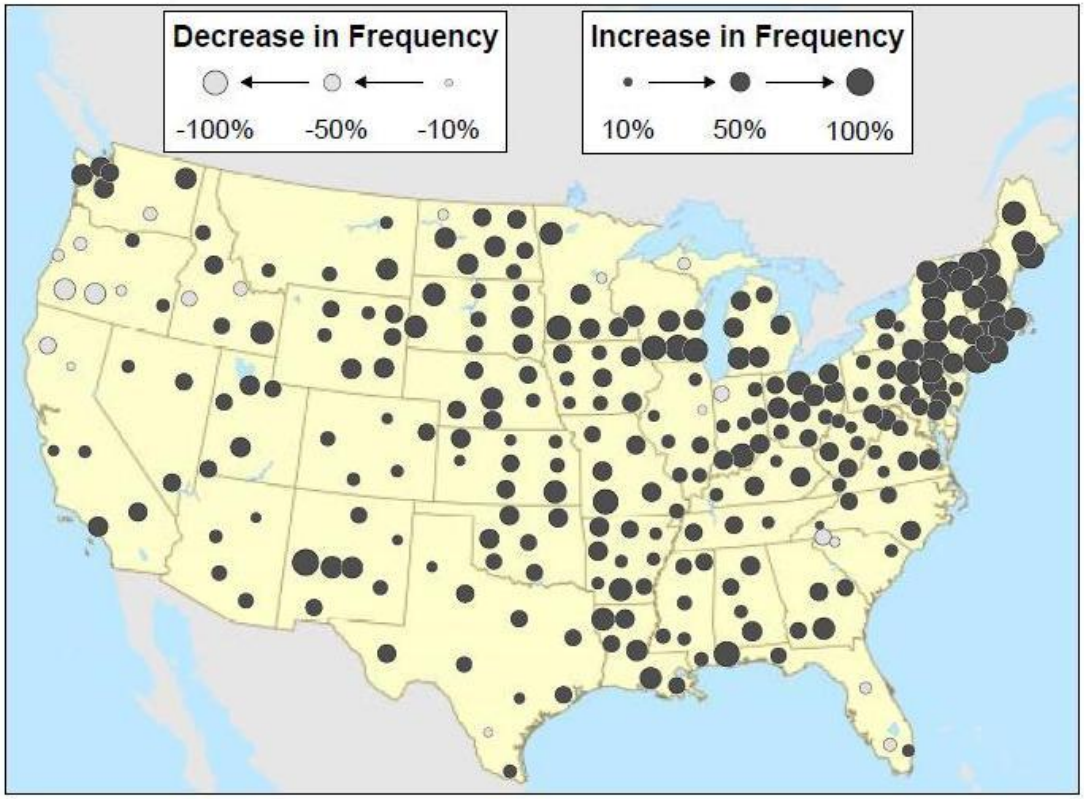
The NOAA National Weather Service -Taunton organized a NWS-WCATWC Tsunami Awareness Emergency Manager Workshop on February 23, 2010. Since 2010, the NWS-WCATWC issued Warnings and Advisories which have not resulted in a tsunami in the Atlantic to date.

Tsunamis were added as a natural hazard in the 2013 edition of the Massachusetts Natural Hazard Mitigation Plan. Chelsea does not currently have mitigation in place for tsunamis and did not in 2008.

Extreme Precipitation and Drought

The annual precipitation rate for Chelsea is 42 inches. While total annual precipitation has not changed significantly, according to the 2012 report *When It Rains It Pours – Global Warming and the Increase in Extreme Precipitation from 1948 to 2011* intense rainstorms and snowstorms have become more frequent and more severe over the last half century in the northeastern United States**.** Extreme downpours are now happening 30 percent more often nationwide than in 1948 (see Figure 6). In other words, large rain or snow storms that happened once every 12 months, on average, in the middle of the 20th century, now happen every nine months.

Figure 6 - Change in Frequency of *Extreme Downpours, 1948 – 2011*



Source: *When It Rains It Pours – Global Warming and the Increase in Extreme Precipitation*, Environment America Research and Policy Center, July 2012

Not only are these intense storm events more frequent, they are also more severe: the largest annual storms now produce 10 percent more precipitation, on average, than in 1948. In particular, the report finds that New England has experienced the greatest change with intense rain and snow storms occurring 85 percent more often than in 1948.

At the other extreme, changes in precipitation patterns and the projected future rising temperatures due to climate change (discussed below) will likely increase the frequency of short-term (one- to three-month) droughts and decrease stream flow during the summer.

Added as natural hazards in the 2013 state Natural Hazard Mitigation Plan, the City did not directly have mitigation in place to deal with either risk in 2008 or in this update. However, the Massachusetts Water Resource Authority, from whom Chelsea gets its water and sewer services, does have comprehensive drought mitigation measures in place.

Land Use and Development Trends

Existing Land Use

The most recent land use statistics available from the state are from aerial photography done in 2005. Table 13 shows the acreage and percentage of land in 33 categories. If the four residential categories are aggregated, residential uses make up 40 % of the area of the City (613.65 acres). The highest percentage use is multi-family residential which comprises 32 % with 1,201.3879 acres.

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.

Table 13
2005 Land Use

Land Use Type	Acres	%
Cropland	0	0
Pasture	0	0
Forest	22.5044	1.48
Non-forested wetlands	1.6257	.10
Mining	0	0
Open land	15.5407	1.0
Participatory recreation	38.4078	2.52

Spectator recreation	0	0
Water recreation	0	0
Multi-family residential	488.7726	32.14
High density residential (less than ¼ acre lots)	124.87384	8.21
Medium density residential (¼ - ½ acre lots)	0	0
Low density residential (larger than ½ acre lot)	0	0
Salt water wetlands	7.94142	.52
Commercial	200.26687	13.17
Industrial	287.2362	18.89
Urban open	148.47926	9.77
Transportation	168.51548	11.10
Waste disposal	16.62698	1.10
Water	0	0
Woody perennials	0	0
Total	***1,520.791***	***100***

Natural Resources and Development

The topography of Chelsea consists primarily of coastal lowlands, punctuated by four drumlins formed during the last Ice Age. These drumlins are located in the southwest (Admirals Hill), southeast (Mount Bellingham), northeast (Powderhorn Hill) and northwest (Mount Washington). A smaller drumlin (Mill Hill) is located on the east side of Chelsea, adjacent to Mill Creek. Soils in the City are primarily urban fill, and there is very little undeveloped land. The U.S. Soil Conservation Service identified four other major soil classifications. Woodbridge-Urban complex, Newport-Urban Complex, and Canton-Urban Complex comprise most of the City's land area not designated as urban. The Udorthents classification of wet substratum is found along portions of the City's waterfront. Chelsea has no undeveloped areas designated as prime agricultural land.

Most of the waterfront is used for industrial purposes and much of the hilltop areas are covered with residential development. Chelsea is bordered on three sides by water, giving the City a unique character and a potentially high degree of access to waterfront areas. The Mystic River borders Chelsea on the southwest, the Chelsea Creek and Mill Creek on the east, and the Island End River on the west. Mill Creek is bordered by marshy wetlands between the developed portions of the City and the creek itself. Chelsea Creek has a more abrupt shoreline, with filled areas dropping off quickly into the creek and industrial uses obscuring much of the access to the shore. The City's accessible frontage on the Mystic River is mostly in the Admiral's Hill area, which has banks gradually sloping down to the water on recreation land.

Chelsea's character is not only related to its adjacent rivers, but also to the character of its landscape. The land in Chelsea is occupied by the five glacial drumlins described above, rising 150'-200' above sea level. This sloped and hilly landscape helps to divide the City into discernible neighborhoods, each with its own character, thereby giving the City a manageable sense of scale and orientation. From the tops of these drumlins, there are dramatic views of Boston, Revere, and other surrounding areas. Despite the fact that in most of the City the natural landscape has been completely covered by development, Chelsea's topography and proximity to water remain dominant features. (Chelsea Open Space Plan 2010-2017).

Chelsea is only 2.19 square miles in area, with a 2010 population of 41,577.
The City is very densely settled, surpassing its neighbors with almost 18,899 people per square mile. Chelsea is the 38th highest populated City or town of the 351 in Massachusetts.

Recent and Potential Future Development

MAPC consulted with City staff to determine areas that have been or are likely to be developed in the future, defined for the purposes of this plan as a five year time horizon.

These areas are shown on Map 2, "Potential Development" and are described below. The letter for each site corresponds to the letters on Map 2.

A. Webster Block: 2 acres, redevelopment 2 new buildings with about 170 apartments and 5,000 SF of new retail space; 1st floor retail in eastern building; residential is fully occupied as of 2011 but retail remains vacant- retail now occupied by a daycare facility.

B. Highland Terrace and Box District Park: Gerrish Avenue/Highland Street/Library redevelopment; 32 residential units on 43,000 SF, 13,000 SF new park, built. Fully occupied

C. 44 Gerrish Avenue: redevelopment: 50 apartments, two parcels, 2.11 acres, built.

D. 22-28 Gerrish Avenue: redevelopment, parcel adjacent to 44 Gerrish Avenue, 46 units, being constructed.

E. 1 North Phase I, 250 Heard Street: redevelopment, 2 acres, permitted, to be built and occupied by 2014. This project will consist of 230 units when fully built. It is 50% complete.

F. 1 North Phase II, Crescent Residential Overlay Project: 2 acres, 222 residential units, in permitting stage.

G. New FBI Headquarters at Maple and Beech Streets: 5 acres, permitted, to be built in 2014. Construction due to begin June, 2014 with building to be in use by July, 2016.

H. Marriott Hotel: 60,000 SF parcel, under construction, open July 2012. Another 150 room hotel will be built on ½ of this parcel.

I. Forbes Industrial Park: redevelopment, 14 acres, 270 residential units, permitting stage.

J. 99 Marginal Street: 32,000 SF, to be used for storage of road salt and open space once existing asphalt storage tanks are removed; total site is about 5 acres. Completed.

K) Market Basket Supermarket: 39 acres, redevelopment, market is 140,000 SF with additional 60,000 of retail; opened in 2010; site used to be Mystic Mall.

L. Creek Side Common Park: former contaminated 21 E site; cleaned and converted to park in 2010.

M. Jefferson at Admiral's Hill: 2 acres, 160 residential units, built in 2010.

N. Captain's Row Assisted Living and Rehab/Nursing Home: four floors, 40 units, built in 2010.

O. Island End Park: 5,000 SF, constructed 2010.

P) 1020 Revere Beach Parkway- Chelsea Place- fifty six apartments. Completed.

Q) Town Place- 150 unit Marriott hotel- under construction**.**

R) 141 Washington Street- New City park- to be dedicated June, 2014.

Recent and Future Development in Hazard Areas

Table 14 shows the relationship of these parcels to two of the mapped hazards. This information is provided so that planners can ensure that development proposals comply with flood plain zoning and that careful attention is paid to drainage issues.

Table 14: Relationship of Recent and Potential Development to Hazard Areas

Parcel	**Landslide risk**	**Flood Zone**
Webster block	Moderate Susceptability	No
Highland Terrace and Box District Park	Moderate Susceptability	No
44 Gerrish Avenue	Moderate Susceptability	No
22-28 Gerrish Avenue	Moderate Susceptability	No
1 North Phase 1; 250 Heard Street	Moderate Susceptability	No
1 North Phase 2; Crescent Residential Overlay Project	Moderate Susceptability	No
New FBI Headquarters at Maple and Beech Street	Moderate Susceptability	No
Marriott Hotel	Moderate Susceptability	No
Forbes Industrial Park	Moderate Susceptability	50.2313% in AE
99 Marginal Street	Moderate Susceptability	14.0904% in AE
Market Basket Supermarket	Moderate Susceptability	No
Creek Side Common Park	Moderate Susceptability	4.4214% in AE
Jefferson at Admiral's Hill	Low	No
Captain's Row Assisted Living and Rehab/ Nursing Home	Low	No

Island End Park	Moderate Susceptability	100% in AE
1020 Revere Beach Parkway	Moderate Susceptability	No
Town Place	Moderate Susceptability	No
141 Washington Street	Moderate Susceptability	No

Critical Infrastructure in Hazard Areas

Critical infrastructure includes facilities that are important for disaster response and evacuation (such as emergency operations centers, fire stations, water pump stations, etc.) and facilities where additional assistance might be needed during an emergency (such as nursing homes, elderly housing, day care centers, etc.). These facilities are listed in Table 15 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, to better understand which facilities may be vulnerable to particular natural hazards.

Explanation of Columns in Table 15

Column 1: ID #: The first column in Table 8 is an ID number which appears on the maps that are part of this plan. See Appendix B.

Column 2: 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: Type: The third column indicates what type of site it is.

Column 4: 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 5: 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:

> **Zones A1-30 and AE**: Special Flood Hazard Areas that are subject to inundation by the base flood, determined using detailed hydraulic analysis. Base Flood Elevations are shown within these zones.
>
> **Zone A** (Also known as Unnumbered A Zones): Special Flood Hazard Areas where, because detailed hydraulic analyses have not been performed, no Base Flood Elevations or depths are shown.
>
> **Zone AO**: Special Flood Hazard Areas that are subject to inundation by types of shallow flooding where average depths are between 1 and 3 feet. These are normally areas prone to shallow sheet flow flooding on sloping terrain.
>
> **Zone VE**, V1-30: Special Flood Hazard Areas along coasts that are subject to inundation by the base flood with additional hazards due to waves with heights of 3 feet or greater. Base Flood Elevations derived from detailed hydraulic analysis are shown within these zones.
>
> **Zone B and X** (shaded): Zones where the land elevation as been determined to be above the Base Flood Elevation, but below the 500 year flood elevation. These zones are not Special Flood Hazard Areas.
>
> **Zones C and X** (unshaded): Zones where the land elevation has been determined to be above both the Base Flood Elevation and the 500 year flood elevation. These zones are not Special Flood Hazard Areas.

Column 6: Locally-Identified Flood Area: The locally identified areas of flooding were identified by town 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: Hurricane Surge Category: The seventh column indicates whether or not the site is located within a hurricane surge area and the category of hurricane estimated to be necessary to cause inundation of the area. The following explanation of hurricane surge areas was taken from the US Army Corps of Engineers web site:

> "Hurricane storm surge is an abnormal rise in sea level accompanying a hurricane or other intense storm. Along a coastline a hurricane will cause waves on top of the surge. Hurricane Surge is estimated with the use of a computer model called SLOSH. SLOSH stands for Sea Lake and Overland Surge from Hurricanes. The SLOSH models are created and run by the National Hurricane Center. The SLOSH model results are merged with ground elevation data to determine areas that will be subject to flooding from various categories of hurricanes. Hurricane categories are defined by the Saffir-Simpson Scale." See www.sam.usace.army.mil/hesdata/General/hestasks.htm

According to the Saffir-Simpson Scale, the least damaging storm is a Category 1 (winds of 74-95 miles per hour) and the most damaging storm is a Category 5 (winds greater than 155 miles per hour).

Table 15: Relationship of Critical Infrastructure to Hazard Areas							
ID	**NAME**	**TYPE**	**Landslide**	**Within FEMA Flood Zone**	**Within Locally Identified Area of Flooding**	**Average Annual Snow Fall**	**Hurricane Surge Areas (Category#)**
1	Chelsea Street Bridge	Bridge	Moderate Susceptibility	0.2 PCT ANNUAL CHANCE FLOOD HAZARD	No	Low	1
2	Tobin Bridge	Bridge	Moderate Susceptibility	No	No	Low	0
3	Meridian Street Bridge	Bridge	No	AE	No	High	0
5	City Hall	Municipal Office	Moderate Susceptibility	No	No	Low	0
6	Chelsea Courthouse	Court House	Moderate Susceptibility	No	No	Low	0
7	CAPIC HeadStart	Child Care	Moderate Susceptibility	No	No	Low	2
8	Best Friends Learning Center	Child Care	Moderate Susceptibility	No	No	Low	0
9	Chelsea City Yard	Municipal Office	Moderate Susceptibility	No	No	Low	1
10	Chelsea Senior Center	Senior Center	Moderate Susceptibility	No	No	Low	0
11	Margolis Apartments	Elderly Housing	Moderate Susceptibility	No	No	Low	0
12	Buckley Apartments	Elderly Housing	Moderate Susceptibility	No	No	Low	2
13	NSTAR Substation	Power Substation	Moderate Susceptibility	No	No	Low	1
14	Emergency Operations & Communications Center	Emergency Operations Center	Moderate Susceptibility	No	No	Low	0
15	Chelsea Engine 3 Fire Station	Fire Station	Moderate Susceptibility	No	No	Low	0
16	Chelsea Engine 1 Fire Station	Fire Station	Moderate Susceptibility	No	No	Low	0
17	Chelsea Central Fire	Fire Station	Moderate	No	No	Low	0

Table 15: Relationship of Critical Infrastructure to Hazard Areas							
ID	**NAME**	**TYPE**	**Landslide**	**Within FEMA Flood Zone**	**Within Locally Identified Area of Flooding**	**Average Annual Snow Fall**	**Hurricane Surge Areas (Category#)**
	Station		Susceptibility				
18	Kayem Foods Inc.	Grocery Store	Moderate Susceptibility	No	No	Low	1
19	Gulf Oil	Gas Distribution	Moderate Susceptibility	No	No	Low	0
20	Alliance Fuel	Gas Distribution	Moderate Susceptibility	No	No	Low	1
21	Massachusetts Information Technology Center	State Office	Moderate Susceptibility	No	No	Low	1
22	Senior Living Bellingham Hill	Elderly Housing	Moderate Susceptibility	No	No	Low	0
23	Chelsea Jewish Nursing Home	Elderly Housing	Moderate Susceptibility	No	No	Low	0
24	Nursing and Rehab Center	Elderly Housing	Moderate Susceptibility	No	No	Low	0
25	Chelsea Police	Police Station	Moderate Susceptibility	No	No	Low	0
26	Verizon Phone Transfer Station	Telecommunications	Moderate Susceptibility	No	No	Low	0
27	U.S. Postal Incoming Mail Center	Post Office	Moderate Susceptibility	No	No	Low	1
28	Shurtleff School Early Learning Center	School	Moderate Susceptibility	No	No	Low	0
29	Chelsea High School	School	Moderate Susceptibility	No	No	Low	1
30	Bunker Hill Community College	School	Moderate Susceptibility	No	No	Low	0
31	Williams Middle School	School	Moderate	No	No	Low	1

Table 15: Relationship of Critical Infrastructure to Hazard Areas							
ID	**NAME**	**TYPE**	**Landslide**	**Within FEMA Flood Zone**	**Within Locally Identified Area of Flooding**	**Average Annual Snow Fall**	**Hurricane Surge Areas (Category#)**
			Susceptibility				
32	St. Rose Elementary School	School	Moderate Susceptibility	No	No	Low	0
33	Clark Avenue School	School	Moderate Susceptibility	No	No	Low	0
34	Burke School Complex	School	Moderate Susceptibility	No	No	Low	2
35	NSTAR Substation	Power Substation	Moderate Susceptibility	No	No	Low	1
36	Massachusetts State Soldiers Home/Hospital	Hospital	Moderate Susceptibility	No	No	Low	0
37	Massachusetts Water Resources Authority	State Office	Moderate Susceptibility	No	No	Low	1
38	Massachusetts Water Resources Authority	State Office	Moderate Susceptibility	0.2 PCT ANNUAL CHANCE FLOOD HAZARD	No	Low	1
39	Chelsea Pumping Station	Water Pumping Station	Moderate Susceptibility	No	No	Low	1

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 Town of Scituate, 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."

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

The HAZUS software was used to model potential damages to the community from a 100 year and 500 year hurricane event; storms that are 1% or 0.1 and 0.2% or 0.002 likely to happen in a given year and roughly equivalent to a Category 2 and Category 4 hurricane. The damages caused by these hypothetical storms were modeled as if the storm track passed directly through the Town, bringing the strongest winds and greatest damage potential.

Though there are no recorded instances of a hurricane equivalent to a 500 year storm passing through Massachusetts, this model was included in order to present a reasonable "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 16
Estimated Damages from Hurricanes

	100 year	**500 year**
Building Characteristics		
Estimated total number of buildings	5,558	5,558
Estimated total building replacement value (Year 2002 $) (Millions of Dollars)	$2,328	$2,328
Building Damages		
# of buildings sustaining minor damage	556	1,781
# of buildings sustaining moderate damage	141	1,051
# of buildings sustaining severe damage	9	152
# of buildings destroyed	0	18
# of households displaced	103	783
# of people seeking public shelter	34	249
Debris		
Building debris generated (tons)	7,133	28,085
Tree debris generated (tons)	1,141	3,651.05
# of truckloads to clear building debris	239	979
Value of Damages (Thousands of dollars)		
Total property damage	$4,288.19	$25,579.13
Total losses due to business interruption	$33,832.10	$204,138.95

Estimated Damages from Earthquakes

Methodology Used

The HAZUS earthquake module allows users to define an earthquake magnitude and model the potential damages caused by that earthquake as if its epicenter had been at the geographic center of the study area. For the purposes of this plan, two earthquakes were selected: magnitude 5.0 and a magnitude 7.0. Historically, major earthquakes are rare in New England, though a magnitude 5 event occurred in 1963.

Table 17
Estimated Damages from Earthquakes

	Magnitude 5.0	**Magnitude 7.0**
Building Characteristics		
Estimated total number of buildings	5,558	5,558
Estimated total building replacement value (Year 2002 $) (Millions of dollars)	$2,328	$2,328
Building Damages		
# of buildings sustaining slight damage	951	365
# of buildings sustaining moderate damage	392	1,403
# of buildings sustaining extensive damage	78	1,489
# of buildings completely damaged	11	2,253
Population Needs		
# of households displaced	180	7,154
# of people seeking public shelter	173	6,838
Debris		
Building debris generated (million tons)	0.030	0.790
Tree debris generated (million tons)	0.012	0.2765
# of truckloads to clear building debris	1,040	31,520
Value of Damages (Millions of dollars)		
Total property damage	$153.33	$2,258.09
Total losses due to business interruption	$14.22	$355.33

Estimated Damages from Flooding

Methodology Used

MAPC did not use HAZUS-MH to estimate flood damages in Chelsea. 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.

Chelsea is 2.19 square miles or 1401.6 acres. Approximately 9.36 acres have been identified by local officials as areas of flooding. This amounts to 0.66 % of the land area in Chelsea. The number of structures in each flood area was estimated by applying the percentage of the total land area to the number of structures (5,558) in Chelsea; the same number of structures used by HAZUS for the hurricane and earthquake calculations. HAZUS uses a value of $418,856 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 $34,518,656 - $172,593,278. These calculations are not based solely on location within the floodplain or a particular type of storm (i.e. 100 year flood).

Table 18: Estimated Damages from Flooding							
ID	**Flood Hazard Area**	**Approximate Area in Acres**	**% of Total Land Area**	**# of Struc-tures**	**Replacement Value**	**Low Damage Estimate**	**High Damage Estimate**
1	Vale Street Neighborhood	4.62	0.33	18	$7,539,408	$753,941	$3,769,704
2	Willow Street	0.48	0.03	2	$837,712	$83,771	$418,856
3	Eastern Ave	1.32	0.09	5	$2,094,280	$209,428	$1,047,140
4	Drainage ditch next to Chelsea Housing Authority	2.94	0.21	12	$5,026,272	$502,627	$2,513,136
	Totals	**9.36**	**0.66**	**37**	**$15,497,672**	**$1,549,767**	**$7,748,836**

V. HAZARD MITIGATION GOALS

The Chelsea Local Multiple Hazard Community Planning Team met on April 26 2012 and April 1, 2014. At those meetings, the team reviewed and discussed the goals from the 2008 Hazard Mitigation Plan for the City of Chelsea. The planning team decided that they would continue to implement the framework of goals established in 2008.

The following nine goals were endorsed by the Committee for the 2014 update of the Chelsea Hazard Mitigation Plan:

1. Prevent and reduce the loss of life, injury 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.

- Continue to use the CIP as a tool for accomplishing mitigation projects.
- Ensure that the Planning Department considers hazard mitigation in its review and permitting of new development.
- Review zoning regulations to ensure that the ordinance incorporates all reasonable hazard mitigation provisions.
- Ensure that the Building Department has the resources to continue to enforce building regulations.

4. Prevent and reduce the damage to public infrastructure resulting from all hazards.

- Begin to assess the vulnerability of municipal buildings and infrastructure to damage from an earthquake.
- Maintain existing mitigation infrastructure in good condition.

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.

- Continue to participate in the Mystic Region LEPC.

7. Ensure that future development meets federal, state and local standards for preventing and reducing the impacts of natural hazards.

8. Educate the public about natural hazards and mitigation measures that can be undertaken by property-owners.

- Provide information on hazard mitigation activities in the languages most frequently spoken in Chelsea.

9. Take maximum advantage of resources from FEMA and MEMA to educate City staff and the public about hazard mitigation.

VI. HAZARD MITIGATION STRATEGY

The central component of a hazard mitigation plan is the strategy for reducing the community's vulnerabilities to natural hazard events. Responding to the analysis of risk, vulnerabilities, potential impacts, and anticipated future development, the process for developing this strategy requires evaluating previous and current community actions to mitigate the effects of natural hazards and assessing where more action is needed to complement or modify existing measures. The following sections include descriptions of existing mitigation measures, a status update on mitigation measures identified in previous plans, and descriptions of proposed new mitigation measures. All mitigation measures are evaluated by their benefits and potential costs to arrive at a prioritized list of action items.

What is Hazard Mitigation?

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, education programs, infrastructure projects and other activities.

Hazard mitigation measures can generally be sorted into six categories, according to FEMA's Local Multi-Hazard Mitigation Planning Guidance:

- Prevention: Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built, and direct public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.

- Property Protection: Modification or removal of existing buildings or infrastructure to protect them from a hazard. Examples include acquisition, elevation, relocation, structural retrofits, flood proofing, storm shutters, and shatter resistant glass.

- Public Education and Awareness: Actions to inform and educate citizens, elected officials, and property owners about the potential risks from hazards and ways to mitigate them. Such actions include outreach projects, real estate disclosure requirements, hazard information centers, and school-age and adult education programs.

- Natural Resource Protection: Actions that, in addition to minimizing hazard losses, preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management,

urban forest and vegetation management, and wetland restoration and preservation.

- Structural Projects: Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include storm water controls (e.g., culverts), floodwalls, seawalls, retaining walls, and safe rooms.

- Emergency Services Protection: Actions that will protect emergency services before, during, and immediately after an occurrence. Examples of these actions include protection of warning system capability, protection of critical facilities, and protection of emergency response infrastructure.

Funding to implement hazard mitigation projects may come from a variety of federal, state, and local sources. 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.

HMGP: http://www.fema.gov/government/grant/hmgp/index.shtm
PDM: http://www.fema.gov/government/grant/pdm/index.shtm
FMA: http://www.fema.gov/government/grant/fma/index.shtm

Other potential funding sources include the U.S. Army Corps of Engineering, the Small Business Administration.

Existing Mitigation Measures

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. These plans contain important information regarding flooding, hurricanes, tornadoes, dam failures, earthquakes, and winter storms. Therefore, the CEMP is a mitigation measure that is relevant to all of the hazards discussed in this plan. Chelsea's CEMP was considered up to date for 2013 and is being updated for 2014.

Communications Equipment – The City has its own Mobile Command Unit and also utilizes the MA emergency Incident Command Unit a mobile communications center available to the City through the MA State Police and the MA Department of Fire Services. The City has a Reverse 911 system in place.

Emergency Power Generators – Emergency power generators are in place in the three Red Cross certified emergency shelters- the Chelsea Senior High School, Williams Middle School and the Mary C. Burke School. All fire and police stations and the Emergency Call Center have backup emergency generators.

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

Mystic Region Emergency Management Planning Committee (REPC) – Chelsea is a member of a regional emergency planning committee with Revere, Everett, Lynn, Malden, Medford, Melrose, North Reading, Reading, Saugus, Somerville, Stoneham, Wakefield, Winchester, Winthrop, and Woburn.

Flooding Hazard Mitigation Measures

City Storm Drain System- Until 1993 when the sewer system maintenance was contracted out, some catch basins had not been cleaned since the 1930s – 1940s. The City started cleaning catch basins in 1996 but ran into the problem of disposing of the hazardous materials that had collected in the catch basins. The disposal problem has been resolved through contracted services. Cyclical cleaning of catch basins now occurs with 500 of the City's 1,500 catch basins cleaned annually completing the cycle Citywide every three years. Approximately 50% of the sewer collection system in the City of Chelsea is combined sanitary sewer and storm sewer, down from 75% five years ago as Chelsea has engaged in a methodical capital improvements planning process since 2008, with sewer/storm drain separation included in that effort. In addition, Chelsea's streets are swept twice monthly from March – November by a private contractor and it has reduced the sand it uses on its roads during the winter season.

Chelsea's 2010-2014 Capital Improvement Program assesses capital expenditures for water, sewer and drainage projects. Since 2008, the City has continued to update and implement actions from its Capital Improvements Plan relating to flooding and stormwater infrastructure improvements including the following:

Chelsea has reduced inflow and infiltration into the City's sanitary sewer collection system over the last five years and separated stormwater drainage from its sewer system. This has helped to reduce flooding during high water runoff periods, particularly in low-lying areas. The new Highland Street Drainage Outfall provides an outlet for storm water in the vicinity of Marginal Street and Highland Street and has reduced flooding in this area.

The Marginal Street tide gate replacement project prevents high tide water from entering the storm drain outfall system and flooding the neighborhood.

The City designed and constructed infrastructure improvements on Jefferson Avenue and Everett Avenue to update water mains, storm drain lines and sewer lines.

The City completed Years 1-5 of its NPDES Stormwater Management Plan, including adopting a stormwater management ordinance and documenting and digitizing stormwater sources.

The City has a Comprehensive Emergency Management Plan that covers flooding issues but primarily from a response perspective. The City restricts development under its floodplain district zoning bylaw and through the regulations of the Conservation Commission.

National Flood Insurance Program (NFIP) – Chelsea participates in the NFIP with 24 policies in force as of the February 28, 2014. 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

Since the 2008 plan, the policies in force have increased by 9 and the total losses have remained the same at 24 losses. The total payments, as of April 30, 2006 were $74,282.52, with no change in the amount reported as of February 28, 2014.

The following information is provided for the City of Chelsea:

Flood insurance policies in force (as of February 28, 2014)	24
Coverage amount of flood insurance policies	$8,242,900
Premiums paid	$35,610
Total losses (all losses submitted regardless of the status)	24
Closed losses (Losses that have been paid)	21
Open losses (Losses that have not been paid in full)	0
CWOP losses (Losses that have been closed without payment)	3
Total payments (Total amount paid on losses)	$74,282.52

The City complies with the NFIP by enforcing floodplain regulations, maintaining up-to-date floodplain maps, and providing information to property owners and builders regarding floodplains and building requirements.

Combined sewer separation – As reported in the CIP, the City receives funding for sewer and drainage improvements through the Massachusetts Water Resources Authority (MWRA). Funds are available as a 25% grant and 75% loan for eligible activities.

Zoning ordinance – The zoning ordinance for the City of Chelsea contains a number of provisions that mitigate flooding problems. These include:

- A requirement for a setback of 15 feet from the mean high water line within the Waterfront District.
- The section on performance standards includes a requirement for erosion control. This provision requires that when any alterations are made to the contours of the land, there shall be no alteration of the runoff of water to or from abutting properties. (Section 5.5.12)
- Section 5.5.15 regulates construction in the flood plain.

- Section 9.3.4 concerns the requirements for a development impact statement which may be required by the special permit granting authority. The impact statement must include information on surface water and subsurface conditions.

Subdivision regulations – Section IV.F.4 states that no net increase in runoff due to the development of a subdivision shall be allowed. It also requires that retention/detention basins shall be included in the design as necessary, using the 100 year design storm event.

Participation in the Mystic Region Local Emergency Planning Committee – In lieu of a local LEPC, the City of Chelsea participates in the Mystic Region LEPC. Participation in this committee is not just limited to issues related to flooding.

Stormwater Management and Construction Site Management Ordinance – Section 30-223 of the Chelsea Code of Ordinances: Every new or modified connection to the City's storm drain system requires a stormwater management plan showing how pollutants will not be allowed into the system, an erosion and sedimentation control plan, monitoring of discharges, and installation of Best Management Practices on-site to retain and treat stormwater volume and water quality.

Green Infrastructure- In 2011, EPA announced its green infrastructure partnership with the City of Chelsea. As part of a nation-wide effort to encourage and support the expanded uses of green infrastructure in partner communities, EPA Region 1 commended Chelsea for being a green infrastructure leader in this watershed by installing tree boxes along Chester Avenue and other low impact stormwater mitigation strategies in their highly urbanized and industrialized environment. Technical assistance from Horsley Witten Group, Inc., along with input from the Chelsea Department of Public Works and the Chelsea Department of Planning & Development, resulted in a series of deliverables in 2012 to help identify and address the barriers posed by local codes and ordinances, and to recommend a suite of green infrastructure practices suitable for Chelsea's poorly draining soils. The City is working to develop and implement post-construction stormwater zoning practices that would satisfy the issuance of the anticipated MS4 stormwater permit.

DCR dam safety regulations- There are no dams located within Chelsea.

Wind Hazard Mitigation Measures

CEMP – The Chelsea Comprehensive Emergency Management Plan contains a section on hurricanes. It lists five generic mitigation measures:

- Develop and disseminate emergency public information and instructions concerning hurricane preparedness and safety.
- Community leaders should ensure that Chelsea is enrolled in the National Flood Insurance Program.

- Develop and enforce local building codes to enhance structural resistance to high winds and flooding. Build new construction in areas that are not vulnerable to direct hurricane effects.
- Review National Flood Insurance Rate Maps and Hurricane Evacuation Maps for possible impact on the community.
- Maintain plans for managing all hurricane emergency response activities.

The Chelsea CEMP outlines three generic mitigation measures for tornados.

- Develop and disseminate emergency public information and instructions concerning tornado safety, especially guidance regarding in-home protection and evacuation procedures, and locations of public shelters.
- Strict adherence should be paid to building code regulations for all new construction.
- Maintain plans for managing tornado response activities. Refer to the non-institutionalized, special needs and transportation resources listed in the Resource Manual.

Tree-trimming program – The City contracts out 100% of its work to trim and remove trees as needed and grind stumps. National Grid maintains its power line corridors.

Wireless Communications Facilities Overlay District- Section 8.4 of the Zoning Ordinance regulates and allows for review of the siting and placement of wireless communications facilities, including towers and antennas.

Massachusetts State Building Code - The City has adopted the Massachusetts State Building Code. The Massachusetts State Building Code contains detailed regulations regarding wind loads. The code's provisions are the most cost-effective mitigation measure against tornados given the extremely low probability of occurrence. If a tornado were to occur in Chelsea, damages would be extremely high due to the prevalence of older construction and the density of development.

Existing Severe Winter Weather Hazard Mitigation Measures

Snow disposal – Regular plowing and snow/ice removal. Calcium chloride is used primarily for road treatments. Sand is very rarely used as it creates siltation and clean up problems. The DPW works to clear roads as requested or in an emergency for the Fire and Police Departments.

Existing Geologic Hazard Mitigation Measures

Massachusetts State Building Code – The City enforces the State Building Code. It 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.

In the event of an earthquake and fires caused by it, 100 % of Chelsea is served by fire hydrants. The City DPW has two mobile, 5Kw generators in case of power loss The fire department has a mobile, 5 Kw generator, a mobile light tower and two electronic message boards. The City also has access Massachusetts Water Resource Authority (MWRA) diesel and gas pumps for flooding and other emergencies.

The City has installed under drains in selected sections of Powder Horn Hill to relieve water seepage.

Existing Other Hazard Mitigation Measures

Wildland Fires	Medium	Minor	Same as state
Major Urban Fires	Low	Minor	Serious
Thunderstorm	High	Minor	Minor
Drought	Low	Minor	Minor
Extreme Temperature	Medium	Minor	Minor
Tsunami	Very low	Extensive	Extensive

Wildland/Brush Fires

Burn Permits – The City fire department does not allow outdoor burning.

Fire Response-Chelsea responds to a brush or wildland fire in the same manner as other fire calls. It does not have a dedicated Forestry Division.

Subdivision/Development Review – The Fire Department participates in the review of new subdivisions and development/redevelopment projects to ensure that proper fire safety provisions are incorporated.

Major Urban Fires

Subdivision/Development Review – The Fire Department participates in the review of new subdivisions and development/redevelopment projects to ensure that proper fire safety provisions are incorporated.

MetroFire- Chelsea belongs to the 34-member MetroFire. MetroFire is an association of Fire Departments in the Metropolitan Boston area to coordinate Mutual Aid and to act as a common entity for improving the overall effectiveness of their Fire and Emergency Medical Services.

Cooling and Warming Centers – The City maintains a link on its City web page to the Center for Disease Control web page on actions on how to preventing overheating.

A summary of the City's existing mitigation measures is found in Table 19.

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Table 19- Chelsea Existing Mitigation Measures

Type of Existing Mitigation Measures	Area Covered	Effectiveness/ Enforcement	Improvements/ Changes Needed
MULTIPLE HAZARDS			
Comprehensive Emergency Management Plan (CEMP)	City-wide.	Emphasis is on emergency response.	Up to date for 2013; completing 2014 update.
Communications Equipment: • Reverse 911-Code Red • Member of NERAC and NEMWIC	City-wide.	Effective	Incident Command Unit. Evacuation/intersection sign-boards.
Massachusetts State Building Code	City-wide.	Effective for new construction.	None
Emergency Power Generators	Chelsea Senior High School, Williams Middle School and the Mary C. Burke School	Effective.	Upgrade generators as needed; provide generators at additional locations; provide alternative fuel sources and generator power source flexibility. New fixed generator needed at DPW facility.
Participation in the Mystic Region Emergency Management Planning Committee	City-wide	A forum for cooperation on natural and manmade disasters.	None
FLOOD HAZARDS/DAMS			
Capital Improvements Program	City-wide	The City has made extensive drainage infrastructure upgrades under its Capital Improvements Program since 2008.	Continue to implement current CIP.

Type of Existing Mitigation Measures	**Area Covered**	**Effectiveness/ Enforcement**	**Improvements/ Changes Needed**
Participation in the National Flood Insurance Program (NFIP)	Areas identified on the FIRM maps	There are 24 policies in force.	Encourage all eligible homeowners to obtain insurance. Follow up on grant request to develop and implement Community Rating System in Chelsea.
City Engineering Department inspects all streets and drainage systems once construction is completed.	City Wide	Effective	None.
Public Works Operations/Maintenance	City-wide	Effective	Continue with annual catch basin and street sweeping programs and continue annual digital update of stormwater lines and outfalls. Implement Green Infrastructure stormwater infiltration and treatment projects.
2010- 2017 Open Space Plan	City Wide	Effective	Seek funding and implement environmental restoration activities in and along Mill Creek.
Flood Plain District	City Wide	Effective	Update with CRS system requirements if grant to implement CRS is awarded.
Flood related building restrictions.	Zoning Districts	Effective	None.
Wetland Ordinance	City-wide	Effective	None.
Stormwater Management and Construction Site Management Ordinance	City-wide.	Effective for new construction and reconstruction.	Consider referencing subdivision standards or referencing MA Stormwater Standards
Subdivision Rules and Regulations	City-wide	Somewhat Effective.	Consider referencing MA Stormwater Standards as standard.
DCR Dam Safety	NA: No dams in Chelsea	NA	NA

Type of Existing Mitigation Measures	Area Covered	Effectiveness/ Enforcement	Improvements/ Changes Needed
WIND HAZARDS			
CEMP	City-wide	Effective	None.
The Massachusetts State Building Code	City-wide	Effective for most situations except severe storms.	None.
Tree trimming program and power line corridor maintenance.	City-wide	Satisfactory	None.
Backup generator capaCity in place at key public facilities.	City-wide	Effective	Add full backup capaCity at City Hall.
WINTER HAZARDS			
Snow Removal	City-wide	Effective.	None.
Snow disposal	The City uses Parcel 12A on Second Street for snow disposal.	Effective.	None.
Snow and ice control plans	The City has a program to educate citizens and notify them during snow emergencies. The City also manages the maintenance of equipment.	Effective.	None.
BRUSH FIRE HAZARDS			
Outdoor burning is not allowed.	City-wide.	Effective.	None.
Water availability: 100 % of City is served by hydrants.	City-wide.	Effective.	None.
Development Review	City-wide.	Effective.	None.

Type of Existing Mitigation Measures	Area Covered	Effectiveness/ Enforcement	Improvements/ Changes Needed
Public Education	City-wide	Effective.	None.
GEOLOGIC HAZARDS			
The Massachusetts State Building Code	City-wide.	Effective.	None.
Mobile generators and light pole for power/light backup	City-wide	Effective.	None.
Under drains installed at Powder Horn Hill	The City has installed under drains in selected sections of Powder Horn Hill to relieve water seepage.	Somewhat effective.	Limited to problem areas on Powder Horn Hill.
OTHER HAZARDS			
Member of MetroFire mutual aid.	City-wide.	Effective.	None.
The Fire Department reviews of all major development projects to ensure that proper fire safety provisions are incorporated.	City-wide.	Effective.	None.
The City maintains a link on its City web page to the Center for Disease Control web page on actions on how to preventing overheating	City-wide.	Effective.	None.

Implementation Progress on the Previous Plan

During the planning process, City staff reviewed mitigation measures identified in the 2008 Metro-Boston Multi-Hazard Mitigation Plan Chelsea Annex and determined whether measures had been implemented, deferred, or were still in process. All in-process measures are carried forward into the 2014 plan. Deferred measures were deleted or carried forward into the 2014 plan update based on an assessment of the continued relevance or effectiveness of the measure and the cause of the deferral. The status of these mitigation measures is shown in Table 20 below.

Table 20
Status of Proposed Mitigation Measures from the 2008 Plan

Mitigation Measures	Priority	Implementation Responsibility	2014 Status
Marginal Street storm drain outfall	High	DPW	Rebuilt and implemented 2009.
Burke School-Eastern Avenue drainage project: completed by MA DOT 2010.	High	MA DOT	Implemented by MA DOT in 2010.
Spruce Street and Blossom Street storm drainage project	High	DPW	In process: estimated to be completed in late 2015. Part of sewer separation on Spruce Street under MA Works Grant.
Crescent Avenue pump station	High	DPW	The pump station was not pursued as the flooding was eliminated through the 2009 Crescent Avenue work between Eleanor and Vernon Streets.
Drain under Spruce Street commuter rail tracks and complete CSO separation	High	DPW	In process: will be completed as part of new FBI/Hotel project at Carter/Beach Street intersection, 2014.
Remediate flooding at Highland and Gerrish Streets area	High	DPW/MWRA	Implemented: Eliminated I and I inflow problem by videoing, cleaning and replacing part of line 2010.
Chelsea Clock site redevelopment	Medium	DPW	Deferred: parcel not redeveloped

Table 20
Status of Proposed Mitigation Measures from the 2008 Plan

Mitigation Measures	Priority	Implementation Responsibility	2014 Status
Island End culvert	Medium	Chelsea/Everett	In process: $350,000 in Chelsea 2014 CIP for pipe replacement design
Bryson and Heard Streets flooding mitigation	Medium	DPW	Implemented: 2012 redevelopment of site with 500 units of new housing included flooding mitigation for the site

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 in a local area. There is a third level of mitigation which is regional; involving a state, regional, or federal agency or an issue that involves numerous municipalities across a wide area of the metropolitan region.

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 Chelsea, the Department of Conservation and Recreation (DCR), and Massachusetts Department of Transportation (MA DOT). 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 where cooperation with these other agencies may be necessary. Implementation of these recommendations will require that all parties work together to develop solutions.

Inter-Community Considerations

Island End culvert- There is a tide gate located adjacent to the commuter rail line in the vicinity of Locust Street in Everett. An open ditch parallels the commuter rail line and then flows beneath the street in a culvert that is partially within the City of Chelsea, emptying into Island End River. The ownership and maintenance responsibility of this

culvert system has been the subject of a lawsuit between Keyspan, Boston Market Terminal, the City of Everett and the City of Chelsea. It is still unclear as to which entity is responsible. The capaCity of the culvert has been reduced due to sedimentation and there is the possibility that the sediments are contaminated. This potential for contamination makes dredging a potential problem. The disposal of catch basin spoils is a regional issue. The repair and maintenance of this system is complicated by the fact that two municipalities and a private company may be involved.

As of 2014, progress has been made to resolve the legal status of the culvert and proceed with eliminating the flooding caused by the blocked culvert. The City of Chelsea's 2014 Capital Improvement Plan includes $350,000 for project design work. The work to replace the culvert with a new 11 x 9 culvert is anticipated to be bid in 2015. Total cost of the project is estimated to be $10-12 million dollars.

Sea Level Rise and Shoreline Environment – The coastal shoreline of the Boston metro area is a dynamic environment where forces of sea-level rise, erosion and deposition of are constantly at work changing the shoreline profile. This process disregards municipal boundaries as sand and other materials are moved along the coast. Shoreline protection measures such as sea walls, jetties, and others have an impact on this process with the potential of building up materials in some areas while stripping it away from others. In Chelsea, a shoreline issue of regional concern is the need for additional storm water and storm surge storage capaCity.

Coastal metro Boston communities should work to understand how these processes and others associated with sea level rise and storm surge are at work locally and consider mutually beneficial means of protecting their shore side communities from the impacts of storm damage and sea-level rise. Chelsea should participate within a regional or state level sea level rise action work group to help plan for and address sea level rise, storm surge and related climate adaptation issues on a regional basis.

Identification of Potential Mitigation Measures

The City of Chelsea solicited suggestions for mitigation measures from City officials and members of the Local Hazard Mitigation Planning Committee because these individuals have the most comprehensive knowledge of local conditions. Mitigation measures from the 2008 plan that had not yet been completed were considered as well as new and modified mitigation measures not included in the previous plan. The Committee reviewed and refined the list of proposed mitigation measures at its two meetings and in subsequent review of the draft plan update. City officials provided the best available information on the mitigation measures, their estimated cost, and time frame for implementation.

This section describes new mitigation measures planned for the next five years. The proposed mitigation measures are listed in Table 21 below, along with priority, lead implementation, time frame, estimated cost, and potential funding sources.

Introduction to Table 21, Summary of Proposed Mitigation Measures and Prioritization

Mitigation Measure – A brief description of each mitigation measure is provided.

Priority – The Chelsea Local Hazard Mitigation Planning Committee determined the priority (high, medium, or low) based on the potential benefits and projected costs of each proposed mitigation measure. The benefits associated with a given mitigation measure were based on local knowledge of the hazard areas, including impacts of hazard events and the extent of the area impacted and the relation of a given mitigation measure to the City's goals. Also considered were factors such as the number of homes and businesses affected and whether or not road closures occurred and what impact closures had on delivery of emergency services and the local economy. The cost approximation takes into account the estimated project costs, as well as other political, social, or environmental aspects as appropriate such as whether the City currently has the technical and administrative capability to carry out the mitigation measures or whether any environmental constraints exist.

The designations could change as conditions in the community change.

Implementation Responsibility – The Local Hazard Mitigation Planning Committee designated implementation responsibility by City agency staff and department managers. It is likely that some mitigation measures will require that several departments work together and assigning staff is the 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. Funding opportunities could affect the time frame for implementation.

Estimated Cost - The cost data, if available, represent current rough estimates only.

Potential Funding Sources – This column identifies likely sources of funding for each measure. Agencies with implementation responsibility in most cases will be responsible for pursuing funding opportunities. Funding sources may be internal or external to the City. Many measures may require several funding sources. Identification of a potential funding source does not guarantee that a project will be eligible for or selected for funding.

Abbreviations Used in Table 21

Federal

FEMA Mitigation Grants includes:
- FMA = Flood Mitigation Assistance Program.
- HMGP = Hazard Mitigation Grant Program.
- PDM = Pre-Disaster Mitigation Program

ACOE = U. S. Army Corps of Engineers
EPA = U.S. Environmental Protection Agency
NPS = National Park Service
USCG = US Coast Guard
USDA = United States Department of Agriculture

State

CZM = Coastal Zone Management
DCR = MA Department of Conservation and Recreation
DEP = MA Department of Environmental Protection (State Revolving Fund)
Mass DOT = Massachusetts Department of Transportation
MBTA = Massachusetts Bay Transit Authority
MWRA= Massachusetts Water Resource Authority

City

DPW = Department of Public Works
FD = Fire Department
CC = Conservation Commission
EM = Emergency Management Department
IS= Inspectional Services

Table 21 - Proposed Mitigation Measures and Prioritization

Mitigation Measure	Priority	Type	Lead Implementation	Time Frame	Estimated Cost	Potential Funding Sources
Flooding Hazard Mitigation Measures- Inland/Riverine, Coastal Hazards, Urban Flooding						
Complete Spruce and Blossom Streets drainage projects to mitigate flooding- 2008 Plan carryover.	HIGH	Structural	DPW	2014-2016	$1-2 M	MassWorks Grant/Chelsea
Mitigate flooding by installing new drain under Spruce Street and completing CSO separation- 2008 Plan carryover.	HIGH	Structural	DPW	2014-2016	$2-3 M	Private development mitigation funds /City
Mitigate flooding caused by collapse of Island End culvert: Design and install new 11 x 9 culvert- 2008 Plan carryover.	HIGH	Structural	DPW	2014-2016	$10-12 M	City
Mitigate flooding along Willow Street between Coynes and Maverick Streets by installing new pump station and Green Infrastructure Best Management Practices.	HIGH	Structural	DPW	2014-2019	$2-3 M	City
Mitigate flooding along Eastern Avenue near Webster Street by installing Green Infrastructure Best Management Practices.	HIGH	Structural	DPW	2014-2018	$5-6 M	City
Mitigate flooding at Chelsea Housing Authority by clearing drainage ditch.	MED	Structural	DPW/MA DOT	2014	$1 M	MA DOT
Assess vulnerability of the electrical grid, particular major City distribution lines and substations to natural hazards likely to be increased by climate change.	HIGH	Prevention	Electric Utilities	2014-2016	TBD	Electric Utilities

Table 21 - Proposed Mitigation Measures and Prioritization

Mitigation Measure	Priority	Type	Lead Implementation	Time Frame	Estimated Cost	Potential Funding Sources
Continue to upgrade drainage and reduce flooding by implementing CIP system and drainage improvements.	HIGH	Structural	DPW	2014-2019	Varies by project	City
Develop and implement post-construction stormwater zoning practices that would satisfy the issuance of the anticipated MS4 stormwater permit.	MED	Prevention	Planning	2014-2019	TBD	City
Upgrade floodplain zoning and conservation regulations and update as needed to be consistent with FEMA guidelines, as a minimum.	HIGH	Prevention	Planning/CC	204-2017	$20,000 per year staff time	City
Assess Chelsea waterfront for additional sea and flood wall protection	LOW	Prevention	DPW /Businesses/DCR /CZM	2014-2018	Staff time for assessment	City/State (DCR and CZM), Federal
Assess the risk of water-reactive chemicals stored in flood-prone buildings	LOW	Prevention	EM and Fire Department/ Mystic LEPC	2014	$5,000 staff time for assessment	City
Develop guidelines and prioritization for better enforcement of flood proofing standards	MED	Prevention	Inspectional Services	2014-16	$5,000 staff time to develop guidelines	City
Review emergency operation planning for storms and flooding	HIGH	Prevention	EM	2014-15	$5,000 staff time for assessment	City
Dam Failure- no dams in Chelsea	NA	NA	NA	NS	NA	NA
Wind Hazard Mitigation Measures- Hurricanes, Tropical Storms, Tornados, Nor'easter						
Update tree maintenance and hazardous tree ID program	MED	Prevention	DPW	2014-2019	$15,000 per year	City
Require new masonry chimneys greater than six feet above a roof to have	HIGH	Prevention	IS	2014-2019	TBD by project	City

Table 21 - Proposed Mitigation Measures and Prioritization

Mitigation Measure	Priority	Type	Lead Implementation	Time Frame	Estimated Cost	Potential Funding Sources
continuous steel bracing.						
Evaluate public buildings and critical Structures for potential to withstand high winds; retrofit to greatest degree possible	LOW	Prevention	IS	2014-2019	$50,000 to assess; retrofit cost TBD	City
Continue to require underground utility placement in new and significant redevelopment projects	MED	Prevention	IS/ Planning	2014-2019	Staff cost	City
Severe Winter Weather- Snow and Blizzard, Ice Storms						
Organize outreach to vulnerable populations to help promote and access safe heating centers/emergency shelters.	MED	Education and Awareness	Fire	2014-2019	$2,000 per year staff time	City
Remind homeowners to install and maintain carbon monoxide monitors and alarms.	HIGH	Education and Awareness	Fire	2014-2019	$2,000 per year staff cost	City
Institute coordinated snow removal and parking program to maintain access to clear roads for emergency vehicles and evacuations.	MED	Emergency Services Protection	Police/DPW/ MA DOT	2014-2019	Staff cost estimated to be $10,000/year	Chelsea/MA DOT
Geologic Hazard Mitigation Measures-Earthquakes and Landslides						
Develop an inventory of public and commercial buildings that may be vulnerable to earthquake, particularly those built prior to 1940.	MED	Prevention	Emergency Management and Planning	2014-17	$50,000	City
Use GIS to map hazard areas, at risk structures, and associated hazards like liquefaction and landslides to assess high-risk areas.	MED	Education and Awareness	Planning/Emergency Management	2014-17	$10,000	City

Table 21 - Proposed Mitigation Measures and Prioritization

Mitigation Measure	Priority	Type	Lead Implementation	Time Frame	Estimated Cost	Potential Funding Sources
Maintain a database to track community vulnerability to earthquake risk.	MED	Prevention	Emergency Management	2015	$1,500 per year staff time	City
Other Natural Hazards- Wildland Fires, Major Urban Fires, Extreme Temperature, Drought, Tsunami						
Wildland Fires: Work with landowners to identify and reduce conditions that lead to brush/wildland fires.	MED	Prevention	Fire	2014-2018	$2,500 per year staff time	City/State
Wildland Fires and Urban Fires: Perform arson prevention cleanup activities in areas of abandoned or collapsed structures, trash or debris, areas of stored flammables and previous spills.	MED	Structural	Fire	2014-20126	$2,500 staff time	City
Major Urban Fires: Assess feasibility of NFPA FireWise Program for urban environmental education of homeowners on reducing urban fires	HIGH	Education and Awareness	Fire	2014-15	$5,000 per year staff time	City/NFPA grant
Drought: Encourage drought tolerant landscape design by using permeable pavement to reduce runoff and increase groundwater recharge.	LOW	Natural Systems Protection	CC	2014-2018	Staff time $1,000 per year	City
Tsunami: Outreach Program	LOW	Education and Awareness	EM			
Extreme Temperatures: update site design requirement to increase tree plantings near buildings, increase the percentage of trees used in parking areas, and along public ways.	MED	Prevention	Planning	2014-2018	$10,000 staff time	City

Table 21 - Proposed Mitigation Measures and Prioritization

Mitigation Measure	Priority	Type	Lead Implementation	Time Frame	Estimated Cost	Potential Funding Sources
Extreme Temperatures: Update site design requirements to include cool roofing products that reflect sunlight and heat away from a building.	MED	Prevention	Planning	2013-17	$10,000 staff time	City
Extreme Temperatures: Prevent outbreaks of West Nile Virus and Eastern Equine Encephalitis by treating catch basins with mosquito larvacides.	MED	Prevention	Board of Health and Suffolk County Mosquito Control	2014-18	$36,000 for materials per treatment for application	City and Suffolk County Mosquito Control
Multi-Hazard Mitigation Measures						
Conduct multi-language Community Preparedness Workshops and Outreach on multiple hazards, prevention and preparation.	MED	Education and Awareness	EM/Planning	2014-18	$5,000 staff time	City/MEMA/FEMA
Identify ways for institutions and businesses to reduce their vulnerability to multiple natural hazards	MED	Education and Awareness	Chamber of Commerce/EM	2014-18	$2,500 per year staff time	City/Chamber of Commerce/MEMA/FEMA

VII. PLAN ADOPTION AND MAINTENANCE

Plan Adoption

The Chelsea Hazard Mitigation Plan was adopted by the City Council on [ADD DATE]. See Appendix D for documentation. The plan was approved by FEMA on [ADD DATE] for a five-year period that will expire on [ADD DATE].

Plan Maintenance

MAPC worked with the Chelsea Hazard Mitigation Planning Team to prepare this plan. This group will continue to meet on an as-needed basis to function as the Local Hazard Mitigation Implementation Group, with one City official designated as the coordinator. Additional members could be added to the local implementation group from businesses, non-profits, and institutions. Additional members could be added to the local implementation group from businesses, non-profits, and institutions. The public will be invited to all meetings in accordance with the Massachusetts Open Meeting Law. MAPC will strongly encourage Chelsea to advertise the meetings in newspaper ads, post the meetings at the local library and on the City's website.

Implementation Schedule

Bi-Annual Survey on Progress– The coordinator of the Hazard Mitigation Implementation Team will prepare and distribute a biannual survey in years two and four of the plan. The survey will be distributed to all of the local implementation group members and other interested local stakeholders. The survey will poll the members on any changes or revisions to the plan that may be needed, progress and accomplishments for implementation, and any new hazards or problem areas that have been identified. MAPC will send an annual reminder to each Local Hazard Mitigation Team contact person to check their hazard mitigation planning schedule and to conduct their bi-annual survey if in year two or four of their plan.

This information will be used to prepare a report or addendum to the local hazard mitigation plan. The Hazard Mitigation Implementation Team will have primary responsibility for tracking progress and updating the plan.

Develop a Year Four Update – During the fourth year after initial plan adoption, the coordinator of the Hazard Mitigation Implementation Team will convene the team to begin to prepare for an update of the plan, which will be required by the end of year five in order to maintain approved plan status with FEMA. The team will use the information from the year four biannual review to identify the needs and priorities for the plan update.

Prepare and Adopt an Updated Local Hazard Mitigation Plan – FEMA's approval of this plan is valid for five years, by which time an updated plan must be approved by FEMA in order to maintain the City's approved plan status and its eligibility for FEMA mitigation

grants. Because of the time required to secure a planning grant, prepare an updated plan, and complete the approval and adoption of an updated plan, the local Hazard Mitigation Planning Team should begin the process by the end of Year 3. This will help the City avoid a lapse in its approved plan status and grant eligibility when the current plan expires.

At this point, the Hazard Mitigation Implementation Team may decide to undertake the update themselves, contract with the Metropolitan Area Planning Council to update the plan or to hire another consultant. However the Hazard Mitigation Implementation Team decides to update the plan, the group will need to review the current FEMA hazard mitigation plan guidelines for any changes. The update of the Chelsea Hazard Mitigation Plan will be forwarded to MEMA and DCR for review and to FEMA for approval.

Integration of the Plans with Other Planning Initiatives

Upon approval of the Chelsea Hazard Mitigation Plan by FEMA, the Local Hazard Mitigation Implementation Team 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. Discussions will focus on how recommendations in the approved NHM plan can be integrated into the City's capital improvement planning program, master planning process, zoning, wetlands, and stormwater or subdivision regulations.

At a minimum, the plan will be reviewed and discussed with the following departments:

- Fire / Emergency Management
- Police
- Public Services / Highway
- Engineering
- Planning and Community Development
- Conservation
- Parks and Recreation
- Health
- Building

Other groups that will be coordinated with include large institutions, Chambers of Commerce, land conservation organizations and watershed groups. The plans will also be posted on a community's website with the caveat that local team coordinator 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.

VIII. LIST OF REFERENCES

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

Local Multi-Hazard Mitigation Planning Handbook, FEMA 2013

Mitigation Ideas- A Resource for Reducing Risk to Natural Hazards, FEMA 2013

Massachusetts State Hazard Mitigation Plans, 2010 and 2013

City of Chelsea General Ordinances

City of Chelsea Zoning Bylaw

City of Chelsea, Green Infrastructure Recommendations, 2012

City of Chelsea, Subdivision Control Regulations

City of Chelsea Capital Improvement Program, 2011- 2015

City of Chelsea, Comprehensive Emergency Management Plan

Chelsea Open Space and Recreation Plan, 2010- 2017

Commonwealth of Massachusetts, MacConnell Land Use Statistics, 2005

Metropolitan Area Planning Council, Geographic Information Systems Lab

Metropolitan Area Planning Council, Regional Plans and Data

APPENDIX A
MEETING AGENDAS

Don Boyce
DIRECTOR

Edward M. Lambert Jr.
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 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

Metro Boston Hazard Mitigation Planning Team

First Meeting

Wednesday, April 13, 10:00 AM
Everett City Hall, Keverian Room (3rd floor)
484 Broadway (Route 99), Everett

AGENDA

METRO BOSTON HAZARD MITIGATION PLANNING TEAM

Boston
Brookline
Cambridge
Chelsea
Everett
Malden
Medford
Somerville

10:00 WELCOME & INTRODUCTIONS

10:10 OVERVIEW OF HAZARD MITIGATION PLANNING & GRANTS

- State Hazard Mitigation Plan & FEMA Grants–Sarah White, MEMA
- FEMA Hazard Mitigation Program and Grants – Nan Johnson, FEMA
- Regional & Local Mitigation Plans - Martin Pillsbury, MAPC

10:30 UPDATING THE METRO BOSTON HAZARD MITIGATION PLAN

- FEMA Requirements & Grant Eligibility
- Review of Scope of Work & Schedule –MAPC
- Questions & Discussion – Local issues & Priorities

11:00 GETTING STARTED: MAPPING AND CRITICAL FACILITIES DATABASE FOR THE METRO BOSTON PLAN UPDATE

- Susan Brunton, GIS Analyst, MAPC

11:20 NEXT STEPS

11:30 ADJOURN

If you have any questions please contact Martin Pillsbury at MAPC:
617-451-2770, ext. 2012 or mpillsbury@mapc.org

Chelsea Predisaster Mitigation Renewal Planning Meeting
April 26, 2012
Chelsea City Hall
10 – 12
Agenda

1. Welcome and Introductions

2. Project Overview (*Sam Cleaves, MAPC*)

3. Survey Handout and Ortho Map Markup of Hazardous Areas/ Conversation:

   What has changed from 2008 PDM Plan?

   Review past Areas of Concern and Potential Areas of Development, Priority Projects

   Plan Update:

   - What floods? How often? Any new mitigation studies done? What mitigation measures have been done or planned for? High or low priority?

   - Other hazards: Brush fires, dams, earthquake, high winds? What areas? Dam studies available?

   - Map known future development areas? Type, size, status of permitting

4. Review Draft Project Goals: See over

5. Discuss Project Outreach: See over

6. Review mitigation projects: community actions and new priority projects/costs

7. Next Steps: Follow up with individuals as needed, continue information gathering, set priority mitigation projects and costs, maximize community collaboration on projects

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Project Overview - MAPC received a grant to prepare natural hazards *Pre-Disaster Mitigation Plan* for the communities of Beverly, Lynn, Nahant, Chelsea, Chelsea, Salem, Saugus, Swampscott and Winthrop. MAPC is working with the nine communities to update their plans 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.

Public Participation Options

1. Presentation by Town/City staff to local groups.
2. MAPC presents at a public meeting – existing board or commission*
3. Post on Town/City website with a set public review period.
4. Distribute to specified organizations or boards/commissions for their review.
5. Create a summary document and distribute in community

Review 2008 Goals

Prevent and reduce the loss of life, injury and property damages resulting from all major natural hazards.

Identify and seek funding for measures to mitigate or eliminate each known significant flood hazard area.

Integrate hazard mitigation planning as an integral factor in all relevant municipal departments, committees and boards.

- Continue to use the CIP as a tool for accomplishing mitigation projects.
- Ensure that the Planning Department considers hazard mitigation in its review and permitting of new development.
- Review zoning regulations to ensure that the ordinance incorporates all reasonable hazard mitigation provisions.
- Ensure that the Building Department has the resources to continue to enforce building regulations.

Prevent and reduce the damage to public infrastructure resulting from all hazards.

- Begin to assess the vulnerability of municipal buildings and infrastructure to damage from an earthquake.
- Maintain existing mitigation infrastructure in good condition.

Encourage the business community, major institutions and non-profits to work with the City to develop, review and implement the hazard mitigation plan.

Work with surrounding communities, state, regional and federal agencies to ensure regional cooperation and solutions for hazards affecting multiple communities.

- Continue to participate in the Mystic Region LEPC.

Ensure that future development meets federal, state and local standards for preventing and reducing the impacts of natural hazards.

Educate the public about natural hazards and mitigation measures that can be undertaken by property-owners.

- Provide information on hazard mitigation activities in the languages most frequently spoken in Chelsea.

Take maximum advantage of resources from FEMA and MEMA to educate City staff and the public about hazard mitigation.

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 Tornados
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 NFIP Flood Zones as its source. For more information, refer to the FEMA Map Service Center website http://www.msc.fema.gov. The definitions of the flood zones are described in detail on this site as well. The flood zone map for each community also shows critical infrastructure and municipally owned and protected open space.

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 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, 2010. The critical infrastructure sites are also shown. The source of the aerial photograph is Mass GIS.

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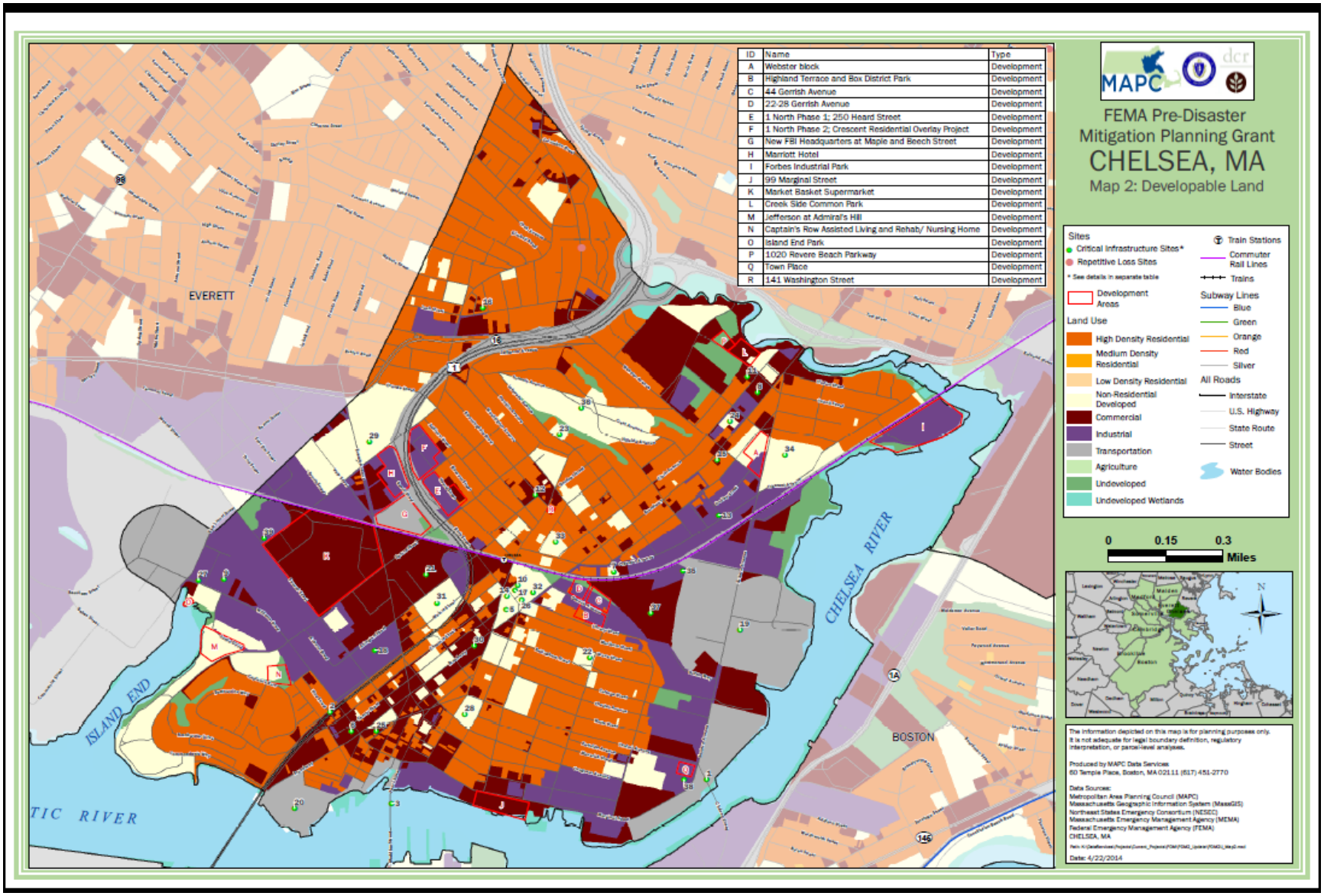
dcr
FEMA Pre-Disaster
Mitigation Planning Grant
CHELSEA, MA
Map 1: Population Density
Sites
Critical Infrastructure Sites*
Repetitive Loss Sites
* See details in separate table
Water Bodies
Population Density
2010 Census Blocks
People Per Acre
0 or No Data
0.1 - 5.0
5.1 - 15.0
15.1 - 30.0
More than 30
Train Stations
Commuter Rail Lines
Trains
Subway Lines
Blue
Green
Orange
Red
Silver
All Roads
Interstate
U.S. Highway
State Route
Street
0 0.15 0.3
Miles
N
EVERETT
REVERE
CHELSEA RIVER
ISLAND END
BOSTON
TIC RIVER
The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analyses.
Produced by MAPC Data Services
60 Temple Place, Boston, MA 02111 (617) 451-2770
Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Northeast States Emergency Consortium (NESEC)
Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)
CHELSEA, MA
Date: 4/22/2014


ID | Name | Type
A | Webster block | Development
B | Highland Terrace and Box District Park | Development
C | 44 Gerrish Avenue | Development
D | 22-28 Gerrish Avenue | Development
E | 1 North Phase 1; 250 Heard Street | Development
F | 1 North Phase 2; Crescent Residential Overlay Project | Development
G | New FBI Headquarters at Maple and Beech Street | Development
H | Marriott Hotel | Development
I | Forbes Industrial Park | Development
J | 99 Marginal Street | Development
K | Market Basket Supermarket | Development
L | Creek Side Common Park | Development
M | Jefferson at Admiral's Hill | Development
N | Captain's Row Assisted Living and Rehab/ Nursing Home | Development
O | Island End Park | Development
P | 1020 Revere Beach Parkway | Development
Q | Town Place | Development
R | 141 Washington Street | Development
MAPC
dcr
FEMA Pre-Disaster Mitigation Planning Grant
CHELSEA, MA
Map 2: Developable Land
Sites
Critical Infrastructure Sites*
Repetitive Loss Sites
* See details in separate table
Development Areas
Land Use
High Density Residential
Medium Density Residential
Low Density Residential
Non-Residential Developed
Commercial
Industrial
Transportation
Agriculture
Undeveloped
Undeveloped Wetlands
Train Stations
Commuter Rail Lines
Trains
Subway Lines
Blue
Green
Orange
Red
Silver
All Roads
Interstate
U.S. Highway
State Route
Street
Water Bodies
0 0.15 0.3
Miles
N
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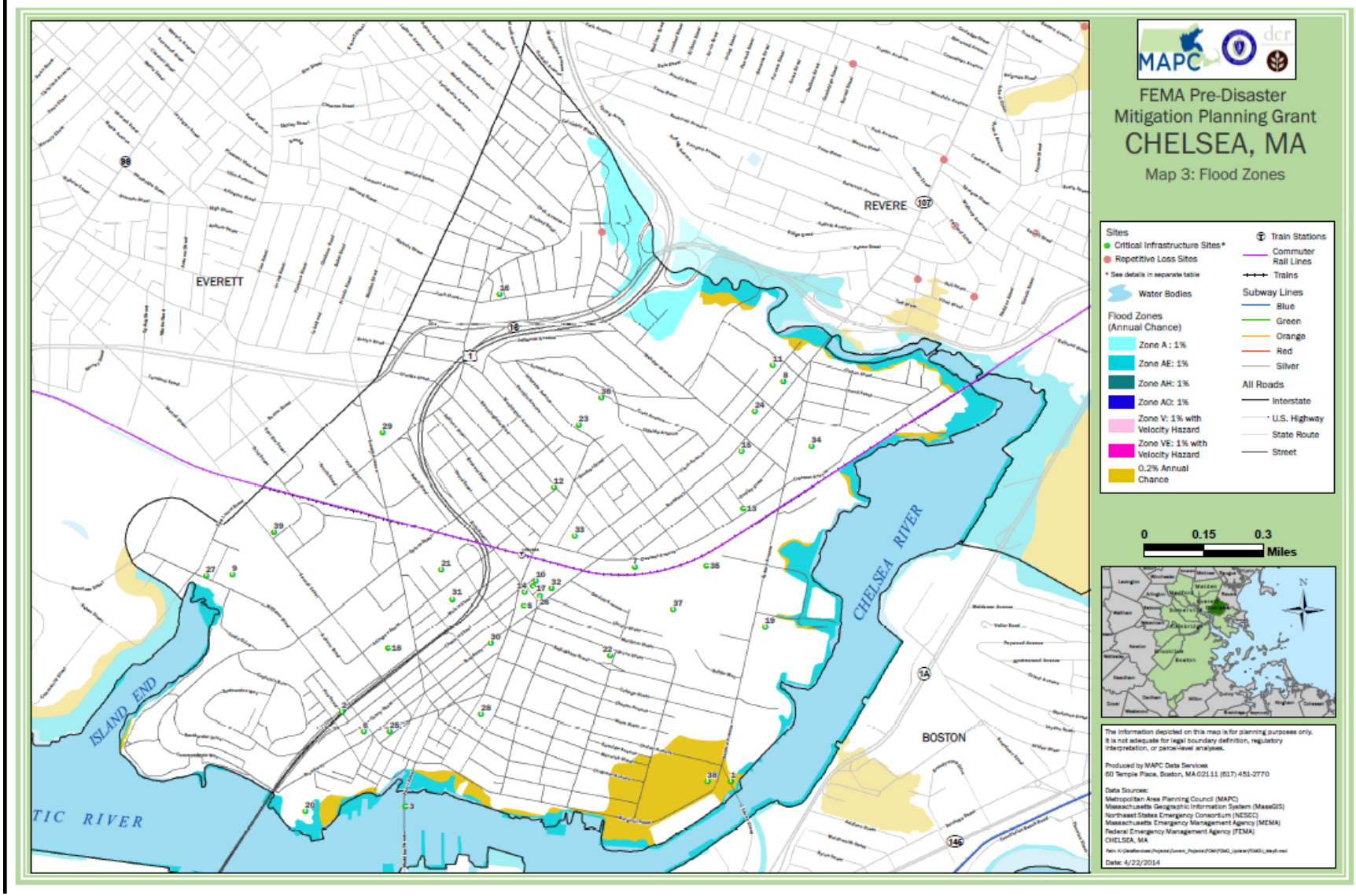
CHELSEA, MA
Date: 4/22/2014
EVERETT
CHELSEA RIVER
ISLAND END
BOSTON
TIC RIVER


MAPC
dcr
FEMA Pre-Disaster
Mitigation Planning Grant
CHELSEA, MA
Map 3: Flood Zones
EVERETT
REVERE
CHELSEA RIVER
ISLAND END
BOSTON
Sites
Critical Infrastructure Sites*
Repetitive Loss Sites
* See details in separate table
Water Bodies
Flood Zones
(Annual Chance)
Zone A : 1%
Zone AE: 1%
Zone AH: 1%
Zone AO: 1%
Zone V: 1% with Velocity Hazard
Zone VE: 1% with Velocity Hazard
0.2% Annual Chance
Train Stations
Commuter Rail Lines
Trains
Subway Lines
Blue
Green
Orange
Red
Silver
All Roads
Interstate
U.S. Highway
State Route
Street
0
0.15
0.3
Miles
N
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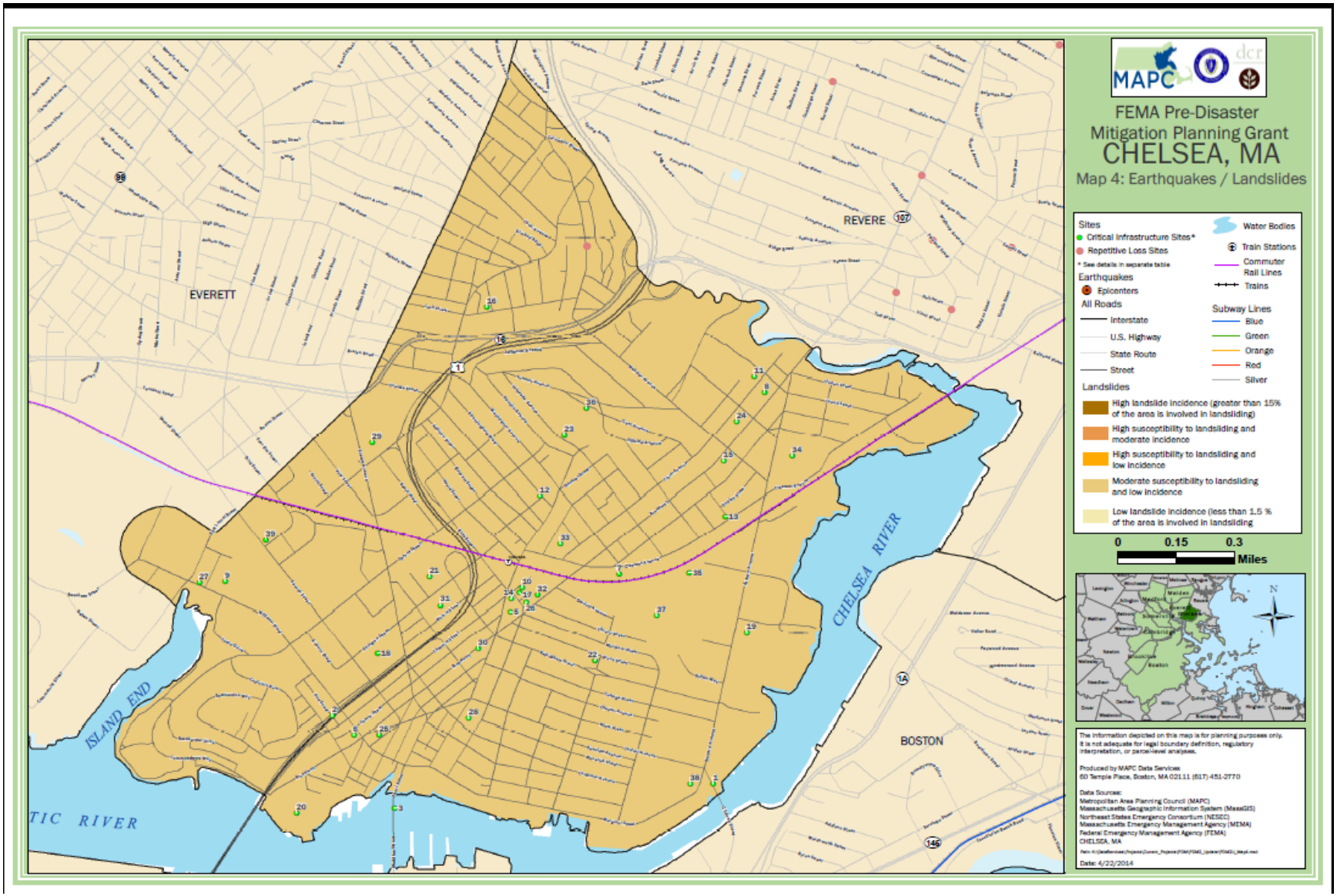
Date: 4/22/2014


MAPC
dcr
FEMA Pre-Disaster
Mitigation Planning Grant
CHELSEA, MA
Map 4: Earthquakes / Landslides
Sites
Critical Infrastructure Sites*
Repetitive Loss Sites
* See details in separate table
Earthquakes
Epicenters
All Roads
Interstate
U.S. Highway
State Route
Street
Landslides
High landslide incidence (greater than 15% of the area is involved in landsliding)
High susceptibility to landsliding and moderate incidence
High susceptibility to landsliding and low incidence
Moderate susceptibility to landsliding and low incidence
Low landslide incidence (less than 1.5 % of the area is involved in landsliding
Water Bodies
Train Stations
Commuter Rail Lines
Trains
Subway Lines
Blue
Green
Orange
Red
Silver
0 0.15 0.3
Miles
The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analyses.
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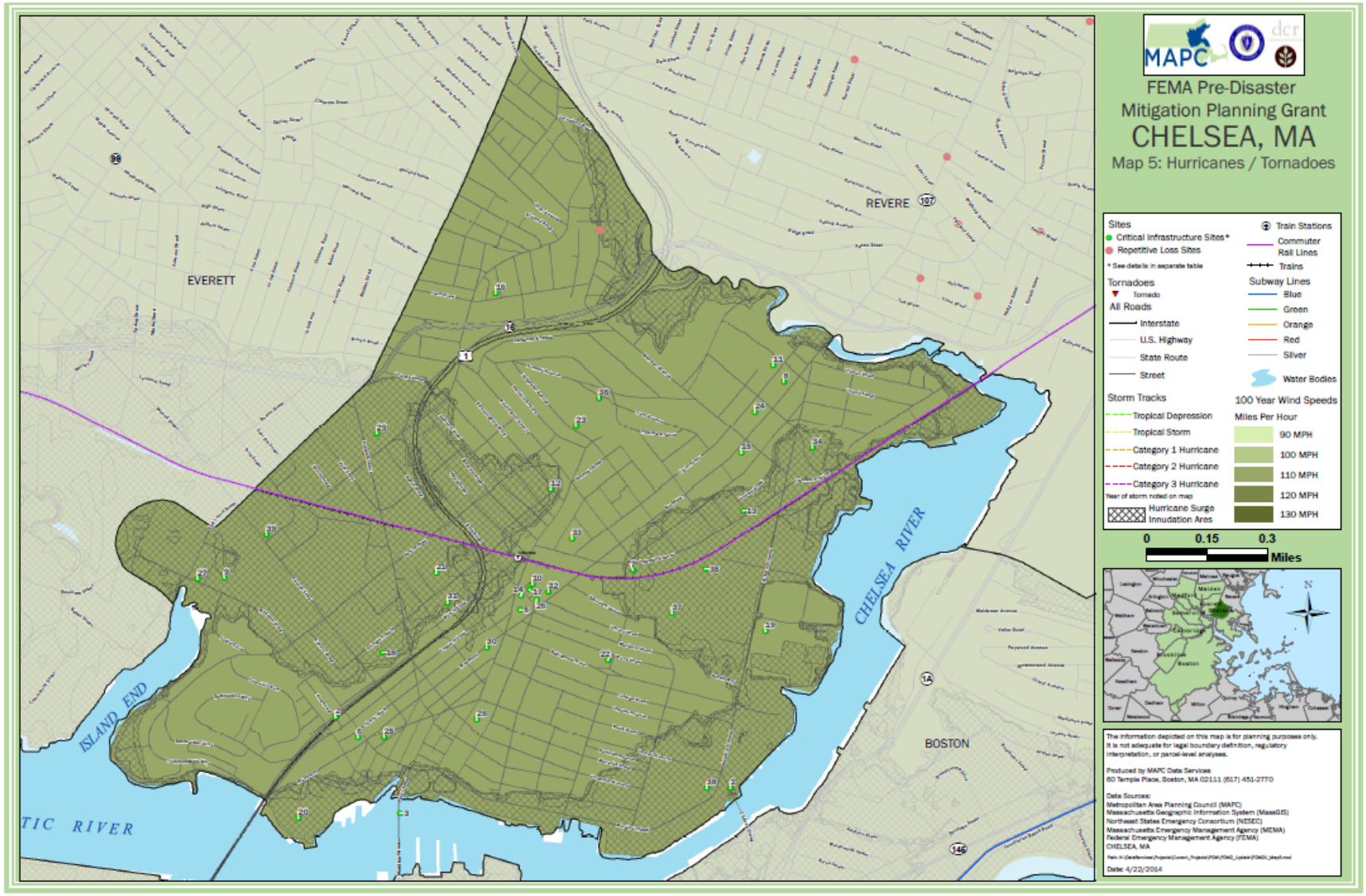
CHELSEA, MA
Date: 4/22/2014
EVERETT
REVERE
CHELSEA RIVER
ISLAND END
BOSTON
TIC RIVER


MAPC
dcr
FEMA Pre-Disaster
Mitigation Planning Grant
CHELSEA, MA
Map 5: Hurricanes / Tornadoes
EVERETT
REVERE
CHELSEA RIVER
BOSTON
ISLAND END
TIC RIVER
Sites
Critical Infrastructure Sites*
Repetitive Loss Sites
* See details in separate table
Tornadoes
Tornado
All Roads
Interstate
U.S. Highway
State Route
Street
Storm Tracks
Tropical Depression
Tropical Storm
Category 1 Hurricane
Category 2 Hurricane
Category 3 Hurricane
Year of storm noted on map
Hurricane Surge Innudation Area
Train Stations
Commuter Rail Lines
Trains
Subway Lines
Blue
Green
Orange
Red
Silver
Water Bodies
100 Year Wind Speeds
Miles Per Hour
90 MPH
100 MPH
110 MPH
120 MPH
130 MPH
0
0.15
0.3
Miles
N
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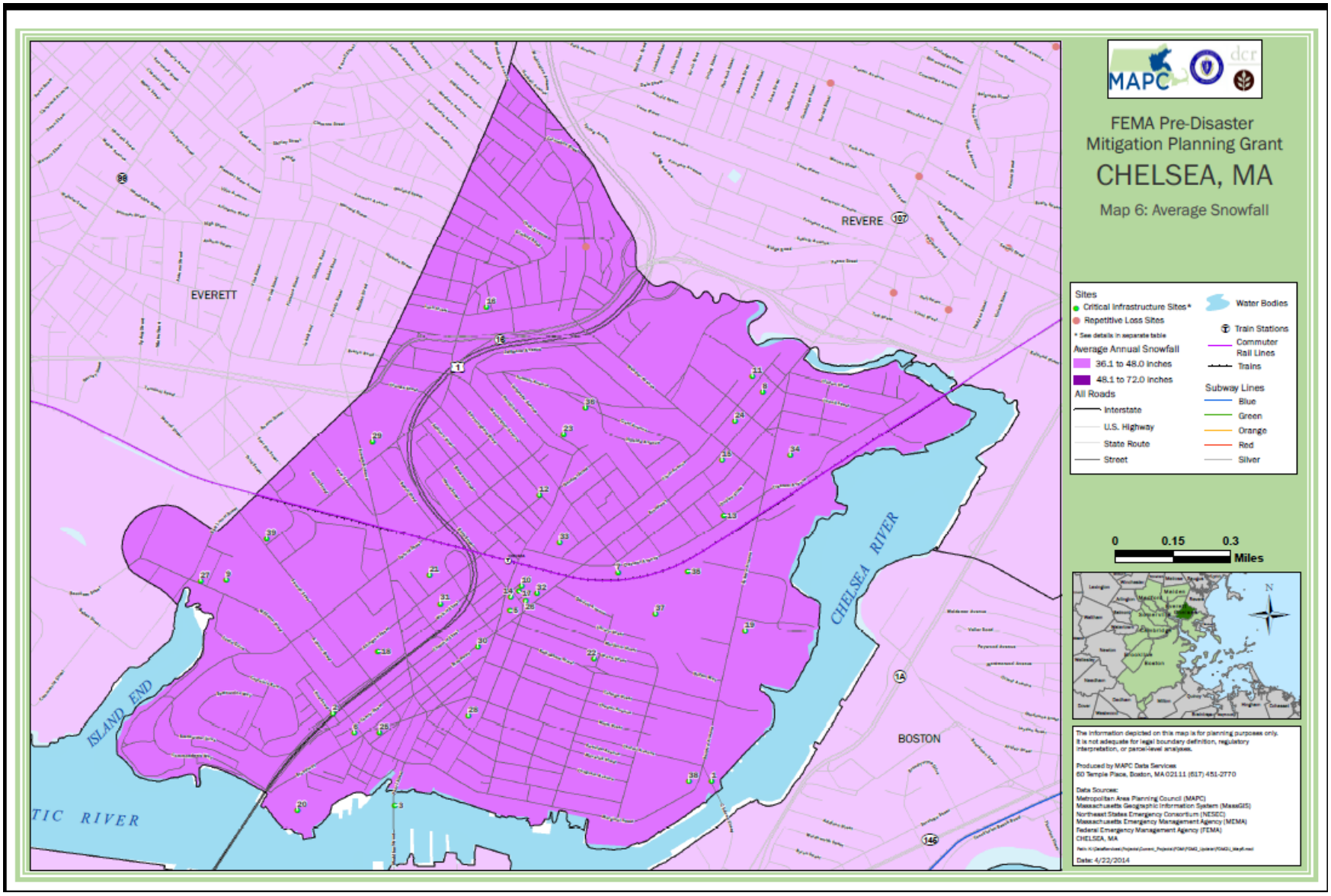
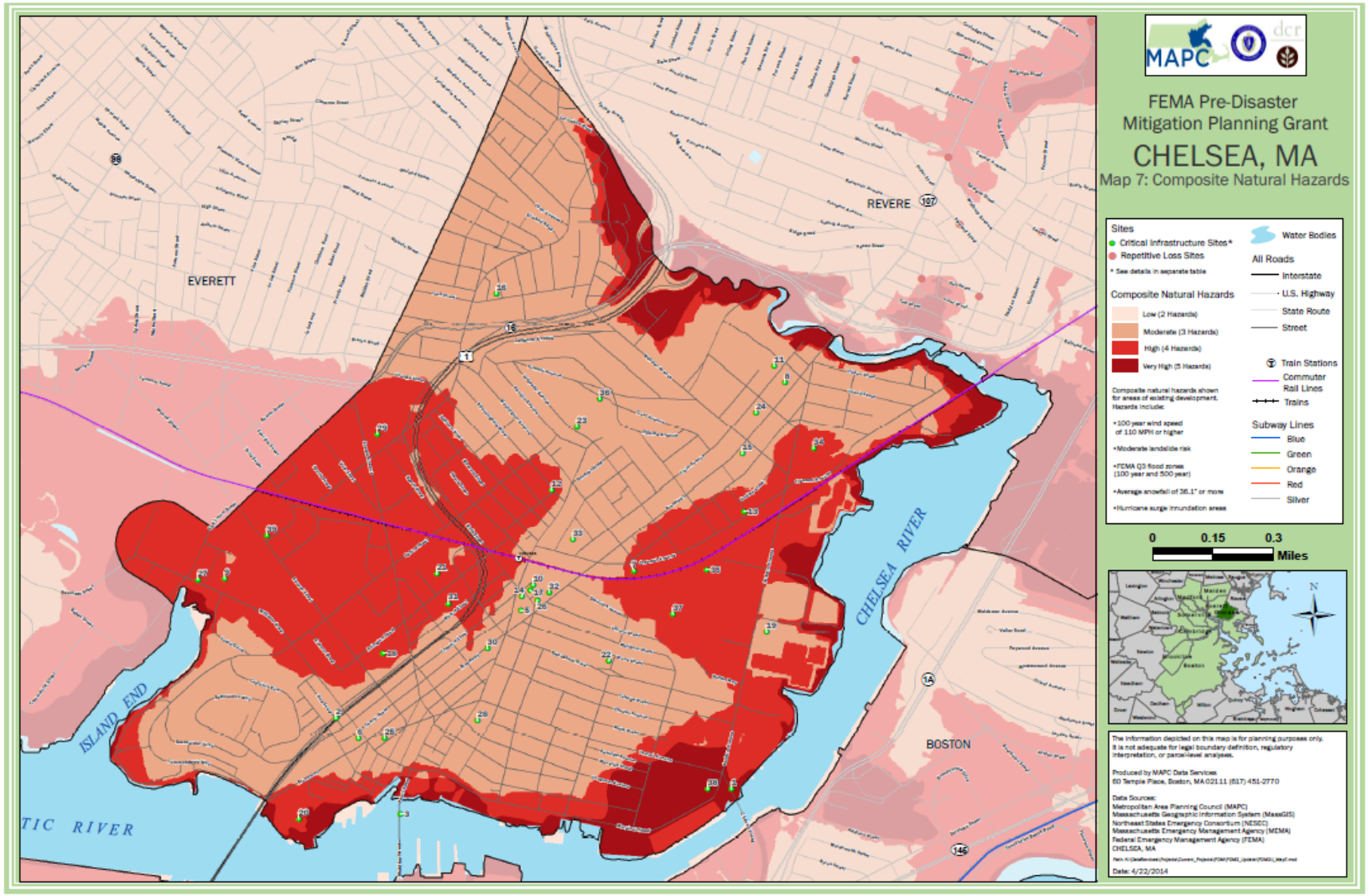
CHELSEA, MA
Date: 4/22/2014


MAPC
dcr
FEMA Pre-Disaster
Mitigation Planning Grant
CHELSEA, MA
Map 6: Average Snowfall
EVERETT
REVERE
CHELSEA RIVER
ISLAND END
BOSTON
Sites
Critical Infrastructure Sites*
Repetitive Loss Sites
* See details in separate table
Average Annual Snowfall
36.1 to 48.0 Inches
48.1 to 72.0 Inches
All Roads
Interstate
U.S. Highway
State Route
Street
Water Bodies
Train Stations
Commuter Rail Lines
Trains
Subway Lines
Blue
Green
Orange
Red
Silver
0
0.15
0.3
Miles
N
The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analyses.
Produced by MAPC Data Services
60 Temple Place, Boston, MA 02111 (617) 451-2770
Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Northeast States Emergency Consortium (NESEC)
Massachusetts Emergency Management Agency (MEMA)
Federal Emergency Management Agency (FEMA)
CHELSEA, MA
Date: 4/22/2014


MAPC
dcr
FEMA Pre-Disaster
Mitigation Planning Grant
CHELSEA, MA
Map 7: Composite Natural Hazards
Sites
Critical Infrastructure Sites*
Repetitive Loss Sites
* See details in separate table
Composite Natural Hazards
Low (2 Hazards)
Moderate (3 Hazards)
High (4 Hazards)
Very High (5 Hazards)
Composite natural hazards shown for areas of existing development. Hazards include:
•100 year wind speed of 110 MPH or higher
•Moderate landslide risk
•FEMA Q3 flood zones (100 year and 500 year)
•Average snowfall of 36.1" or more
•Hurricane surge innundation areas
Water Bodies
All Roads
Interstate
U.S. Highway
State Route
Street
Train Stations
Commuter Rail Lines
Trains
Subway Lines
Blue
Green
Orange
Red
Silver
0 0.15 0.3
Miles
N
The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analyses.
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60 Temple Place, Boston, MA 02111 (617) 451-2770
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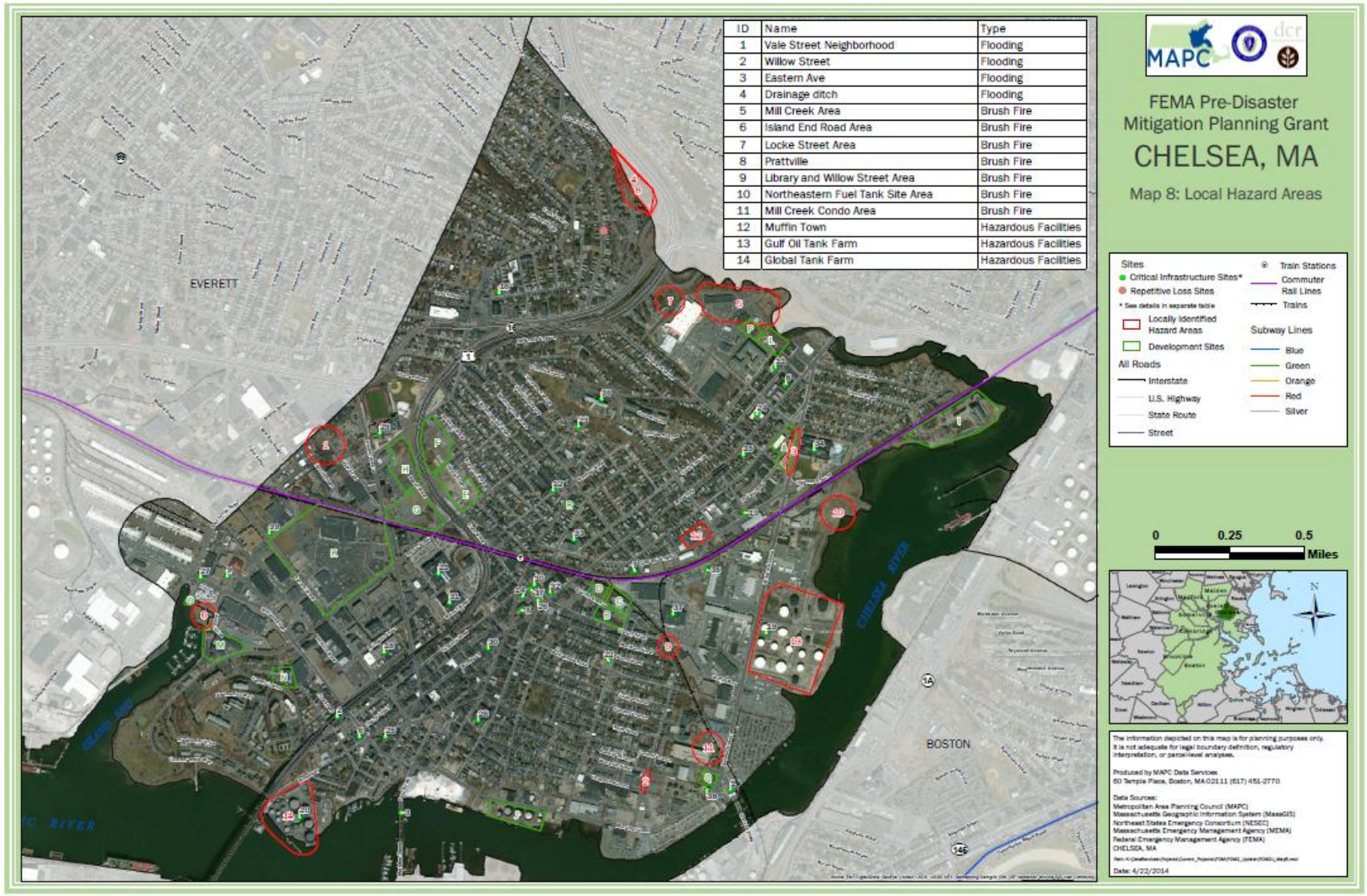
Federal Emergency Management Agency (FEMA)
CHELSEA, MA
Date: 4/22/2014
EVERETT
REVERE
CHELSEA RIVER
BOSTON
ISLAND END
TIC RIVER


ID | Name | Type
1 | Vale Street Neighborhood | Flooding
2 | Willow Street | Flooding
3 | Eastern Ave | Flooding
4 | Drainage ditch | Flooding
5 | Mill Creek Area | Brush Fire
6 | Island End Road Area | Brush Fire
7 | Locke Street Area | Brush Fire
8 | Prattville | Brush Fire
9 | Library and Willow Street Area | Brush Fire
10 | Northeastern Fuel Tank Site Area | Brush Fire
11 | Mill Creek Condo Area | Brush Fire
12 | Muffin Town | Hazardous Facilities
13 | Gulf Oil Tank Farm | Hazardous Facilities
14 | Global Tank Farm | Hazardous Facilities
MAPC
dcr
FEMA Pre-Disaster Mitigation Planning Grant
CHELSEA, MA
Map 8: Local Hazard Areas
Sites
Critical Infrastructure Sites*
Repetitive Loss Sites
* See details in separate table
Locally Identified Hazard Areas
Development Sites
All Roads
Interstate
U.S. Highway
State Route
Street
Train Stations
Commuter Rail Lines
Trains
Subway Lines
Blue
Green
Orange
Red
Silver
0 0.25 0.5 Miles
EVERETT
BOSTON
CHELSEA RIVER
Produced by MAPC Data Services
Date: 4/22/2014

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APPENDIX C
DOCUMENTATION OF PUBLIC PARTICIPATION

Stephen N. Sarikas
Chairperson

City of Chelsea
Conservation Commission
City Hall, Room 101, 500 Broadway
Chelsea, Massachusetts 02150

Tel: (617) 466-4180
Fax: (617) 466-4195

John DePriest, AICP
Conservation Agent

AGENDA

Notice is hereby given in accordance with Section 23A, 23B and 23C, Chapter 39 of the General Laws of the Commonwealth of Massachusetts and the Massachusetts Wetlands Protection Act that a meeting of the Chelsea Conservation Commission will be held on:

Thursday, April 16, 2013, 6:00 PM
City Hall, Rm 101
500 Broadway

I. Call of Roll of Members

II. New Business

Chelsea Housing Authority – Request for Determination of Applicability – Site Improvements, Guam and Burma Road Apartments – PUBLIC MEETING

III. Other Business

Information Session – Draft Natural Hazard Mitigation Plan Update – Sam Cleaves, Metropolitan Area Planning Council – PUBLIC MEETING

IV. Adjournment

Plans and copies of filings may be viewed at the Department of Planning & Development, City Hall, Rm 101, 500 Broadway, Chelsea, MA during regular business hours, 8 AM to 4 PM Monday, Wednesday and Thursday; 8 AM to 7 PM. Tuesdays; and 8 AM to Noon on Fridays.

CITY OF CHELSEA
PLANNING BOARD
Chelsea City Hall
500 Broadway, Room 101
Chelsea, Massachusetts 02150

Tel: (617) 466-4180
Fax: (617) 466-4195

Tuck Willis, Chairman

AGENDA

Notice is hereby given in accordance with Section 23A, 23B and 23C, Chapter 39 of the General Laws of the Commonwealth of Massachusetts and the Massachusetts Zoning Act that a meeting of the Chelsea Planning Board will be held on the following date:

Tuesday, April 23, 2013, at 6:00 p.m.
Chelsea City Hall, Room 102, Conference Room, 500 Broadway, Chelsea, MA

I. **Call to Order**

II. **Approval of Minutes of March 19, 2013**

III. **Information and Comment Session on City of Chelsea Natural Hazard Mitigation Plan (Sam Cleaves, Metropolitan Area Planning Council)**

IV. **New Business**

Case # 2013-06 **158-160 & 162-164 Shawmut Street – The Neighborhood Developers**
PUBLIC MEETING – Special Permit Recommendation
For Special Permit recommendation to demolish a three-family dwelling and a one-story office building and construct a new four (4) unit apartment building with three (3) off-street parking spaces which does not meet the current requirements for off-street parking and requires a Variance for dimensional relief

Case # 2013-07 **117-119 Library Street – Frank Williams**
PUBLIC MEETING – Special Permit Recommendation
For Special Permit recommendation to construct a new six (6) unit dwelling, altering the shape of the former six (6) unit dwelling that was demolished due to a multi-alarm fire, which requires off-street parking space relief and a Variance for dimensional relief

Case # 2013-08 **22 Adams Street – Maria Russo and Richard Schiappa**
PUBLIC MEETING – Special Permit Recommendation
For Special Permit recommendation for a change of a nonconforming use from previous liquor store to a pizza parlor and sandwich shop and construct a 10 foot by 10 foot cooler addition, and which does not meet current requirements for off-street parking and requires a Variance for dimensional relief

Case # 2013-09 **228 Everett Avenue – Geoffrey Reilinger**
PUBLIC MEETING – Special Permit Recommendation
For Special Permit recommendation for a change of a nonconforming use from a dry cleaning use to a laundromat, reducing the square footage of the building from approximately 3,260 s.f. to 2,600 s.f., and which does not meet the current requirements for off-street parking

V. **Other Business/Communications**
VI. **Adjournment**

Plans and copies of filings may be viewed at the City Clerk's Office, City Hall, 500 Broadway, Chelsea, MA during regular business hours, 8:00 a.m. to 4:00 p.m. Monday, Wednesday and Thursday, 8:00 a.m. to 7:00 p.m. Tuesday, and 8:00 a.m. to 12:00 p.m. on Friday.

CITY OF CHELSEA
PLANNING BOARD
Chelsea City Hall
500 Broadway, Room 101
Chelsea, Massachusetts 02150

Tel: (617) 466-4180
Fax: (617) 466-4195

Tuck Willis, Chairman

AGENDA

Notice is hereby given in accordance with Section 23A, 23B and 23C, Chapter 39 of the General Laws of the Commonwealth of Massachusetts and the Massachusetts Zoning Act that a meeting of the Chelsea Planning Board will be held on the following date:

Tuesday, April 22, 2014, at 6:00 p.m.
Chelsea City Hall, Room 102, Conference Room, 500 Broadway, Chelsea, MA

RECEIVED
CITY CLERK'S OFFICE
CHELSEA, MA
2014 MAR 31 P 3:05

I. Call to Order

II. Approval of Minutes of March 25, 2014

III. New Business

Case # 2010-15(B) **155 Sixth Street, Heard Street, Carter Street, Blossom Street, Maple Street, and Bryson Road – Chelsea North LLC**
PUBLIC HEARING – Site Plan Review and Approval
PUBLIC MEETING – Special Permit Recommendation
For a Major Modification of Site Plan approval under Section 34-215 of the Zoning ordinance and a Special Permit recommendation related to a Petition to allow the construction of 222 residential units and 253 off-street parking spaces (Phase II of One North of Boston)

Case # 2014-05 **399 Broadway and 148 Hawthorn Street – Rod Rivera – PUBLIC MEETING – Special Permit Recommendation**
For Special Permit recommendation to alter existing nonconforming structure and add a 15'-4 ½" by 53' (fifteen foot four and one half inch by 53 foot) addition to second and third floor of three story masonry structure to establish four residential units above existing commercial space which does not meet requirements for height, lot size, usable open space, floor area ratio and off-street parking spaces.

IV. Other Business/Communications

- Presentation of Updated Draft Natural Hazard Mitigation Plan for the City of Chelsea by Sam Cleaves, Metropolitan Area Planning Council

V. Adjournment

Plans and copies of filings may be viewed at the City Clerk's Office, City Hall, 500 Broadway, Chelsea, MA during regular business hours, 8:00 a.m. to 4:00 p.m. Monday, Wednesday and Thursday, 8:00 a.m. to 7:00 p.m. Tuesday, and 8:00 a.m. to 12:00 p.m. on Friday.

APPENDIX D
DOCUMENTATION OF PLAN ADOPTION

[To be added to final plan after adoption by the City]