

2014 TOWN OF CHARLEMONT LOCAL MULTI-HAZARD MITIGATION PLAN



MEMA REVIEW DRAFT

Prepared by:

The Charlemont Multi-Hazard Mitigation Planning Committee

Michael Walsh, Charlemont Emergency Management Director

David Cunningham, Charlemont Selectboard

Kenneth Hall, Charlemont Fire Chief

Jared Bellows, Charlemont Police Chief

Gordon Hathaway, Charlemont Highway Superintendent

Dana Johnson, Charlemont Ambulance

and

The Franklin Regional Council of Governments

Peggy Sloan, Director of Planning & Development

Kimberly Noake MacPhee, P.G., Land Use and Natural Resources Program Manager

Alyssa Larose, Land Use Planner

Ryan Clary, Senior GIS Specialist

This project was funded by a grant received from the Massachusetts Emergency Management Agency (MEMA)

Table of Contents

1 - INTRODUCTION	3
Hazard Mitigation.....	3
Planning Process.....	3
Plan Updates and Changes	5
2 – LOCAL PROFILE.....	7
Community Setting.....	7
Infrastructure	7
Natural Resources.....	9
Cultural and Historic Resources.....	10
Community Facilities and Resources	11
3 – HAZARD IDENTIFICATION & ANALYSIS	13
Hazard Identification.....	13
Vulnerability Assessment.....	47
Hazard Analysis Methodology.....	76
Development Trends Analysis	81
4 – MITIGATION STRATEGIES	85
Current Mitigation Strategies	85
Future Mitigation Strategies	119
National Flood Insurance Program Compliance	130
5 – PLAN ADOPTION & IMPLEMENTATION.....	133
Plan Adoption.....	133
Plan Maintenance Process	133
APPENDICES	139
Appendix A: Charlemont zoning bylaws and Subdivision Rules and Regulations	139
Appendix B: Meeting Agendas, Sign In Sheets, & Correspondence	145
Appendix c: Charlemont Select Board Adoption Resolution	154

1 - INTRODUCTION

HAZARD MITIGATION

The Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA) define Hazard Mitigation as any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards such as flooding, storms, high winds, hurricanes, wildfires, earthquakes, and other disasters. Mitigation efforts undertaken by communities will help to minimize damage to buildings and infrastructure, such as water supplies, sewers, and utility transmission lines, as well as natural, cultural and historic resources.

Planning efforts, like the one undertaken by the Town of Charlemont's Multi-Hazard Mitigation Planning Committee and the Franklin Regional Council of Governments (FRCOG), make mitigation a proactive process. Pre-disaster planning emphasizes actions that can be taken before a natural disaster occurs. Future property damage and loss of life can be reduced or prevented by a mitigation program that addresses the unique geography, demography, economy, and land use of a community within the context of each of the specific potential natural hazards that may threaten a community.

Preparing a Local Multi-Hazard Mitigation Plan before a disaster occurs can save the community money and will facilitate post-disaster funding. Costly repairs or replacement of buildings and infrastructure, as well as the high cost of providing emergency services and rescue/recovery operations, can be avoided or significantly lessened if a community implements the mitigation measures detailed in the Plan. Many disaster assistance agencies and programs, including FEMA, require that a community adopt a pre-disaster mitigation plan as a condition for both mitigation funding and disaster relief funding. For example, the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA) and the Community Rating System (CRS), are programs with this requirement.

PLANNING PROCESS

The multi-hazard mitigation planning process for the Town of Charlemont included the following tasks:

- Review of the Charlemont 2005 Local Natural Hazard Mitigation Plan, assessment of relevancy of existing materials, status of action items and addition of new materials based upon MEMA recommendations and Committee input.
- Identifying the hazards that may impact the community, and past occurrences of hazards at the local or regional level.
- Conducting a Vulnerability/Risk Assessment to identify the infrastructure (i.e., critical facilities, public buildings, roads, homes, businesses, etc.) at the highest risk for being damaged by the identified hazards, particularly flooding.

- Identifying and assessing the policies, programs, and regulations Charlemont is currently implementing to protect against future disaster damages. Examples of such strategies include:
 - Preventing or limiting development in natural hazard areas like floodplains, wetlands, drinking water recharge areas, and conservation land;
 - Implementing recommendations in existing planning documents including Community Development Plans, Master Plans, Open Space and Recreation Plans, and Emergency/Evacuation Plans that address the impacts of hazards; and
 - Requiring or encouraging the use of specific structural requirements for new buildings such as buried utilities, flood-proofed structures, and lightning grounding systems.
 - Identifying deficiencies in the current mitigation strategies and establishing goals for updating, revising or adopting new strategies.
 - Identifying specific projects that will mitigate the risk to public safety and damages to infrastructure from hazards.
 - Adopting and implementing the final Multi-Hazard Mitigation Plan.

The planning process for the Town of Charlemont also incorporated the following procedures:

- Providing an opportunity for the public to comment on the plan during the drafting and prior to the approval of the plan. Publicity was done with a press release in the Greenfield Recorder in April 2012, and was posted at the Charlemont Town Hall and on the Charlemont town website. See Appendix B for copies of the flyers and the press release. The final draft plan was made available for public review on-line at www.Charlemont-ma.us, and at the Town Hall.
- Providing an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities and agencies that have the authority to regulate development, and businesses, academia and other private and nonprofit organizations to be involved in the planning process by publicizing the planning process.
- Reviewing and incorporating, if appropriate, information from existing plans, studies, reports and technical information. Plans reviewed and incorporated are cited in footnotes throughout this plan, and in part include:
 - Charlemont Community Development Plan, 2004
 - Town of Charlemont Comprehensive Emergency Management Plan, 2010
- Documenting the planning process, including how it was prepared, and how the public was involved.

Much of this work was carried out by the staff of the FRCOG Planning Department with the assistance of the Charlemont Multi-Hazard Mitigation Planning Committee, which includes the Emergency Management Director, Charlemont Ambulance, Police Department, Fire Department, Highway Department, and Selectboard. The Planning Board reviewed the plan at a Board meeting on July 18, 2013 and provided feedback that was incorporated into the final plan. Meeting minutes, sign in sheets and other correspondence are located in the appendix of this document.

PLAN UPDATES AND CHANGES

As indicated above in the Planning Process section, changes and updates were made to this Plan based upon MEMA recommendations and Committee input. The following sections of the Charlemont 2005 Local Natural Hazard Mitigation Plan were added to and/or substantially updated to create the 2012 Charlemont Multi-Hazard Mitigation Plan:

- **Section 2: Local Profile**
 - Cultural and Historic Resources section added pp. 10-12
- **Section 3: Hazard Identification and Analysis**
 - Hazard Identification
 - Drought and Extreme Temperatures added13
 - Location and Extent for Each Hazard added pp.14-35
 - Beaver Dams (Sub-Category of Dam Failure) added pp.26-28
 - Landslides added..... pp.29-30
 - Ice Jams added pp.30-31
 - Manmade Hazards added..... pp.31-35
 - Vulnerability Assessment
 - Assessment by Hazard – detailed section for each hazard added
 - Exposure pp.36-61
 - Damages..... pp.36-61
 - Loss estimates pp.36-61
 - Population impacts..... pp.36-61
 - Data deficiencies pp.36-61
 - Development Trends Analysis..... pp.67-68
 - Current Zoning Map added.....p.70
 - Updated Critical Facilities and Infrastructure Map added.....p.71
 - Hazard Analysis Methodology
 - New Methodology developed pp.62-65
 - All Hazards Vulnerability Assessment Table addedp.66
- **Section 4: Mitigation Strategies**
 - Current Mitigation Strategies were added for new hazards
 - Landslides pp.109-111
 - Ice Jams.....p.112
 - Manmade Hazards pp.113-114
 - Future Mitigation Strategies
 - Prioritization of Hazards added 119
 - Identification of Most Important Hazards added 120
 - Goal Statement and Action Items updated..... 121
 - 2005 Action Items Completed added..... 121
 - Prioritization of Action Items added..... 121-123
 - Prioritized Action Plan in new table format with Potential Funding Sources added 124-128
 - Preparedness and Response Action Plan added..... 128-129

- NFIP Community Rating System (CRS) and additional NFIP info added.....130
- **Section 5: Plan Adoption and Implementation**
 - Implementation Schedule.....133
 - New Potential Funding Sources Table added 134-137

DRAFT

2 – LOCAL PROFILE

COMMUNITY SETTING

Charlemont is located at the foot of the Berkshire Hills between the towns of Greenfield and North Adams. The area's abundant fishing and woodland resources are believed to have made it attractive to Native Americans. The Mohawk Trail, a regional corridor for Native Americans, cuts through the town.

European settlement of the town began in 1740. Farming dominated the town's economy, although the power of the Deerfield River was used for mill operations. The town's population grew significantly during the Federal Period, with the development of two commercial village centers – Charlemont Center and East Charlemont.

During the end of the 19th and beginning of the 20th centuries, mining operations also became important in Charlemont. Small manufacturers and commercial enterprises also prospered during this time. The town was serviced by the Troy and Greenfield Railroad beginning in 1868 and the Hoosac Tunnel was opened in 1875.

Over the past fifty years, the town's economy has shifted from agriculture and industry to tourism and recreation, due mostly to the construction of Route 2 and the automobile's rise in popularity. Second home owners, drawn by the abundant natural beauty of the town, are a growing presence. Skiing, whitewater rafting and other outdoor activities are complemented by the lodging and restaurant industries. In 2010 the population of Charlemont was 1,266, a decrease of -6.8% from 2000 when the population was 1,358.¹

According to the 2005 MassGIS Land Use Data, the total land area of Charlemont is approximately 16,859 acres with roughly 84% of town classified as forested. Agricultural uses (cropland, pasture, orchard, and nursery) make up approximately 1,254 acres or 7.4% of the total land in town. Residential use makes up approximately 549 acres (3.3%).

INFRASTRUCTURE

Charlemont's geography has been a major factor in the development of its infrastructure. The Deerfield River is the dominant natural feature in the town, and has served to guide the economy, growth and commercial opportunities of Charlemont.

Roads and Highways

The major arteries running through Charlemont are Route 2 and Route 8A, which connect Charlemont with nearby towns and urban centers. On the town's southeast corner, Route 112

¹ 2000 and 2010 U.S. Census.

links Charlemont to the Town of Buckland. The closest access to I-91, Franklin County's major north/south route, is in Greenfield.

About sixteen miles (24 percent) of Charlemont's roads are gravel. The town has a total of 66 miles of roads.²

Rail

The Pan Am Rail System runs through Charlemont but does not serve the freight needs of the town.

Public Transportation

The Franklin Regional Transit Authority (FRTA) operates fixed route service between Greenfield and Charlemont on weekdays. The FRTA also has weekly demand response door-to-door transit service for seniors and the disabled for a small fee.

Public Drinking Water Supply

The Town of Charlemont does not have a municipal water supply. Private wells or springs serve all residences and businesses. The Department of Environmental Protection identifies nineteen public water supply systems in the Town of Charlemont, one of which is a community system and two of which are nontransient, noncommunity public water supply systems.³ Data layers provided by MassGIS show the western portion of town as being the location of a high yield aquifer, which could be a potential future water supply.

Sewer Service

The Town of Charlemont has a wastewater treatment facility that serves approximately 400 – 450 people in Charlemont Center. It is a recirculating sand filter facility with a design capacity of 50,000 gallons per day.⁴ The wastewater treatment facility composts its sludge and discharges its effluent to the Deerfield River. The Charlemont Sewer District is not designed to accommodate uses that would require an extension of its collection system or its storage and filtration capacity. The ordinance authorizing designation of the District does not allow for its boundaries to expand and there is not enough land surrounding the wastewater treatment facility to allow for an expansion of the holding tanks or sand filters. However, the district is designed to allow for limited increases in wastewater treatment needs for existing uses. Currently, the facility is treating wastewater at 50% of its design capacity⁵. When a wastewater treatment facility operates at 80% of its design capacity, the Massachusetts Department of Environmental

² MassDOT 2007.

³ Woodland Park is a community water supply system. The Academy at Charlemont and Hawlemont Regional School are non-transient, non-community systems. The remaining 16 systems are in various businesses across town. As is shown on the Critical Facilities, Infrastructure, 1999 Land Use & Natural Hazards Map for the Town of Charlemont, some systems can have more than one source.

⁴ Source: Sewer District personal communication, April 2011

⁵ Ibid.

Protection (DEP) requires the facility to pursue changes to the system to increase its design capacity.

Other parts of the town are served by private septic systems.

Schools

Public schools serving Charlemont include Hawlemont Regional School located within the town, and Mohawk Trail Regional High School in Buckland. The Academy at Charlemont is a private school located within town.

NATURAL RESOURCES

Charlemont's most noteworthy natural feature is the Deerfield River, which runs through the length of the town. The Deerfield River Valley offers the majority of the town's agricultural land. Steep hills rise on either side of the river, with the highest elevations in the southwestern and northeastern corners of town. Pocumtuck Mountain, at 1,872 feet, is the town's highest point. The highest elevation in Charlemont is mainly covered with forest, highly suitable for recreation and wildlife and sparsely developed.

Water Resources

Charlemont lies in the Deerfield River Watershed, a part of the larger Connecticut River Watershed. Charlemont has about 145 acres covered by forested and non-forested wetlands, which are fed by nearby brooks and rivers.⁶ Wetlands are essential for promoting water quality and biodiversity of both plant and animal species. The town also has a fairly substantial amount of open water within its borders⁷ (approximately 309 acres). The rivers and wetlands in Charlemont are buffered in accordance with the Massachusetts Wetlands Protection Act. The Deerfield River is supportive of recreational use.

There are a number of other surface water resources in Charlemont, including over twenty brooks, which drain into the Deerfield River along both banks.

Forest Resources⁸

Forests constitute one of the most important natural resources in the Town of Charlemont and the region. The Commonwealth of Massachusetts owns 1,902 acres (MassGIS) of forestland as part of the Mohawk Trail State Forest in the western half of Charlemont. The Department of Conservation and Recreation oversees this forestland and approximately 6,500 acres in the neighboring Towns of Savoy, Florida and Hawley. Other protected open space and natural resources in the region include Savoy Mountain State Forest in Savoy, Kenneth Dubuque State Forest in Hawley, and Catamount State Forest in Colrain.

⁶ 2005 MassGIS Land Use Data.

⁷ This includes the Deerfield and Cold rivers as well as various brooks and streams.

⁸ This section was excerpted from the 2004 Charlemont Open Space and Recreation Plan.

CULTURAL AND HISTORIC RESOURCES

The importance of integrating cultural resource and historic property considerations into hazard mitigation planning is demonstrated by disasters that have occurred in recent years, such as the Northridge earthquake in California, Hurricane Katrina in New Orleans, or floods in the Midwest. Closer to home, the June 1, 2011 tornado, which ripped through Springfield, Monson and other towns in Hamden and Worcester Counties, caused injuries, loss of life and widespread damages to historic properties. The effects of a disaster can be extensive—from human casualties to property and crop damage to the disruption of governmental, social, and economic activity. Often not measured, however, are the possibly devastating impacts of disasters on historic properties and cultural resources. Historic structures, artwork, monuments, family heirlooms, and historic documents are often irreplaceable, and may be lost forever in a disaster if not considered in the mitigation planning process. The loss of these resources is all the more painful and ironic considering how often residents rely on their presence after a disaster, to reinforce connections with neighbors and the larger community, and to seek comfort in the aftermath of a disaster.⁹

Historic properties and cultural resources can be important economic assets, often increasing property values and attracting businesses and tourists to a community. While preservation of historic and cultural assets can require funding, it can also stimulate economic development and revitalization. Hazard mitigation planning can help forecast and plan for the protection of historic properties and cultural resources.

Cultural and historic resources help define the character of a community and reflect its past. These resources may be vulnerable to natural hazards due to their location in a potential hazard area, such as a river corridor, or because of old or unstable structures. The 2010 Charlemont Comprehensive Emergency Management (CEM) Plan identifies cultural resources in Charlemont, some of which contain historic documents and cultural artifacts (Table 2-1).

Table 2-1: 2010 Charlemont CEM Plan Cultural Resources

Resource Name	Resource Location	Resource Type
“Hail to the Sunrise” Monument	Zoar Road	Outdoor sculpture
Bissell Bridge	North Heath Road	Covered bridge
Charlemont Fairgrounds	Park Street	Fairgrounds
Charlemont Town Hall	157 Main Street	Archives; Historical building
Little Red School House	Route 2	Not identified
Tyler Memorial Hall	Main Street	Library

Source: 2010 Charlemont CEM Plan.

Charlemont Village is listed on the National Register of Historic Places. The district, located on Main Street in the center of town, is comprised of 500 acres with 87 buildings. This designation does not provide any protective measures for the historic resources, but designated sites may qualify for federal and state funding if damaged during a natural or manmade hazard.

⁹ Integrating Historic Property and Cultural Resource Considerations Into Hazard Mitigation Planning, State and Local Mitigation Planning How-To Guide, FEMA 386-6 / May 2005.

Flooding of the Deerfield River during Tropical Storm Irene on August 27 and 28, 2011 caused damage to some structures in downtown Charlemont, though the village was largely spared from damage.

COMMUNITY FACILITIES AND RESOURCES

It is important for communities to determine which areas or specific populations in their community may need special attention in times of an emergency. In addition to the infrastructure previously described, these critical facilities are identified on the 2012 Critical Facilities and Infrastructure Map on page 84.

Critical Facilities

A community's critical facilities include important municipal structures (i.e., town hall), emergency service structures (i.e., municipal public safety complex, shelters, and medical centers), and locations of populations that may need special assistance (i.e., nursing homes, day cares, schools, prisons) and major employers or other areas where there is a dense concentration of people. The 2010 Charlemont Comprehensive Emergency Management Plan identifies the following facilities as either public venues, special institutions, critical infrastructure, or shelters: Hawlemont Regional Elementary School, Charlemont Academy, Berkshire East Ski Center, Charlemont Fairgrounds, Charlemont Federated Church, Country Aire Campground, Crab Apple Whitewater Rafting, Mohawk Park Family Campground, Mohawk Trail State Forest, Moxie Outdoor Adventures, Zoar Outdoor Whitewater Rafting, Charlemont DPW, Charlemont Police Station, Charlemont Fire Department, and Charlemont Town Hall.

Multi-Hazard Emergency Shelters

The Comprehensive Emergency Management (CEM) Plan for Charlemont was last updated in August 2010 by town officials and the Massachusetts Emergency Management Agency. The document "outlines an emergency management program for planning and response to potential emergency or disaster situations," which includes emergency shelters to accommodate victims of disaster events. The Charlemont CEM Plan identifies two shelters within town: the Hawlemont Regional Elementary School in the village center, and the Charlemont Academy located on Route 2. The Greenfield Community College (GCC), located in Greenfield, is also identified as a shared shelter facility, however the Town does not have formal agreements with the college to use the facility as a shelter. According to the Committee, the use of GCC as a shelter is not likely practical, since the only access from Charlemont to the school is along Route 2. A number of scenarios could make Route 2 impassable, including flooding, dam failure, or forest fire.

According to the plan, neither of the identified facilities within town has a back-up generator on-site. Additionally, the Hawlemont School is within the 100-year floodplain of the Deerfield River, while the Charlemont Academy is directly adjacent to the Deerfield River floodplain. Both shelters are accessed via Route 2, which runs parallel to the Deerfield River throughout Charlemont, sections of which are located within the floodplain. In the event of a major flood along the river, these shelters could be inundated, or inaccessible due to road conditions on

Route 2. No shelters are identified south of the Deerfield River for residents on that side of the river. The Town is currently researching alternative locations for shelters.

Flooding on the Deerfield River during Tropical Storm Irene on August 27 and 28, 2011, reached the Hawlemont School and the Fire Station, which was being used as an Emergency Operations Center (EOC). The EOC was moved to the Town Hall, while evacuees seeking shelter were temporarily housed in the Charlemont Federated Church in the village center, though for a time it looked like flood waters might force the shelter to be moved to even higher ground. After the storm, town officials began discussions of identifying a new shelter and EOC further from the floodplain for flooding events. Improving communications between response agencies, and between town officials and the public, is also being explored.¹⁰ At this point mobile radio is available, with a power pack based at the Fire Station.

The Committee should periodically review the available shelters to determine each shelter's potential occupancy, accessibility via evacuation routes, susceptibility to hazards (such as floods and high winds), access to back-up utilities, and available supplies. The Town uses bull horns and sirens, Connect-CTY, door-to-door, radio and cable television, and Shelburne Control as notification methods to alert residents of emergency conditions and to provide instructions.

¹⁰ "Charlemont Reviews Emergency Planning." *The Recorder*, November 3, 2011.

3 – HAZARD IDENTIFICATION & ANALYSIS

HAZARD IDENTIFICATION

Historical research, conversations with the Committee and other local officials and emergency management personnel, available hazard mapping and other weather-related databases were used to identify the natural hazards which are most likely to have an impact on the Town of Charlemont. It should be noted that because different sources of data are used for various hazards, the year of most recent information available may vary from one hazard to another. In all cases the most recent information available at the time that data collection began for this update in January 2012 was used.

Two hazards, drought and temperature extremes, historically have not been significant hazards for Charlemont. These hazards are no more likely to occur in Charlemont than elsewhere in the state. Therefore, drought and extreme temperatures were not covered in detail in this plan, other than a summary of these two hazards, which is presented, below.¹¹ For more information on these hazards, please refer to the recently updated Massachusetts State Hazard Mitigation Plan (2013).¹²

Drought is a period characterized by long durations of below normal precipitation. Drought conditions occur in virtually all climatic zones yet its characteristics vary significantly from one region to another, since it is relative to the normal precipitation in that region. Drought can affect agriculture, water supply, aquatic ecology, wildlife, and plant life. The Commonwealth of Massachusetts is often considered a ‘water-rich’ state. Abundant precipitation results from frontal systems or storms that move across the continent and exit through the Northeast. Under normal conditions, regions across the state annually receive between 44 and 47 inches of precipitation.

There is no universal definition for extreme temperatures. The term is relative to the usual weather in the region based on climatic averages. Extreme heat, for this climatic region, is usually defined as a period of 3 or more consecutive days above 90 °F, but more generally a prolonged period of excessively hot weather, which may be accompanied by high humidity. Extreme cold, again, is relative to the normal climatic lows in a region. Temperatures that drop decidedly below normal and wind speeds that increase can cause harmful wind-chill factors. The wind chill is the apparent temperature felt on exposed skin due to the combination of air temperature and wind speed. Massachusetts has four well-defined seasons. The seasons have several defining factors, with temperature one of the most significant. Extreme temperatures can be defined as those that are far outside of the normal ranges for Massachusetts.

¹¹ Adapted from the 2010 Massachusetts State Hazard Mitigation Plan.

¹² <http://www.mass.gov/eopss/agencies/mema/hazard-mitigation/planning/planning-and-the-state-hazard-mitigation-plan.html>

Flooding

General Description

The average annual precipitation for Charlemont and surrounding areas is 47 inches (2010 data).¹³ There are three major types of storms that bring precipitation to Charlemont. Continental storms that originate from the west continually move across the region. These storms are typically low pressure systems that may be slow-moving frontal systems or more intense, fast-moving storms. Precipitation from coastal storms, also known as nor'easters because the winds come from the northeast, that travel into New England from the south constitute the second major storm type. In the late summer or early fall, the most severe type of these coastal storms, hurricanes, may reach Massachusetts and result in significant amounts of rainfall. The third type of storm is the result of local convective action. Thunderstorms that form on warm, humid summer days can cause locally significant rainfall.

Floods are classified as either *flash floods*, which are the product of heavy, localized precipitation in a short time period over a given location or *general floods*, which are caused by precipitation over a longer time period in a particular river basin. Another type of flooding experienced in the area is known locally as *backwater flooding* due to ice jams on the Connecticut River and other rivers in the regions. There are several local factors that determine the severity of a flooding event, including: stream and river basin topography, precipitation and weather patterns, recent soil moisture conditions, amount of impervious surface area, and the degree of vegetative clearing. Floods occur more frequently and are the most costly natural hazard in the United States.

Flash flooding events typically occur within minutes or hours after a period of heavy precipitation, after a dam or levee failure, or from a sudden release of water from an ice jam. Most often, flash flooding is the result of a slow-moving thunderstorm or the heavy rains from a hurricane. In rural areas, flash flooding often occurs when small streams spill over their banks. However, in urbanized areas, flash flooding is often the result of clogged storm drains (leaves and other debris) and the higher amount of impervious surface area (roadways, parking lots, roof tops).

In contrast, *general flooding* events may last for several days. Excessive precipitation within a watershed of a stream or river can result in flooding particularly when development in the floodplain has obstructed the natural flow of the water and/or decreased the natural ability of the groundcover to absorb and retain surface water runoff.

A floodplain is the relatively flat, lowland area adjacent to a river, lake or stream. Floodplains serve an important function, acting like large “sponges” to absorb and slowly release floodwaters back to surface waters and groundwater. Over time, sediments that are deposited in floodplains develop into fertile, productive farmland like that found in the Connecticut River Valley. In the past, floodplain areas were also often seen as prime locations for development. Industries were located on the banks of rivers for access to hydropower. Residential and commercial development occurred in floodplains because of their scenic qualities and proximity to the water.

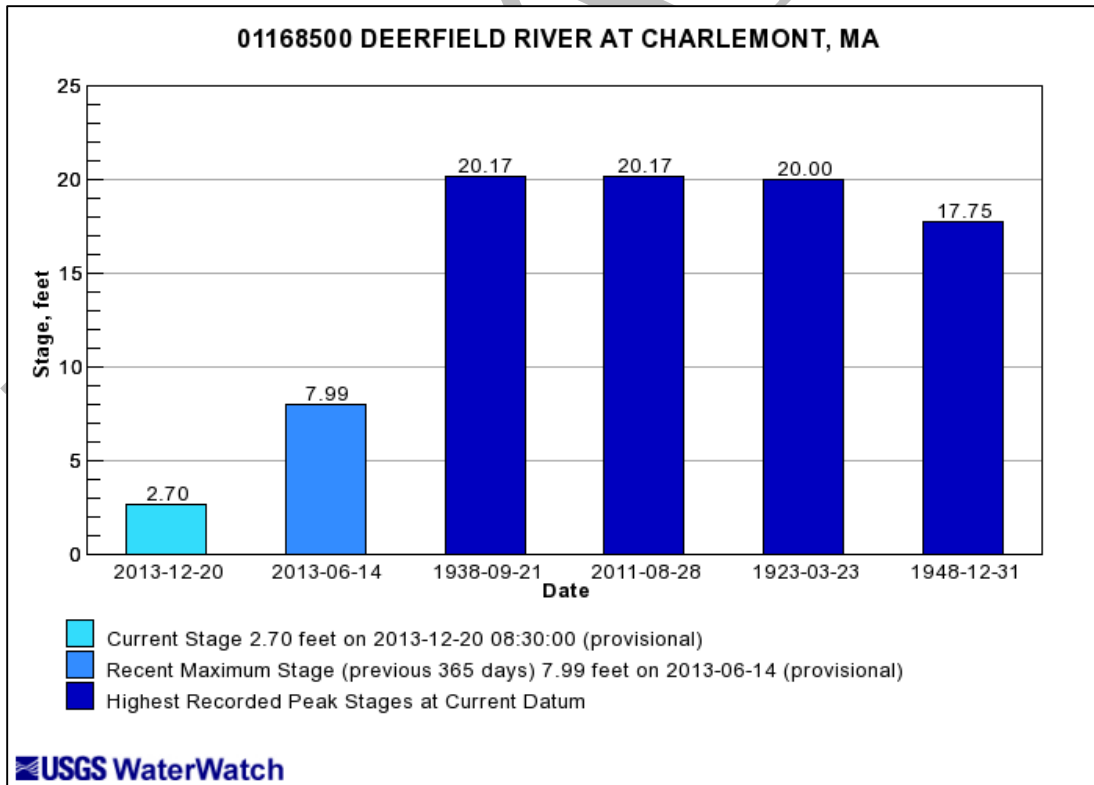
¹³ Massachusetts Department of Conservation and Recreation precipitation data, <http://www.mass.gov/eea/agencies/dcr/water-res-protection/water-data-tracking/rainfall-program.html>.

Although periodic flooding of a floodplain is a natural occurrence, past and current development and alteration of these areas will result in flooding that is a costly and frequent hazard.

Fluvial erosion hazard (FEH) zones are areas along rivers and streams that are susceptible to bank erosion caused by flash flooding. Any area within a mapped FEH zone is considered susceptible to bank erosion during a single severe flood or after many years of slow channel migration. While the areas of the FEH zones often overlap with areas mapped within the 100-year floodplain on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), the FIRMs only show areas that are likely to be inundated by floodwaters that overtop the riverbanks during a severe flood. However, much flood-related property damage and injuries is the result of bank erosion that can undermine roads, bridges, building foundations and other infrastructure. Consequently, FEH zones are sometimes outside of the 100-year floodplain shown on FIRMs. FEH zones can be mapped using fluvial geomorphic assessment data as well as historic data on past flood events. Both the FIRMs and FEH maps should be used in concert to understand and avoid both inundation and erosion hazards, respectively.¹⁴

Location and Extent

Franklin County has several major rivers and numerous tributaries which are susceptible to flood events. The major rivers in the region include the Connecticut, the Deerfield, and the Millers, with the Deerfield River running through Charlemont. The graph below shows the four highest recorded peak flooding events on the Deerfield River at Charlemont. The most recent event was recorded on August 28, 2011, during Tropical Storm Irene.



Source: http://waterwatch.usgs.gov/index.php?r=ma&id=ww_flood

¹⁴ Ammonoosuc River Fluvial Erosion Hazard Map for Littleton, NH. Field Geology Services, 2010.

Table 3-1 shows occurrences of flooding in Franklin County since 1993.

Table 3-1: Flood Events in Franklin County Since 1993

Year	# of Flood Events	Annual Property Damage	Annual Crop Damage
2013	0	\$0	\$0
2012	2	\$0	\$0
2011	8	\$22,375,000	\$0
2010	1	\$150,000	\$0
2009	0	\$0	\$0
2008	3	\$38,000	\$0
2007	1	\$250,000	\$0
2006	0	\$0	\$0
2005	5	\$11,435,000	\$0
2004	2	\$10,000	\$0
2003	1	\$10,000	\$0
2002	0	\$0	\$0
2001	1	\$0	\$0
2000	1	\$0	\$0
1999	0	\$0	\$0
1998	4	\$75,000	\$0
1997	0	\$0	\$0
1996	11	\$1,800,000	\$0
1995	3	\$0	\$0
1994	2	\$0	\$0
1993	5	\$0	\$0
Total # of Years	Total # of Flood Events	Average Annual Property Damage	Average Annual Crop Damage
21	50	\$720,860	\$0

Source:

http://www.ncdc.noaa.gov/stormevents/listevents.jsp?beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1996&endDate_mm=06&endDate_dd=30&endDate_yyyy=2013&eventType=%28C%29+Flood&county=FRANKLIN&zone=ALL&submitbutton=Search&statefips=25%2CMASSACHUSETTS#

In October 2005, rains from Tropical Storm Tammy and a subtropical depression caused severe flooding in New England, with Massachusetts sustaining \$6.5 million in damages. A trailer park in Greenfield was destroyed, leaving 70 people homeless. Roads were washed out as more than 20 inches of rain fell on some areas of the region.

On July 16, 2000, showers and thunderstorms dumped torrential rainfall along the east slopes of the Berkshires, with many areas receiving 2 to 4 inches of rain. In the northern part of Franklin County near the Vermont border, radar estimated nearly 9 inches of rain, most of which fell in less than 8 hours. Severe flash flooding resulted in the towns of Heath and Rowe, where more than a dozen roads were either partially or completely washed out. Over 50 campers were

successfully evacuated from campgrounds in neighboring Charlemont. No damages were reported from this event.¹⁵

On August 27 and 28 2011, Tropical Storm Irene brought heavy rain to the region, causing extensive and long term damage to a number of Franklin County towns. According to the National Weather Service, up to 9.92 inches of rain fell during the storm, though amounts varied significantly across Franklin County. Rivers, streams, and brooks throughout the county reached and surpassed flood levels. Rising water gathered debris that clogged culverts, roads and bridges were washed out, and homes and businesses were flooded, and in some cases, literally washed downriver. After the storm, Franklin, Berkshire, Hampshire and Hampden Counties were declared a disaster area by President Barack Obama, freeing up federal funds to assist towns with emergency work and road, bridge, and facility repairs. Up to 75 percent of repair costs can be covered by federal funds, as well as the cost of approved hazard mitigation efforts.

FEMA preliminary damage assessment (PDA) from the storm totals a cost of \$27,713,911 statewide for municipal public damage, not including damage incurred by state-owned infrastructure. Franklin County's PDA estimates a total of \$22,816,077 in damages, or 82% of the cost of all local public damage statewide. At the writing of this plan, these are very rough preliminary estimates of the total cost of the storm. More detailed numbers will become available as FEMA analyzes the particular damage in each town.

During Tropical Storm Irene, the Deerfield River set a new flood record at 23.8 feet, greatly surpassing the previous record of 17.7 feet, set in April of 1987.¹⁶ Damages in Charlemont included the Hawlemont School, where the boiler room was flooded and the property was covered with mud from the river, the Indian Plaza building on Route 2 was inundated with water and mud from the river, causing the business to cancel all of its scheduled Native American powwow events for the remainder of the year. Zoar Outdoor, located just west of the village center, suffered damage to a storage shed and some whitewater rafting equipment. Significant damage occurred along Route 2 towards the western border of town, where a seven mile section was closed to traffic from the time of the storm until December 2011.¹⁷ In addition to Route 2, the Tower Road Bridge was closed, as well as several other sections of roadway in town. Rice Energy lost over 100 propane bottles, and the wastewater sewer facility was submerged in water. The NOAA Climatic Data Center did not provide damage estimates for Charlemont, however the Committee provided a damage estimate of \$107,000 as of April 2012, for damages to public facilities. Private property damages have not been assessed yet. **[Committee working on obtaining an updated figure]**

Table 3-2 below provides information on recent flood events in Charlemont.

¹⁵ NOAA Climatic Data Center: <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

¹⁶ National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

¹⁷ "Hawlemont School won't Open for Weeks." *The Recorder*, September 1, 2011; "Man swims in door to rescue friend on Route 2 in Charlemont," *The Recorder*, August 31, 2011; "Route 2 a 'no-go,'" *The Recorder*, September 1, 2011.

Table 3-2: Flood Events in Charlemont 1991-2013¹⁸

Date	Type	Property Damage	Crop Damage	Excerpts from storm details for Charlemont only
8/28/2011	Heavy rain/ Tropical Storm	\$0	\$0	After receiving six to eight inches of rain associated with Tropical Storm Irene, the Deerfield River flooded, closing portions of Route 2 in Charlemont.
8/4/2012	Flood	\$0	\$0	Route 2 was flooded with 2 feet of water. Firefighters trying to get to the Rowe Elementary School in Rowe were delayed due to the flooding.

Source: <http://www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwevent~ShowEvent~260419> (previous query) and http://www.ncdc.noaa.gov/stormevents/listevents.jsp?beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1996&endDate_mm=08&endDate_dd=31&endDate_yyyy=2013&eventType=%28C%29+Flood&county=FRANKLIN&zone=ALL&submitbutton=Search&statefips=25%2CMASSACHUSETTS (accessed 12/20/2013).

In Charlemont, the 100-year floodplain covers about 815 acres, or approximately 5 percent of the town, including an estimated 22 acres of developed residential land.¹⁹ In addition to the 100-year floodplain, there are a number of streams in Charlemont with the potential to cause localized flooding. The 2010 Charlemont CEM Plan identifies the area within 200 feet of the Deerfield River as a flood prone area in town.

Other key areas of concern that experience chronic flooding include the southern, flat section of Legate Hill Road, and sections of Route 2.

See the Critical Facilities and Infrastructure map on page 84 for locations of chronic flooding.

Severe Winter Storms

General Description

Severe winter storms can pose a significant risk to property and human life because the rain, freezing rain, ice, snow, cold temperatures and wind associated with these storms can disrupt utility service, phone service and make roadways extremely hazardous. Severe winter storms can be deceptive killers. The types of deaths that can occur as a result of a severe winter storm include: traffic accidents on icy or snow-covered roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to cold temperatures. Infrastructure and other property are also at risk from severe winter storms and the associated flooding that can occur following heavy snow melt. Power and telephone lines, trees, and telecommunications structures can be damaged by ice, wind, snow, and falling trees and tree limbs. Icy road conditions or roads blocked by fallen trees may make it difficult to respond promptly to medical emergencies or fires. Prolonged, extremely cold temperatures can also cause inadequately insulated potable water lines and fire sprinkler pipes to rupture and disrupt the delivery of drinking water and cause extensive property damage.

¹⁸ The NOAA database is undergoing its 3rd upgrade. 18 event(s) were reported between 01/01/1996 and 08/31/2013 (6453 days). Website accessed November 2013.

¹⁹ 2005 MassGIS land use data.

Severe winter storms can include blizzards, heavy snow, sleet, freezing rain and ice storms. A blizzard is a severe snowstorm characterized by strong winds and low temperatures. The difference between a blizzard and a snowstorm is the strength of the wind. To be a blizzard, a snow storm must have sustained winds or frequent gusts that are greater than or equal to 56 km/h (35 mph) with blowing or drifting snow which reduces visibility to 400 meters or a quarter mile or less and must last for a prolonged period of time — typically three hours or more.²⁰ Snowfall amounts do not have to be significant. A severe blizzard has winds over 72 km/h (45 mph), near zero visibility, and temperatures of -12°C (10°F) or lower. A ground blizzard has snowdrifts and blowing snow near the ground, but no falling snow.²¹ Blizzards can bring near-whiteout conditions, and can paralyze regions for days at a time, particularly where snowfall is unusual or rare. Freezing Rain is rain that falls as a liquid but freezes into glaze upon contact with the ground.²² Heavy Snow generally means snowfall accumulating to 4" or more in depth in 12 hours or less; or snowfall accumulating to 6" or more in depth in 24 hours or less.²³ Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Heavy sleet is a relatively rare event defined as an accumulation of ice pellets covering the ground to a depth of approximately $\frac{1}{2}$ " or more.²⁴ The term ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice make walking and driving extremely dangerous. Significant ice accumulations are usually accumulations of approximately $\frac{1}{4}$ " or greater.²⁵

Location and Extent

Franklin County regularly experiences severe winter storm events between the months of December and April. **The entire town of Charlemont is equally susceptible to severe winter storms.** According to the National Climatic Data Center (NCDC), there have been a total of 115 snow and ice events reported in Franklin County between February 1993 and February 2013, including heavy snow, snow, ice storms, snow squalls, freezing rain and winter storms.²⁶ The NCDC web site has more detailed information about each of the listed storms. Twelve out of the 115 snow and ice events that impacted Franklin County (as well as other areas of Massachusetts) resulted in Presidential Disaster Declarations or Emergency Declarations, which then made the state, residents and businesses eligible for federal disaster relief funds. **Table 3-3 lists the twelve recent severe winter disasters and other events that have led to Presidential Disaster or Emergency Declarations in Massachusetts.**

²⁰ <http://w1.weather.gov/glossary/index.php?letter=b>

²¹ <http://www.britannica.com/EBchecked/topic/69478/blizzard>

²² <http://w1.weather.gov/glossary/index.php?letter=f>

²³ <http://w1.weather.gov/glossary/index.php?letter=h>

²⁴ <http://w1.weather.gov/glossary/index.php?letter=s>

²⁵ <http://w1.weather.gov/glossary/index.php?letter=i>

²⁶ <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

Table 3-3: Major Disaster and Emergency Declarations in Massachusetts, 1993 - 2009

Disaster Name	Date of Event	Declared Areas	Disaster #/ Type of Assistance	Federal Share Disbursed
Blizzards, High Winds and Record Snowfall	March 1993	All 14 Counties	FEMA-3103-EM (PA)	\$1,284,873
Blizzard	January 1996	All 14 Counties	FEMA-1090-EM (PA)	\$16,177,860
Snowstorm	March 2001	Counties of Berkshire, Essex, Franklin, Hampshire, Middlesex, Norfolk, and Worcester. The cost share is 75% federal and 25% local.	FEMA-3165-EM (PA)	\$21,065,441
Snowstorm	February 2003	All 14 Counties. The cost share is 75% federal and 25% local.	FEMA-3175-EM (PA)	\$28,868,815
Snowstorm	December 2003	Counties of Barnstable, Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, and Worcester	FEMA-3191-EM (PA)	\$35,683,865
Snowstorm	January 2005	All 14 Counties	FEMA-3201-EM (PA)	\$49,945,087
Severe Winter Storm	December 2008	Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Suffolk, and Worcester *(Figure as of 9/8/2009)	FEMA-3296-EM-MA	\$66,509,713
Severe Storms and Flooding	December 2008	5 counties (Berkshire, Franklin, Hampden, Hampshire, and Worcester Counties)	FEMA-1813-DR-MA(PA)	\$32,058,172
Severe Winter Storm and Snowstorm	January 2011	Berkshire, Essex, Hampshire, Middlesex, Norfolk, Suffolk and Hampden Counties	FEMA-1959-DR (PA)	\$1,050,102
Tropical Storm Irene	August 27-29, 2011	Berkshire, Franklin, Hampden, Hampshire, Norfolk, Bristol, Plymouth, Barnstable, Martha's Vineyard, and Nantucket Counties	FEMA-4028-DR	\$26,620,515
Severe Storm and Snowstorm	October 2011	Berkshire, Franklin, Hampden, Hampshire, Middlesex, and Worcester Counties	FEMA-4051-DR (PA)	\$71,927,443 (obligated)
Severe Winter Storm, Snowstorm and Flooding	February 8-9, 2013	All 14 Counties	FEMA-DR-4110	\$16,474,989 (obligated)

Notes: **Public Assistance (PA) Project grants.** Supplemental disaster assistance to states, local governments, certain private non-profit organizations resulting from declared major disasters or emergencies.

Although ice storms occur much less frequently than snow storms (4 out of 115 in the NCDC database), the effects can be devastating. On December 11, 2008, Franklin County residents

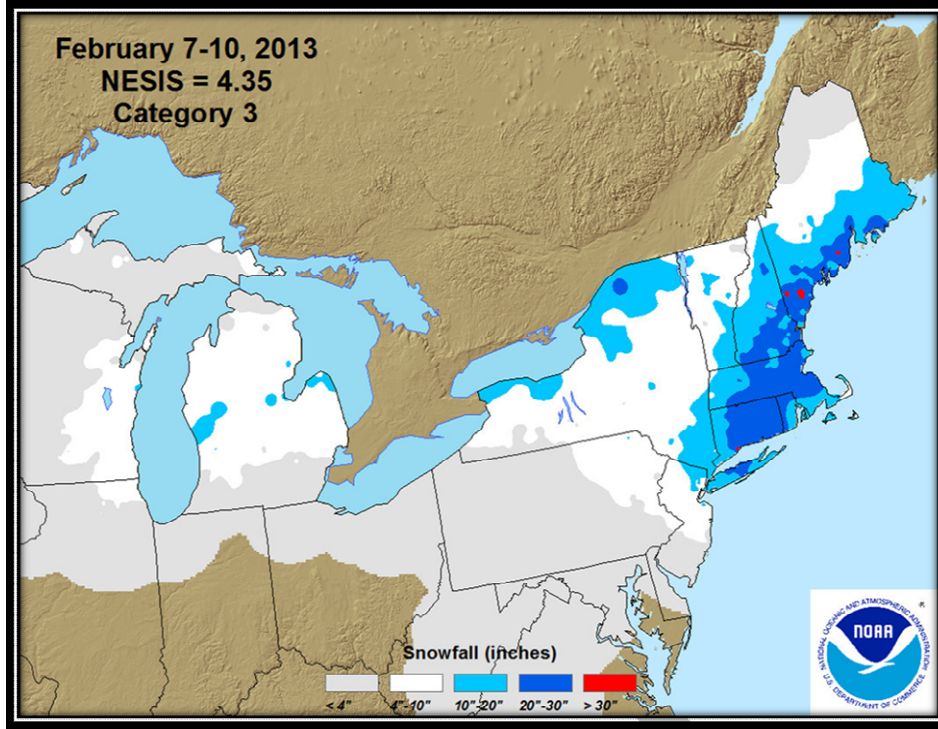
awoke to a landscape coated with ice. Half an inch of ice accumulated on exposed surfaces across Franklin County. This major ice storm affected interior Massachusetts and southern New Hampshire as well as much of northern New England. The ice buildup on exposed surfaces combined with breezy conditions resulted in numerous downed trees, branches, and power lines, which resulted in widespread power outages. More than 300,000 customers were reportedly without power in Massachusetts and an additional 300,000 were without power in the state of New Hampshire. Because of the breadth of this storm (from Pennsylvania to Maine), extra crews to reinstate power were harder to come by. Power crews from states as far away as South Carolina, as well as local National Guard teams, were called out to help with power restoration and clean up. While most people had their power restored within a week, others were still without power at Christmas (nearly 2 weeks later).

During this period, temperatures were mostly below normal and at least one major snowstorm affected the same area. At the time of the December 19th snowstorm, which dumped 7 – 12 inches of snow in eastern Franklin County and 9 – 14 inches of snow in western part of the county, over 100,000 customers were still without power in the two states combined. Two days later, on December 21st, 5 – 7 inches of new snow blanketed eastern Franklin County.

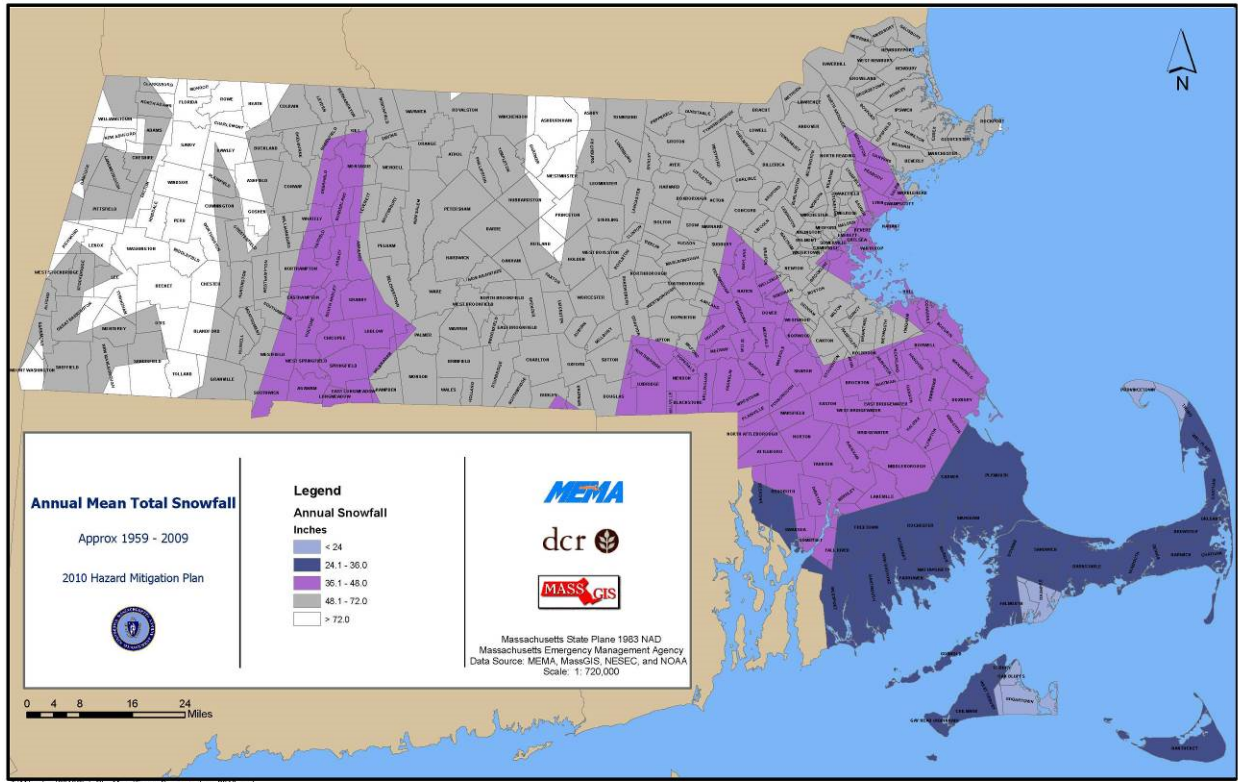
Not all severe winter storms result in Presidential Disaster Declarations or Emergency Declarations although damage to property and infrastructure, fatalities, and interruptions to critical services and businesses can occur as a result of these events. The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin and Louis Uccellini of the National Weather Service (Kocin and Uccellini, 2004) characterizes and ranks Northeast snowstorms that have a large geographic impact. NESIS has five categories: Extreme (5), Crippling (4), Major (3), Significant (2), and Notable (1). The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. 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. Thus NESIS gives an indication of a storm's societal impacts. This scale was developed because of the impact Northeast snowstorms can have on the rest of the country in terms of transportation and economic impact.²⁷ The NESIS database includes 47 storms, many of which have dumped at least 10-20 inches on Franklin County towns. The database also includes maps of the affected areas.²⁸ Because of the rural nature of the county, a storm classified as Extreme or Crippling for the affected area may not have had as devastating an impact on the towns in Franklin County. However, the severity of these storms and their impact on Franklin County, neighboring counties and other New England states may affect the availability of disaster relief services.

²⁷ <http://www.ncdc.noaa.gov/snow-and-ice/nesis.php>

²⁸ <http://www.ncdc.noaa.gov/snow-and-ice/rsi/nesis>



The entire Town of Charlemont is at risk to the impacts of severe winter storms. The 2010 Massachusetts State Hazard Mitigation Plan includes a map of Mean Annual Snowfall for the period 1959-2009. This map shows that many of the towns in western Franklin County receive the greatest amount of annual snowfall in the state. The mean annual snowfall for most of Charlemont is over 72 inches.



On October 29, 2011, an early snow storm brought over a foot of snow in some areas of the county. In lower elevations, the snow was heavier and caused many tree limbs, most of which still held their leaves, to break and fall. Power outages were widespread across New England, and lasted over a week in a few places in the Connecticut River valley. The amount of allowable expenses in Charlemont for the snowstorm is \$15,179. The Town applied for assistance from FEMA and will be reimbursed for 75% of the allowable expenses.

Hurricanes and Tropical Storms

General Description

Hurricanes are violent rainstorms with strong winds that can reach speeds of up to 200 miles per hour. Hurricanes generally occur between June and November and can result in flooding and wind damage to structures and above-ground utilities. August, September, and the first half of October are when most hurricanes occur in New England. The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures.²⁹ Tropical storms, defined as having

²⁹ National Weather Service National Hurricane Center: <http://www.nhc.noaa.gov/aboutshws.php>.

sustained winds from 34-73 mph, have also resulted in damages to buildings and infrastructure from the high winds and flooding associated with these storms.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: <http://www.nhc.noaa.gov/aboutsshws.php>

Location and Extent

In Massachusetts, major hurricanes occurred in 1904, 1938, 1954, 1955, 1960, 1976, 1985 and 1991.³⁰ The Great New England Hurricane of 1938, a Category 3 hurricane which occurred on September 21, 1938, was one of the most destructive and powerful storms ever to strike Southern New England. Sustained hurricane force winds occurred throughout most of Southern New England. Extensive damage occurred to roofs, trees and crops. Widespread power outages occurred, which in some areas lasted several weeks. Rainfall from this hurricane resulted in severe river flooding across sections of Massachusetts and Connecticut. The combined effects from a frontal system several days earlier and the hurricane produced rainfall of 10 to 17 inches across most of the Connecticut River Valley. This resulted in some of the worst flooding ever recorded in this area.³¹

The last hurricane to make landfall in New England was Hurricane Bob, a weak category 2 hurricane, in August 1991. In Franklin County, Hurricane Bob caused roughly \$5,555,556 in property and crop damages.³² Between 1990 and 2008, 16 tropical storms impacted the County, causing almost \$600,000 in property damages.³³ Tropical Storm Irene hit Franklin County on

³⁰ <http://www.nhc.noaa.gov/aboutsshws.php>

³¹ <http://www.erh.noaa.gov/box/hurricane/hurricane1938.shtml>

³² Spatial Hazard Events and Losses Database (SHELDUS), <http://webra.cas.sc.edu/hvri/>

³³ Ibid.

August 28, 2011, resulting in over \$22 million in property damages from flooding and an additional \$3,050,000 in other, mostly wind-related, damage.³⁴ The entire Town of Charlemont is at risk to the effects of hurricanes and tropical storms.

According to MEMA maps, in 1893, a Category 1 hurricane with 70 mile per hour winds tracked through the eastern end of the Town of Charlemont. The 2010 Charlemont CEM Plan does not identify any areas of town that are susceptible to impacts from hurricanes.

Tornados

General Description





Tornados are swirling columns of air that typically form in the spring and summer during severe thunderstorm events. In a relatively short period of time and with little or no advance warning, a tornado can attain rotational wind speeds in excess of 250 miles per hour and can cause severe devastation along a path that ranges from a few dozen yards to over a mile in width. The path of a tornado may be hard to predict because they can stall or change direction abruptly. Within Massachusetts, tornados have occurred most frequently in Worcester County and in communities west of Worcester. High wind speeds, hail, and debris generated by tornados can result in loss of life, downed trees and power lines, and damage to structures and other personal property (cars, etc.).

Location and Extent

The Enhanced Fujita Scale, implemented in February 2007, is used by meteorologists to rate tornado damage on a scale from EF0 to EF5. The EF Scale incorporates more damage indicators and degrees of damage than the original Fujita Scale, allowing more detailed analysis and better correlation between damage and wind speed.

Since 1996, three tornadoes have been reported in Franklin County, in the towns of Heath (1997), Charlemont (1997), and Wendell (2006). See Table 3-4. The July 2006 tornado in Wendell was rated F2 (Strong) on the Fujita Scale with winds estimated near 155 mph.

The entire Town of Charlemont is at risk from a tornado. On July 3, 1997, a

	F-0: (Light Damage) Chimneys are damaged, tree branches are broken, shallow-rooted trees are toppled.
	F-1: (Moderate Damage) Roof surfaces are peeled off, windows are broken, some tree trunks are snapped, unanchored manufactured homes are overturned, attached garages may be destroyed.
	F-2: (Considerable Damage) Roof structures are damaged, manufactured homes are destroyed, debris becomes airborne (missiles are generated), large trees are snapped or uprooted.
	F-3: (Severe Damage) Roofs and some walls are torn from structures, some small buildings are destroyed, non-reinforced masonry buildings are destroyed, most trees in forest are uprooted.
	F-4: (Devastating Damage) Well-constructed houses are destroyed, some structures are lifted from foundations and blown some distance, cars are blown some distance, large debris becomes airborne.
	F-5: (Incredible Damage) Strong frame houses are lifted from foundations, reinforced concrete structures are damaged, automobile-sized debris becomes airborne, trees are completely debarked.

³⁴ Hazards & Vulnerability Research Institute (2012). The Spatial Hazard Events and Losses Database for the United States, Version 10.0 [Online Database]. Columbia, SC: University of South Carolina. Available from <http://www.sheldus.org>

tornado was reported in Charlemont and was ranked F1 (Moderate Tornado) on the Fujita Scale of Tornado Intensity.

“Gustnado” is a slang term for a short-lived, ground-based, shallow, vortex that develops on a gust front associated with either thunderstorms or showers. Gustnadoes have been known to cause damage in Franklin County. In 2009, a gustnado destroyed a tobacco barn and downed trees in the town of Sunderland. According to NOAA, a gustnado may only extend to 30 to 300 feet above the ground with no apparent connection to the convective cloud above. They may be accompanied by rain, but usually are 'wispy', or only visible as a debris cloud or dust whirl at or near the ground. Wind speeds can reach 60 to 80 mph, resulting in significant damage, similar to that of a F0 or F1 tornado. However, gustnadoes are not considered to be a tornado, and in some cases, it may be difficult to distinguish a gustnado from a tornado. Gustnadoes are not associated with storm-scale rotation (i.e. mesocyclones) that is involved with true tornadoes; they are more likely to be associated visually with a shelf cloud that is found on the forward side of a thunderstorm.

Table 3-4: Tornado Events in Franklin County, 1995-2013

Date	Location	Hazard Type	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
7/3/1997	Heath	Tornado	0	0	\$ 50,000	\$0	
7/3/1997	Charlemont	Tornado	0	0	\$ 50,000	\$0	
7/11/2006	Wendell	Tornado	0	0	\$ 200,000	\$0	Tornado (F2)

Source: NOAA National Climate Data Center

http://www.ncdc.noaa.gov/stormevents/listevents.jsp?beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1996&endDate_mm=08&endDate_dd=31&endDate_yyyy=2013&eventType=%28C%29+Tornado&county=FRANKLIN&zone=ALL&submitbutton=Search&statefips=25%2CMASSACHUSETTS

More recently, on June 1, 2011, a severe tornado ripped through western and central Massachusetts, killing one person and injuring four others. In an area where tornados are rare, this event was a reminder that tornados do, in fact, impact the region. The fearsome storm downed trees, ripped roofs from hundreds of homes, and damaged many historic properties. On June 15, 2011, President Obama signed a disaster declaration for Hampden and Worcester counties which provided federal funds for affected residents and properties.

Preservation groups – including Preservation Massachusetts and the Springfield Preservation Trust – have assisted hardest hit communities, especially Springfield and Monson. In part, these preservation groups are helping to inventory properties and to encourage towns not to rush to demolish historic structures. The groups are also offering a list of resources property owners can consult to assist them in making decisions about repairing historic properties. MEMA also conducted a briefing for historic properties owners and encouraged representatives of Historical Commissions, Historical Societies, libraries, museums, and other non-profit organizations dedicated to preserving historic structures to communicate with town officials and FEMA and MEMA staff throughout the disaster recovery process.

Wind Storms (includes Severe Thunderstorms)

General Description

Damaging winds due to severe thunderstorms and microbursts are common in western Massachusetts and can cause significant damage. The National Weather Service defines a severe thunderstorm as having large hail, at least 3/4 inches (0.75 inches) in diameter, and/or damaging winds, at least 58 mph, or 50 knots.³⁵ A microburst is a downdraft (sinking air) in a thunderstorm that is less than 2.5 miles in scale. Some microbursts can pose a threat to life and property, but all microbursts pose a significant threat to aviation. Although microbursts are not as widely recognized as tornados, they can cause comparable, and in some cases, worse damage than some tornados produce. In fact, wind speeds as high as 150 mph are possible in extreme microburst cases. There are a handful of factors that cause microbursts to develop, including mid-level dry air entrainment, cooling beneath the thunderstorm cloud base, sublimation (occurs when the cloud base is above the freezing level), and the existence of rain and/or hail within the thunderstorm (i.e. precipitation loading).³⁶

Severe thunderstorms and microbursts and their associated wind, hail and lightning effects - can cause severe damage. Microbursts often cause tornado-like destruction and can be mistaken for tornados. In contrast to the upward rush of air in a tornado, air blasts rapidly downward from thunderstorms to create microbursts.

Location and Extent

Table 3-5 shows data supplied by the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center for high wind events in Franklin County between 1993 and 2013. A "high wind" event is defined by NOAA as one with sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration.

Table 3-5: High Wind Events in Franklin County, 1993-2013³⁷

Year	# of High Wind Events	Annual Property Damage	Annual Crop Damage
2013	0	\$0	\$0
2012	0	\$0	\$0
2011	0	\$0	\$0
2010	0	\$0	\$0
2009	0	\$0	\$0
2008	0	\$0	\$0
2007	0	\$0	\$0
2006	5	\$1,928,000	\$0
2005	1	\$305,000	\$0
2004	1	\$340,000	\$0

³⁵ <http://www.erh.noaa.gov/box/sevwxdef.html>

³⁶ <http://www.srh.noaa.gov/ama/?n=microbursts>

³⁷ The NOAA database was accessed on November 17, 2013 to update this information. The database has been undergoing upgrades and no longer has most of the older data listed. For Western Franklin County, 5 event(s) were reported between 01/01/1996 and 08/31/2013 (6453 days). These events are highlighted in the table.
http://www.ncdc.noaa.gov/stormevents/listevents.jsp?beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1996&endDate_mm=08&endDate_dd=31&endDate_yyyy=2013&eventType=%28Z%29+High+Wind&county=FRANKLIN&zone=WESTERN%2BFRANKLIN&submitButton=Search&statefips=25%2CMASSACHUSETTS

Year	# of High Wind Events	Annual Property Damage	Annual Crop Damage
2003	2	\$1,350,000	\$0
2002	0	\$0	\$0
2001	0	\$0	\$0
2000	0	\$0	\$0
1999	1	\$0	\$0
1998	0	\$0	\$0
1997	0	\$0	\$0
1996	2	\$0	\$0
1995	5	\$0	\$0
1994	4	\$5,050,000	\$0
1993	3	\$550,000	\$0
21		\$453,476	\$0
# of Years		Average Annual Property Damage	Average Annual Crop Damage

The entire Town of Charlemont is susceptible to wind storms and microbursts. Damaging high wind events such as microbursts and strong thunderstorm winds are fairly common in Charlemont. According to data supplied by NOAA, between 1993 and 2013, the town experienced six thunderstorm wind events. The event that caused the most property damage was on July 21, 2003, when several tree limbs were downed on Route 2, and roughly 2,000 people were left without power, totaling approximately \$10,000 in damages.

Table 3-6: Thunderstorm Wind Events in Charlemont, 1993-2013

Date	Type	Property Damage	Crop Damage	Excerpts from storm details for Charlemont only
5/29/1998	Thunderstorm Wind	\$0	\$0	Trees and wires were down, Route 2 was blocked in Charlemont.
7/21/2003	Thunderstorm Wind	\$10,000	\$0	A severe thunderstorm downed several large tree limbs on Route 2 in Charlemont, and downed trees and wires in Heath. About 2,000 customers were left without power after the storm moved through Franklin County.
8/1/2005	Thunderstorm Wind	\$5,000	\$0	Severe winds brought down several trees in Charlemont.
6/19/2006	Thunderstorm Wind	\$5,000	\$0	Severe thunderstorms downed trees onto power lines in Charlemont.
8/3/2007	Thunderstorm Wind	\$0	\$0	Trees down.
6/24/2010	Thunderstorm Wind	\$5,000	\$0	Large limbs and a tree were downed near Massachusetts Route 2.

Source:

http://www.ncdc.noaa.gov/stormevents/listevents.jsp?beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1996&endDate_mm=09&endDate_dd=30&endDate_yyyy=2013&eventType=%28C%29+Thunderstorm+Wind&county=FRANKLIN&zone=WESTERN%20FRANKLIN&submitButton=Search&statefips=25%20MASSACHUSETTS

Wildfires and Brushfires

General Description

According to FEMA, there are three different classes of wildland fires: *surface fires*, *ground fires* and *crown fires*.³⁸ The most common type of wildland fire is a surface fire that burns slowly along the floor of a forest, killing or damaging trees. A ground fire burns on or below the forest floor and is usually started by lightning. Crown fires move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions.

While wildland fires have not been a significant problem in Charlemont, there is always a possibility that changing land use patterns and weather conditions will increase a community's vulnerability. For example, drought conditions can make forests and other open, vegetated areas more vulnerable to ignition. Once the fire starts, it will burn hotter and be harder to extinguish. Soils and root systems starved for moisture are also vulnerable to fire. Residential growth in rural, forested areas increases the total area that is vulnerable to fire and places homes and neighborhoods closer to areas where wildfires are more likely to occur.

Location and Extent

Between 2004 and 2010, the Charlemont Fire Department reported a total of 15 brush fires.³⁹ Often brush fires are started on residential lots to clear grass, brush and other woody debris and become a problem when the homeowner can no longer control them. In 2010, Shelburne Control issued 314 burn permits in Charlemont. There is a significant fuel load in the forests as a result of the 2008 ice storm and the 2011 October snowstorm, which, if ignited by a lightning strike or by careless human behavior, could present a significant wildfire threat. **Since 2010, no significant brush fires or wildfires have occurred in Charlemont. [committee to confirm]**

Table 3-7: Brush Fires Reported from Franklin County Fire Departments, 2004-2010

Fire Department	Total # of Brush Fires	2004	2005	2006	2007	2008	2009	2010
Bernardston	47	5	14	7	5	8	5	3
Charlemont	15	3	1	0	8	1	2	0
Colrain	13	3	1	0	3	0	1	5
Conway	29	4	5	5	3	4	4	4
Deerfield	26	6	5		1	4	7	3
Erving	10	4	2	1	0	3	0	0
Gill	17	0	1	7	4	1	1	3
Greenfield	51	0	1	4	11	13	6	16
Hawley	2	0	0	2	0	0	0	0
Heath	8	1	1	0	0	2	2	2
Leverett	11	1	1	3	5	0	1	0
Leyden	3	1	0	0	2	0	0	0
Montague Center	49	3	8	10	7	1	9	11
New Salem	23	0	0	3	5	1	5	9
Northfield	1	0	0	0	0	1	0	0
Orange	36	4	3	3	9	0	6	11

³⁸ FEMA, "Fact Sheet: Wildland Fires," September 1993.

³⁹ Massachusetts Fire Incident Reporting System (MFIRS), Massachusetts Department of Fire Services.

Fire Department	Total # of Brush Fires	2004	2005	2006	2007	2008	2009	2010
Shelburne Center	13	4	2	5	2	0	0	0
Shelburne Falls	7	0	0	1	4	1	1	0
Shutesbury	6	0	1	0	0	1	2	2
South Deerfield	21	4	2	3	5	2	2	3
Sunderland	22	4	6	6	0	1	0	5
Turners Falls	45	8	5	4	7	1	4	16
Warwick	5	2	1	1	0	0	0	1
Wendell	10	0	0	6	2	0	1	1
Whately	28	6	7	6	1	3	0	5
Total	498	63	67	77	84	48	59	100

Source: Massachusetts Fire Incident Reporting System (MFIRS).

Areas of concern, or critical facilities, such as schools and senior housing complexes are important to identify because these populations may need special assistance in times of an emergency. In Charlemont, these areas include the Hawlemont Regional Elementary School and the Charlemont Academy. Additionally, people camping in the Mohawk Trail State Forest could be susceptible to forest fire and need assistance evacuating from the park. These areas are shown on the 2014 Critical Facilities and Infrastructure Map on page --.

Dam Failures

General Description

Although dams and their associated impoundments provide many benefits to a community, such as water supply, recreation, hydroelectric power generation, and flood control, they also pose a potential risk to lives and property. Dam failure is not a common occurrence but dams do represent a potentially disastrous hazard. When a dam fails, the potential energy of the stored water behind the dam is instantly released, oftentimes with catastrophic consequences as the water rushes in a torrent downstream flooding an area engineers refer to as an “inundation area.” The number of casualties and the amount of property damage will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Many dams in Massachusetts were built in the 19th Century without the benefit of modern engineering design and construction oversight. Dams can fail because of structural problems due to age and/or lack of proper maintenance. Dam failure can also be the result of structural damage caused by an earthquake or flooding brought on by severe storm events.

The Massachusetts Department of Conservation and Recreation (DCR) is the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00). The DCR was also responsible for conducting dam inspections until 2002, when state law was changed to place the responsibility and cost of inspections on the owners of the dams. In accordance with the new regulations, which went into effect in 2005, dam owners must register, inspect and maintain dams in good operating condition. Owners of High Hazard Potential dams and certain Significant Hazard Potential dams are also required to

prepare, maintain and update Emergency Action Plans. The state has three hazard classifications for dams:

- *High Hazard Potential:* Dams located where failure or improper operation will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.
- *Significant Hazard Potential:* Dams located where failure or improper operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.
- *Low Hazard Potential:* Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected.

Owners of dams are required to hire a qualified engineer to inspect and report results using the following inspection schedule:

- Low Hazard Potential dams – 10 years
- Significant Hazard Potential dams – 5 years
- High Hazard Potential dams – 2 years

The time intervals represent the maximum time between inspections. More frequent inspections may be performed at the discretion of the state. Dams and reservoirs licensed and subject to inspection by the Federal Energy Regulatory Commission (FERC) are excluded from the provisions of the state regulations provided that all FERC-approved periodic inspection reports are provided to the DCR. FERC inspections of high and significant hazard projects are conducted on a yearly basis. All other dams are subject to the regulations unless exempted in writing by DCR.

Beaver Dams

Along with manmade dams, failure of beaver dams can cause flooding as well. Alteration of the landscape by beavers is a natural process that creates habitat for shore birds, mammals and rare amphibians. However, beaver ponds can flood structures, roads and utilities, causing costly and potentially dangerous situations. Beaver activity can also pollute drinking water supplies. Mitigation measures suggested by Massachusetts Division of Fish and Wildlife (MassWildlife) and other agencies can help communities and homeowners deal with nature's master builders.

Until 1996, when a ballot initiative passed restricting the practice, Massachusetts residents were permitted to trap beavers. That change in policy caused a spike in the beaver population, which, in turn, led to a sharp increase in complaints about beaver activity and its effects. The law was modified in 2000 so that town Board of Health members could issue emergency trapping permission outside of the usual trapping season. State law makes it illegal for any person to disturb or tear open a beaver dam or beaver lodge without written permission from MassWildlife and the local Conservation Commission or Department of Environmental Protection. Permits are needed to disturb a beaver dam for any reason in Massachusetts. Even dams that cause flooding require permits to be breached.⁴⁰

⁴⁰ Langlois, S.A. and T.A. Decker. 2004. *The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts* (Rev. Ed.). MA Division of Fisheries and Wildlife. 18pp.

In 2011, a bill is under consideration with the State Legislators which would give individuals and towns an additional option when they are having issues with beavers. Under this new bill, a special permit could be obtained from the State Department of Fisheries and Wildlife. The bill does not aim to repeal the bill that bans trapping but rather allows the issuing of an emergency permit under the provisions allowed within the laws of the State. The proposed bill also calls for the State to begin keeping better records of all permits issued and how many beavers are trapped each year.

An increased beaver population, combined with land development reducing beaver habitat, means that humans and beavers continue to clash. Several mitigation measures, when applied thoughtfully, legally and with maintenance measures in mind, can help with beavers' negative effects, while preserving beavers' positive impact on the land.⁴¹

While trapping beaver can have short-term benefits, the right conditions for beaver habitat will eventually lure new beavers. It may be best to combine trapping with measures that discourage beaver activity that's bad for humans. Techniques used to mitigate the flooding damage caused by beaver include breaching of beaver dams, protecting road culverts with fences or guards, and controlling water levels with water flow devices. All these techniques require a certain degree of effort and regular maintenance to insure water levels that can be tolerated (thereby preserving the positive aspects of the associated wetland). See the MassWildlife publication *The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts* for details on these mitigation measures. The following techniques were adapted from that publication.

- Dam breaching is an immediate but very short-term solution to flooding problems caused by beaver. Potato hoes or stone hooks are the best tools for dismantling dams by hand. Shovels and spading forks are ineffective. Good water control is possible if the breach is kept shallow and broad so that the water level falls slowly. Opening a deep breach creates a dangerous situation and may cause serious flooding and erosion downstream. Tractor- or truck-mounted excavators may be used by town, county or state highway employees to remove large amounts of material from beaver dams but care should be taken to avoid downstream flooding. Neighbors should be told where, when, and why a dam excavation is going to be done. If the method is justified and must be used, it is best done in mid-summer when the water level is low.
- Beavers build dams instinctively. When they sense running water, they start to build or repair dams. Culverts, especially ones made out of metal, will amplify the sound of the water rushing through them. Thus, beaver will commonly block road culverts with sticks, mud and rocks. This can cause flooding upstream. Culverts blocked from the inside are difficult to clean and potentially dangerous. The use of meshes and grills, placed on both the upstream and downstream ends of the culvert, can prevent beavers from entering. Several strategies are listed in *The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts*.
- Water Level Control Devices (WLCDs) keep beavers away from an intake pipe that lowers the water level of the pond. It's been estimated that only 4.5% of beaver problems

⁴¹ Otsego County (NY) All Hazards Mitigation Plan, 2010.

in Massachusetts will respond to these devices. Using and maintaining a WLCD in conjunction with trapping young beavers can allow coexistence for years. Several types of WLCDs are available. For construction details, see *The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts*.

Location and Extent

According to information from the MA DCR Office of Dam Safety, as of January 2011, there are no dams located within Charlemont. The Charlemont Comprehensive Emergency Management (CEM) Plan also confirms there are no dams in Charlemont.

Of particular concern to Charlemont are the dams on the Deerfield River owned by TransCanada and licensed by the Federal Energy Regulatory Commission (FERC). These include the Somerset Dam, the Harriman Dam, and the Sherman Dam, all of which are classified as High Hazard Dams by FERC. The Fife Brook Dam and the Bear Swamp Upper Reservoir, owned by Brookfield Power, are also High Hazard dams. The Emergency Action Plans for these projects include a series of inundation maps for each dam which illustrate potential flooding conditions for downstream areas including portions of Charlemont adjacent to the Deerfield River.⁴² A catastrophic failure of any one of these High Hazard dams would likely result in the cascading failure of all the downstream dams (both High and Low Hazard dams), resulting in widespread flooding of downstream areas in a matter of hours.

TransCanada created new Emergency Action Plans for the Sherman, Harriman, and Somerset dams on the Deerfield River in 2011. The plans include new inundation mapping that was created using models with greater accuracy of the flow of the river. The maps show inundation areas under a Sunny Day scenario (a dam breach under regular weather conditions), and under a Probable Maximum Flood (PMF) scenario (a dam breach under existing major flooding conditions). Inundation maps for the Harriman Dam, located just over the border in Whitingham, Vermont, extend from the dam downstream to Holyoke, roughly 86 miles away. Under PMF or Sunny Day conditions, flood waters from the breach would reach the western border of Charlemont (17 miles from the dam) in approximately 1 hour, with peak flooding occurring 1.6 hours after a breach. Water would reach the Route 8A bridge in the village center (22.3 miles from the dam) approximately 1.3 hours after a breach (slightly less time for a Sunny Day breach), with peak flooding occurring at 2.17 hours for both a PMF breach and Sunny Day breach.

Under both Sunny Day and PMF flooding scenarios, the village center in Charlemont would be completely inundated. Critical facilities that fall within the inundation area include the Hawlemont Regional Elementary School, the Charlemont Fire Station, Charlemont DPW and Police Station, Charlemont Wastewater Treatment Plant, Town Hall, and the Federated Church. Floodwaters would also reach a wide swath of land and structures south of the river, including the Berkshire East facilities at the base of the ski mountain. Route 2 and the railroad are both largely within the inundation area throughout the entire stretch of Charlemont. The Mohawk Park Campground is completely within the inundation area, as well as the whitewater rafting companies Zoar Outdoor and Crab Apple Whitewater. Route 8A is inundated both south and north of the Deerfield River in the village center. Further east, the Charlemont Academy, one of

⁴² *Harriman Dam Emergency Action Plan*. TransCanada Hydro Northeast Inc. May, 2011.

the town's designated shelters, would also be inundated by floodwaters during either breach scenario.

In 2010 the Franklin Regional Council of Governments (FRCOG) and the University of Massachusetts Transportation Center (UMTC) prepared a study that examined the impact of a Harriman Dam failure on the transportation network in the towns within the inundation zone as well as the county.⁴³ Building upon this exercise, the FRCOG developed town-specific recommendations in the event of flooding caused by failure of the Harriman Dam.⁴⁴ An analysis was conducted for each of the Towns located along the path of the flood including identification of critical facilities located within Town boundaries. The recommendations are intended to be used as a starting point for the development of specific emergency plans in each Town.

The report examined the village center in Charlemont more closely because of the greater density of people and the critical municipal facilities located there. It is important to note that the analysis was conducted using older inundation mapping. A review of the updated inundation mapping from 2011 shows that the report's observations still hold true. The report includes the following recommendations for the village center and for the town as a whole:

- The town should have a communication plan in place to receive updates and warnings on the estimated arrival and magnitude of the flood, and to relay information to downstream communities as to the magnitude and rate of the flood and status of evacuations.
- The areas within the inundation zones in the village center, and throughout town, should be evacuated immediately, and all roads that will be inundated should be manually disabled after evacuation has occurred. Due to its proximity to the dam, the Town will have limited time to evacuate before the arrival of the flood.
- Evacuees may need to go to shelters in neighboring communities. The report recommends pre-emergency planning between Charlemont and neighboring towns to develop agreements for use of shelters in the event of a Harriman Dam failure. It is recommended that the town have agreements for shelters on both the north and south side of the Deerfield River. Possible shelters identified in the report are:
 - North:
 - Rowe Elementary School, capacity 230;
 - Heath Community Hall/Senior Center, capacity 150;
 - Heath Elementary School, capacity 200 (no generator); and
 - Heath Union Church, capacity 50 (no generator).
 - South:
 - Savoy Center Plunkett Elementary School, capacity 1,500 (no generator);
 - Savoy Hoosac Valley High School, capacity 1,200; and
 - Savoy Elementary School, capacity 100 (no generator).
- The Hawlemont Regional Elementary School and the Charlemont Academy should have emergency evacuation plans in place.
- Individuals and businesses should develop an emergency evacuation plan for pets and livestock, in addition to people.

⁴³ Evacuation Planning in Western MA, Case Study: Failure of the Harriman Dam. Franklin Regional Council of Governments (FRCOG) and the University of Massachusetts Transportation Center (UMTC). 2010.

⁴⁴ Town Recommendations: Supplement to the Failure of the Harriman Dam Evacuation Planning Report. Franklin Regional Council of Governments (FRCOG). 2010.

- An emergency evacuation plan should be developed for municipal facilities that are expected to become inundated and should examine the following:
 - Town Hall – The preservation of vital records and documents;
 - DPW – Moving equipment needed for flood restoration efforts to higher ground; and
 - Police and Fire – Gathering critical supplies, tools, and resources while also responding to and enforcing flood evacuation orders and the flood emergency.

In addition to the town critical facilities and the schools, businesses that could potentially have a large number of staff and customers on site at the time of a breach, such as the whitewater rafting companies, campgrounds, and Berkshire East, should have evacuation plans in place for such a scenario. Businesses should coordinate with the Town on evacuation plans, to ensure Town emergency management personnel are aware of where people are being sent.

Given that a Harriman Dam failure will impact many towns and a large number of people for an extended period of time, it is probable that regional shelters will open soon after a dam breach to accommodate this need. These regional shelters should be accessible for people on both sides of the river. Transportation will likely need to be coordinated between local shelters and the regional shelters. The Franklin County Regional Emergency Planning Committee and the Western Massachusetts Regional Homeland Security Council are currently working together on a Regional Sheltering Plan for Franklin County that will work to identify regional shelters for different hazard scenarios, and address issues such as transportation.

The remaining five (5) dams on the Deerfield River are classified as Low Hazard Dams; therefore, no Emergency Action Plan or inundation mapping is required by FERC. Consultants hired by US GEN in 2003 (then-owner of the dams) examined a “Sunny Day” failure scenario for these dams to determine the downstream flooding hazard potential. The incremental impact was also determined for a dam failure that occurred at a flow equivalent to the 100-year frequency flood. For these two scenarios, the study indicates that the additional flooding above the 100-year flood stage was insignificant and therefore these projects do not present a significant hazard to life and property.⁴⁵ However, the cascading failure of one or more of these dams that would occur if one of the High Hazard dams failed would result in the catastrophic flooding shown on the inundation maps in the High Hazard dam EAPs.

The 100-year floodplain covers approximately 815 acres of the town, including an estimated 22 acres of developed residential land. An inundation area due to dam failure would cover substantially more acreage. Emergency responders should review inundation areas and identify possible evacuation routes.

There are several areas in town that experience issues due to beaver dams. According to the Committee, beaver dams persistently cause flooding on Legate Hill Road. The Highway Department regularly deals with the problem by putting up cones in the road to keep traffic away from the flooded area. The Highway Department has breached beaver dams on East Hawley Road, where they frequently block culverts.

⁴⁵ “Emergency Action Plans for the Deerfield River FERC Licensed Projects Nos. 2323 and 2669,” prepared for US GEN New England, Inc., by Kleinschmidt Energy and Water Resource Consultants, November 2003.

Earthquakes

General Description

An earthquake is a sudden, rapid shaking of the ground that is caused by the breaking and shifting of rock beneath the Earth's surface. Earthquakes can occur suddenly, without warning, at any time of the year. New England experiences an average of 30 to 40 earthquakes each year although most are not noticed by people.⁴⁶ Ground shaking from earthquakes can rupture gas mains and disrupt other utility service, damage buildings, bridges and roads, and trigger other hazardous events such as avalanches, flash floods (dam failure) and fires. Un-reinforced masonry buildings, buildings with foundations that rest on filled land or unconsolidated, unstable soil, and mobile homes not tied to their foundations are at risk during an earthquake.⁴⁷

The Richter magnitude scale was developed in 1935 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value.

Earthquakes with magnitude of about 2.0 or less are usually called microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater - there are several thousand such shocks annually - are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes, such as the 1964 Good Friday earthquake in Alaska, have magnitudes of 8.0 or higher. On the average, one earthquake of such size occurs somewhere in the world each year. The Richter Scale has no upper limit.

It is important to note that the Richter Scale is not used to express damage. An earthquake in a densely populated area which results in many deaths and considerable damage may have the same magnitude as a shock in a remote area that does nothing more than frighten the wildlife. Large-magnitude earthquakes that occur beneath the oceans may not even be felt by humans.⁴⁸

The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally - total destruction. Although numerous *intensity scales* have been developed over the last several hundred years to evaluate the effects of earthquakes, the one

⁴⁶ Northeast States Emergency Consortium Web site: www.nesec.org/hazards/earthquakes.cfm

⁴⁷ Federal Emergency Management Agency Web site: www.fema.gov/hazards/earthquakes/quake.shtml.

⁴⁸ Adapted from <http://earthquake.usgs.gov/learn/topics/richter.php>

currently used in the United States is the Modified Mercalli (MM) Intensity Scale. It was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects.

The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects actually experienced at that place.

The **lower** numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The **higher** numbers of the scale are based on observed structural damage. Structural engineers usually contribute information for assigning intensity values of VIII or above.⁴⁹ The figure below shows the Modified Mercalli Scale (far left column) and the corresponding Richter Scale magnitude rating (far right column).⁵⁰

Category	Effects	Richter Scale (approximate)
I. Instrumental	Not felt	1-2
II. Just perceptible	Felt by only a few people, especially on upper floors of tall buildings	3
III. Slight	Felt by people lying down, seated on a hard surface, or in the upper stories of tall buildings	3.5
IV. Perceptible	Felt indoors by many, by few outside; dishes and windows rattle	4
V. Rather strong	Generally felt by everyone; sleeping people may be awakened	4.5
VI. Strong	Trees sway, chandeliers swing, bells ring, some damage from falling objects	5
VII. Very strong	General alarm; walls and plaster crack	5.5
VIII. Destructive	Felt in moving vehicles; chimneys collapse; poorly constructed buildings seriously damaged	6
IX. Ruinous	Some houses collapse; pipes break	6.5
X. Disastrous	Obvious ground cracks; railroad tracks bent; some landslides on steep hillsides	7
XI. Very disastrous	Few buildings survive; bridges damaged or destroyed; all services interrupted (electrical, water, sewage, railroad); severe landslides	7.5
XII. Catastrophic	Total destruction; objects thrown into the air; river courses and topography altered	8

Location and Extent

Tables 3-8 and 3-9 show historic occurrences of earthquakes in the Northeastern part of the United States. This Northeast States Emergency Consortium data is current as of October 2013. A NOAA data query for earthquake events in Franklin County between the years 1996 and 2013 turned up no events.⁵¹

⁴⁹ Adapted from <http://earthquake.usgs.gov/learn/topics/mercalli.php>

⁵⁰ Adapted from <http://img.docstoccdn.com/thumb/orig/80153368.png>

⁵¹ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=25%2CMASSACHUSETTS>

On June 22, 2010 there was a magnitude 5.8 earthquake in Canada which could be felt in Franklin County. No damage was reported, but residents stated they felt the quake and were unnerved by the experience. On August 23, 2011 an earthquake measuring 5.8 on the Richter scale centered in Virginia was felt throughout the northeast, prompting the evacuation of a number of multi-story buildings in the Franklin County region, but causing no property damage or personal injury.

Table 3-8: Northeast Earthquakes with a Magnitude of 4.2 or more 1924 - 2007

Location	Date	Magnitude
Ossipee, NH	December 20, 1940	5.5
Ossipee, NH	December 24, 1940	5.5
Dover-Foxcroft, ME	December 28, 1947	4.5
Kingston, RI	June 10, 1951	4.6
Portland, ME	April 26, 1957	4.7
Middlebury, VT	April 10, 1962	4.2
Near NH Quebec Border, NH	June 15, 1973	4.8
West of Laconia, NH	Jan. 19, 1982	4.5
Plattsburg, NY	April 20, 2002	5.1
Bar Harbor, ME	October 3, 2006	4.2

Source: Northeast States Emergency Consortium Web site: www.nesec.org/hazards/earthquakes.cfm.

Table 3-9: Northeast States Record of Historic Earthquakes

State	Years of Record	Number Of Earthquakes
Connecticut	1668 - 2007	137
Maine	1766 - 2007	544
Massachusetts	1668 - 2007	355
New Hampshire	1638 - 2007	360
Rhode Island	1776 - 2007	38
Vermont	1843 - 2007	73
New York	1840 - 2007	755
Total Number of Earthquakes within the Northeast states between 1638 and 2007 = 2,403.		

Source: Northeast States Emergency Consortium Web site: www.nesec.org/hazards/earthquakes.cfm.

According to the United States Geological Survey, a fault line runs north-south and extends along the entire length of Franklin County, and was originally responsible for the creation of the Connecticut River. Additionally, a fault line runs to the west and north of Charlemont, through Florida and Rowe. Massachusetts introduced earthquake design requirements into their building code in 1975. However, these specifications apply only to new buildings or to extensively modified existing buildings. Buildings, bridges, water supply lines, electrical power lines and facilities built before 1975 may not have been designed to withstand the forces of an earthquake. Approximately 59% of Charlemont's housing was constructed before 1970, and is therefore particularly susceptible to damage from an earthquake.⁵² The seismic standards have also been

⁵² 2005-2009 American Community Survey housing data.

upgraded with the 1997 revision of the State Building Code. The entire town is at risk to the effects of an earthquake.

Landslides

General Description

Landslides are geological phenomena that include a wide range of ground movement, such as rock falls, failure of slopes and shallow debris flows. They can occur in coastal, mountain, and river edge environments.

Landslides occur when the stability of a slope changes from a stable to an unstable condition. A change in the stability of a slope can be caused by a number of factors, acting together or alone. Natural causes of landslides include:

- groundwater pressure acting to destabilize the slope
- loss or absence of vertical vegetative structure, soil nutrients, and soil structure (e.g. after a wildfire)
- erosion of the toe of a slope by rivers
- weakening of a slope through saturation by snowmelt or heavy rains
- earthquakes adding loads to barely-stable slopes
- earthquake-caused liquefaction destabilizing slopes
- volcanic eruptions

Landslides are created by human activities as well, including deforestation, cultivation and construction, which destabilize already fragile slopes. Landslides can also occur due to:

- vibrations from machinery or traffic
- blasting
- earthwork which alters the shape of a slope, or which imposes new loads on an existing slope
- in shallow soils, the removal of deep-rooted vegetation that binds colluvium to bedrock
- construction, agricultural or forestry activities (logging) which change the amount of water which infiltrates the soil.

Location and Extent

A typical setting for a landslide might bring to mind the precarious seaside hills in California. However, landslides have occurred much closer to home. According to WWLP News, early in the morning on March 7 of 2011, torrential rains swept away a piece of cemetery into the backyards of homes and nearby streets in Greenfield, MA. The landslide sent silt, mud, and debris slid down from the Green River Cemetery into homes on nearby Meridian Street. Residents did not hear a thing. A passerby called 911 and alerted authorities that part of the Green River Cemetery had slid down onto Meridian Street. Residents of three homes were evacuated. This area of Greenfield has been in the news before due to other landslides.

According to The Recorder newspaper, state geologists estimated that about 1,500 to 3,000 cubic yards of mud and debris came down into the yards but that no graves were involved. Three

inches of rain in Greenfield over a day and a half contributed to the disaster that caused thousands of dollars worth of damage. The company called in to divert water away from homes below and help clear their yards of some of the mud found that a drainage system that had been installed in 1986 was been plugged and buried by the mudslide. The drainage system was cleaned out and was found to be in good shape and should handle any future rains adequately. The Town indicated that it is the responsibility of the Cemetery board to make sure the system is evaluated and cleared of any silt accumulation on a regular basis.

The Connecticut River Valley is given a Moderate landslide incidence rating (1.5% to 15% of the area involved) while the remainder of the state is listed as Low landslide incidence (less than 1.5% of the area involved).⁵³ In Charlemont minor landslides have occurred along Route 8A near the intersection with South River Road due to poor drainage. There is also a regular problem along Route 8A North near the town line, where the slope adjacent to the road often falls into the road. Additionally West Oxbow Road subsided approximately two feet due to saturation of the soil during Tropical Storm Irene. The road has since been repaired.

Ice Jams

General Description

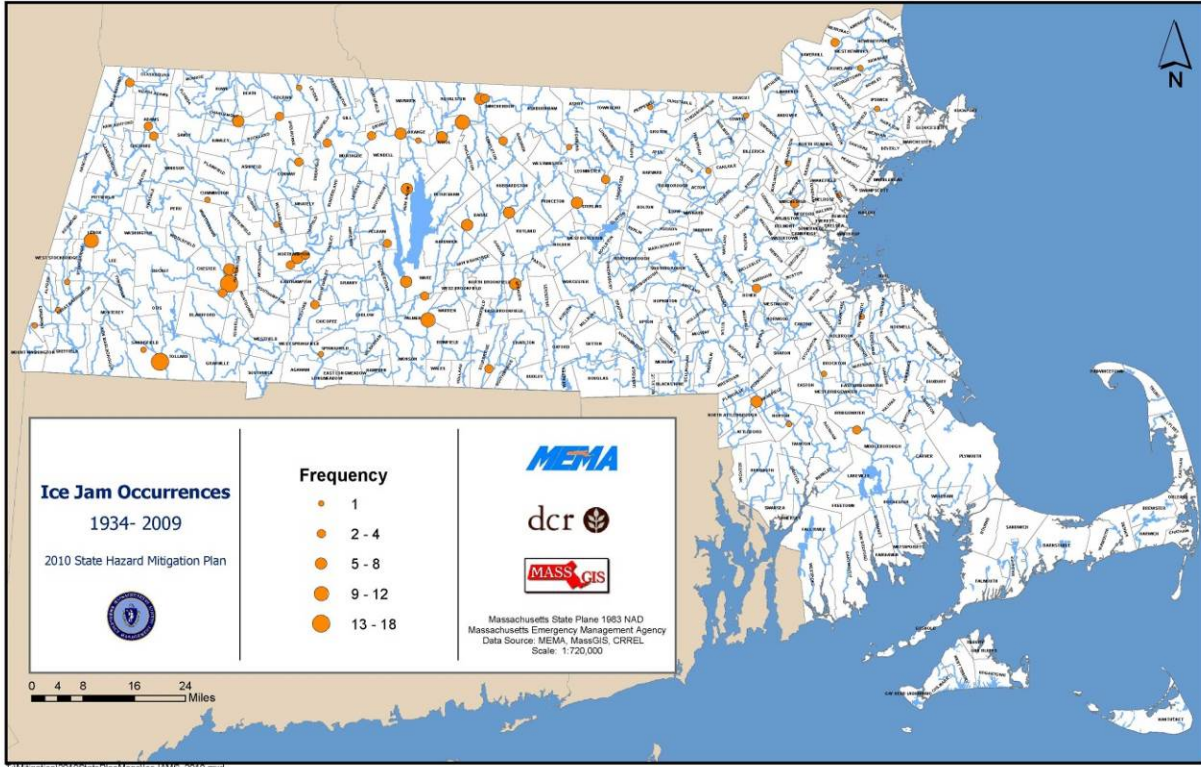
Ice jams (or ice dam) occur when water builds up behind a blockage of ice. Ice dams can occur in various ways, but in New England they predominantly form on rivers and streams and mainly threaten infrastructure.

When the upstream part of a river thaws first and the ice is carried downstream into the still-frozen part of the watercourse, ice can form a dam and flood low lying areas upstream of the jam. Also, once an ice dam breaks apart, the sudden surge of water that breaks through the dam can flood areas downstream of the jam. Ice jams and flooding usually occur in spring; however, they can happen as winter sets in when the downstream reach of a river freezes first. Where floods threaten, the blockage can be removed mechanically.

Location and Extent

According to information in the 2010 Massachusetts State Hazard Mitigation Plan, ice jams have occurred with varying frequency on several rivers in Franklin County, including the Deerfield, Millers, Green, North and South Rivers between 1934-2009 (see map, below).

⁵³ U.S. Department of the Interior, U.S. Geological Survey. National Landslide Hazards Mitigation Strategy: A Framework for Loss Reduction. 2000.



Historical data from the U.S. Army Cold Regions Research and Engineering Laboratory show nine ice jams have occurred along the Deerfield River between 1918 and 1959. Six of the jams occurred in Charlemont, and 3 occurred in West Deerfield. No ice jams have been recorded on the Deerfield River since 1959.⁵⁴

Table 3-10: Ice Jam Occurrences on the Deerfield River

Date	Type	Latitude	Longitude	Town	Description or other information
01/22/1959	unknown	42° 32' 9" N	72° 39' 54" W	West Deerfield	Maximum annual gage height of 11.46 feet
01/23/1957	unknown	42° 32' 9" N	72° 39' 54" W	West Deerfield	Maximum annual gage height of 7.49 feet. Discharge 9,570 cfs
02/08/1941	unknown	42° 32' 9" N	72° 39' 54" W	West Deerfield	Maximum annual gage height of 8.31 feet. Discharge "about" 10,000 cfs
03/12/1936	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 19.9 feet
02/05/1934	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 8.80 feet
02/17/1930	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 8.22 feet
02/12/1925	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 15.97 feet. Discharge 9,330 cfs
03/23/1923	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 20.0 feet
03/21/1918	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 11.75 feet

⁵⁴ U.S. Army Cold Regions Research and Engineering Laboratory: <https://rsgis.crrel.usace.army.mil/apex/f?p=273:2:1146541549603750>

According to the Committee, ice jams have occurred on the Deerfield River in recent years near the Crab Apple Whitewater Rafting company in East Charlemont, but have not caused any problems.

Manmade Hazards⁵⁵

General Description

Most non-natural or manmade hazards fall into two general categories: intentional acts and accidental events, although these categories can overlap. Some of the hazards included in these two categories, as defined by MEMA, consist of intentional acts such as explosive devices, biological and radiological agents, arson and cyberterrorism and accidental events such as nuclear hazards, invasive species, infrastructure failure, industrial and transportation accidents. Accidental events can arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials.

Note: This plan does not address all manmade hazards that could affect Charlemont. A complete hazards vulnerability analysis was not within the scope of this update. For the purposes of the 2011 plan, the Committee has evaluated non-natural hazards that are of an accidental nature. They include industrial transportation accidents and industrial accidents in a fixed facility.

Hazardous Materials Definition

Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products are shipped daily on the nation's highways, railroads, waterways, and pipelines. Chemical manufacturers are one source of hazardous materials, but there are many others, including service stations, hospitals, and hazardous materials waste sites. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or because of chemical accidents in plants.

A release may occur at a fixed facility or in transit. Communities with a large industrial base may be more inclined to experience a hazardous materials release due to the number of facilities such materials in their manufacturing process. Communities with several major roadways may be at a greater risk due to the number and frequency of trucks transporting hazardous materials passing through.

Location and Extent

Because manmade hazards are not included in the All Hazards Vulnerability Assessment, *the extent, based upon severity of impact has not been assessed.*

Industrial Accidents - Transportation

Franklin County transportation systems include road, rail, and air. Accessible and efficient freight transportation plays a vital function in the economy of the region. Most freight and goods being transported to and from Franklin County are by truck; however, a significant amount of

⁵⁵ Content adapted from Commonwealth of Massachusetts State Hazard Mitigation Plan 2010

freight that moves through the county is being hauled over the three main rail lines. Given that any freight shipped via air needs first to be trucked to an airport outside the region, air transportation is not being evaluated in this plan.

The major trucking corridors in Franklin County are Interstate 91, running north/south, and Route 2, running east/west. These two highways also represent the busiest travel corridors in the region for non-commercial traffic. Safe and efficient transportation routes for trucks to and through the region are important to the region's economy and to the safety of its citizens. The safer the transportation routes are, the less likely a transportation accident will occur. According to the Franklin County Hazardous Material Emergency Plan (HMEP),⁵⁶ approximately 13 to 15 trucks per hour traveling through the region contain hazardous materials (Table 3-11). While most of these vehicles are on Interstate 91, approximately 2 trucks per hour travel on Route 2, and 0 to 1 trucks per hour travel along Route 8A, which are both main roads in Charlemont. The Charlemont CEM Plan lists Routes 2 and 8A as hazardous transportation routes in town. According to the HMEP, the following hazardous materials are regularly carried on Route 2:

- Gasoline
- Fuel oil
- Kerosene
- Liquefied Petroleum Gas (LPG)
- Propane
- Sodium aluminate
- Sulfuric acid
- NOS Liquids 3082

Materials regularly carried on Route 8A are as follows:

- Gasoline
- Fuel oil
- Kerosene
- Liquefied Petroleum Gas (LPG)
- Propane

Ten to 24 trains per day travel on the main freight line of the Pan Am Systems Railroad, a single track that runs adjacent to the Deerfield River (Table 3-12). On each of these trains, an average of 4 cars carries hazardous materials. The CEM Plan lists the Pan Am Railroad as a hazardous transportation route. Rail accidents can be caused by faulty or sabotaged track; collision with another train, vehicle or other object on the track; mechanical failure of the train; or driver error. Depending on the freight, an accident could cause residents to evacuate the area. According to the HMEP, the hazardous materials regularly carried on these trains passing through Charlemont include:

- Hydrocyanic Acid
- Hydrochloric Acid
- Chlorine

⁵⁶ Franklin County Regional Emergency Planning Committee, Franklin County Hazardous Material Emergency Plan and Maps, 2006. Based on a one-time survey conducted in 2003.

- Caustic soda
- Methanol
- Sodium chlorate
- Liquefied Petroleum Gas (LPG)
- Sulfuric acid

The trains themselves pose a potential hazard since 3 or 4 engines are used per train and each engine has a 2,000 gallon fuel tank. A spill along this line could easily contaminate the Deerfield River, and would pose a risk to Charlemont residences, farms, and businesses located downstream. Since the development of the Franklin County Hazardous Material Emergency Plan in 2006, the transport of ethanol through the region has increased by both rail and truck. The Massachusetts Department of Environmental Protection issued a white paper in July 2011 stating that trains containing 60 – 80 cars full (up to 3.2 million gallons total) of ethanol travel from St. Albans, VT south through Franklin County and on into Connecticut on a weekly basis.

Table 3-11: Estimated Levels of Hazardous Material Transported on Area Roadways, 2006

Roadway	Number of Tank or Van Trucks Carrying Hazardous Materials per hour
Interstate 91	10
Route 2	2
Other major roadways (<i>Routes 5/10, 63, 47, 116, 112, 202, 8A, 78, 122, 142, and 2A</i>)	1 or 0

Source: Franklin County Hazardous Material Emergency Plan, 2006.

Table 3-12: Estimated Level of Hazardous Material Transport on Area Train Lines, 2006

Train Line	Trains per Day (General Merchandise)	Average Number of Cars per Train	Average Number of Cars per Train with Hazardous Materials
Main Freight Line, Pan Am Systems	10 to 24	50	4
Connecticut River Line, Pan Am Systems	2 to 3	30	2
East Deerfield Rail Yard, Pan Am Systems	10 to 15 trains passing through yard	n/a	2 to 5
New England Central	2	60	5

Source: Franklin County Hazardous Material Emergency Plan, 2006.

Industrial Accidents – Fixed Facilities

An accidental hazardous material release can occur wherever hazardous materials are manufactured, stored, transported, or used. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas. Those facilities using, manufacturing, or storing toxic chemicals are required to report their locations and the quantities of the chemicals stored on-site to state and local governments. The Charlemont CEM Plan lists the following businesses and town facilities that use hazardous materials.

Table 3-13: Charlemont Facilities that Store Hazardous Materials

Facility Name	Facility Location	Hazardous Chemical Inventory
Charlemont Wastewater Treatment Plant	4 Factory Road	Chlorine
Charlemont DPW	3 Factory Road	Diesel, gasoline, salt, sand
Verizon Switch Station	South Street	Propane, batteries
Sprint Switch Station	Zoar Gap Road	Propane, batteries
Rice Propane	East Hawley Road	Propane

Source: 2010 Charlemont Comprehensive Emergency Management Plan.

In addition to the above facilities, many farmers store agricultural chemicals on their properties. Given that much farmland is located in or near floodplains and their adjacent water bodies, the potential for an accidental hazardous materials spill to impact water quality is present. This plan does not include an in-depth evaluation of hazardous materials as they relate to farming. In many cases, farmers do use and store pesticides, herbicides and fertilizers on their property. And in most cases, farmers are utilizing best management practices in the use and storage of agricultural chemicals and have undergone any required training and licensing if they are applying these chemicals to the land. Despite training and best management practices, an accidental release of hazardous materials can occur and potentially threaten human health and the environment. An additional concern is storage of older chemicals in barns that are no longer in use. Property owners may be unaware of what is stored in a barn or other building on their premises. One approach that the Town could take to help prepare for a hazardous materials spill on a farm would be to become familiar with the types and quantities of chemicals stored on site at the larger farms. This would assist first responders in being adequately prepared to protect human health and prevent contamination of the environment in the event of a major spill or other accidental release of hazardous materials.

Hazardous facilities located outside of town boundaries can potentially impact the Town as well. The Vermont Yankee nuclear power plant is located on the Connecticut River in Vernon, Vermont, near the Vermont/Massachusetts border and approximately 20 miles from Charlemont Town Hall. In January 2010, the facility notified the Vermont Department of Health that samples taken in November 2009 from a ground water monitoring well on site contained tritium. This finding signals an unintended release of radioactive material into the environment. Testing has shown that contaminated groundwater has leaked into the Connecticut River, though tritium levels in the river have remained below the lower limit of detection.⁵⁷ The Nuclear Regulatory Commission recently extended the plant's operating license for 20 more years, which expires in March 2012.

Within 7.5 miles of the Charlemont Town Hall, the Yankee Atomic Electric Company (YAEC) stores spent nuclear fuel from the former Yankee Rowe nuclear facility, which operated for over three decades as a power generating facility until 1992. The plant was disassembled and officially decommissioned in 2007. However spent fuel from the plant's operation is still stored on site adjacent to the Sherman Reservoir on the Deerfield River, upstream from Charlemont. The fuel is stored in Nuclear Regulatory Commission – approved dry canisters and casks made of steel and concrete, which are placed on a concrete pad on the site. The stored fuel is monitored

⁵⁷ Vermont Department of Health. http://healthvermont.gov/enviro/rad/vt_yankee.aspx

24 hours a day. The fuel storage site is within the inundation zone for the Harriman Dam, which is located approximately 6.5 miles upstream from the site. According to the YAEC's website, the type of container that the fuel is stored in has been tested to withstand submersion under 50 feet of water for 8 hours, among other safety tests.⁵⁸

More recently, the 2011 tsunami and earthquake in Japan that damaged a nuclear power plant demonstrates the potential vulnerability of these facilities to natural disasters, and the geographic extent that could be impacted by an accident. Town officials should stay abreast of proper evacuation procedures in the event of an accident at the Vermont Yankee nuclear power plant or Yankee Rowe fuel storage facility.

DRAFT

⁵⁸ Yankee Atomic Electric Company. http://www.yankeerowe.com/fuel_transportation.html.

VULNERABILITY ASSESSMENT

Vulnerability Overview

The tables within the Vulnerability Assessment section were developed to provide towns with a template for calculating and estimating potential losses and costs of flooding and other hazards. They draw from and integrate the work of other Natural Hazard Mitigation Plans, specifically the Natural Hazard Mitigation Plan for Thurston County, Washington, September 2009, but the tables can be linked to the most recent demographic, land use, and infrastructure information (databases) and automatically calculate and estimate the cost of flooding to each town or region.

Vulnerability Assessment Methodology

The Vulnerability Assessment is a series of tables that enabled FRCOG staff to determine the vulnerability of Charlemont to flooding and to calculate the potential costs of flooding to the town. Estimated losses for all other hazard events were also determined, based on damages from past recorded events. The potential implications for vulnerable populations such as senior and low income populations in the event of a hazard are also assessed.

Flooding

Hazard Summary

In this section, a vulnerability assessment was prepared to evaluate the potential impact that flooding could have on the portions of Charlemont located within the 100-year floodplain. Flooding was chosen for this detailed evaluation because it is a natural hazard likely to impact the community and the location of the impact can be determined by mapping of areas inundated during severe flooding events. Flooding can be caused by severe storms, such as hurricanes, nor'easters, and microbursts, as well as ice jams and snow melt. To determine the vulnerability of the town, data was gathered and calculated for the value of residential, commercial, and industrial properties. The damage estimates presented are rough estimates and likely reflect a worst-case scenario. Computing more detailed damage assessments based on assessor's records is a labor-intensive task and beyond the scope of this project.

Data Collected and Used

National weather databases and Town of Charlemont data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center website. This data was used to support an evaluation of exposure and potential impacts associated with this hazard. Available historic data are presented in Table 3-1 on pages 14-15. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on flooding and the Committee members were interviewed for additional information.

Impact on the Community

Exposure and Loss Estimation

Flooding can cause a wide range of issues, from minor nuisance roadway flooding and basement flooding to major impacts such as roadway closures. Specific damages associated with flooding events include the following primary concerns:

- Blockages of roadways or bridges vital to travel and emergency response
- Breaching of dams
- Damaged or destroyed buildings and vehicles
- Uprooted trees causing power and utility outages
- Drowning, especially people trapped in cars
- Contamination of drinking water
- Dispersion of hazardous materials
- Interruption of communications and/or transportation systems
- Debris management issues including debris removal and identification of disposal sites

Property Damage

Of Charlemont’s total acreage, 815 acres lie within the 100-year floodplain. Most of this land is in agricultural use or is forested. Table 3-14 displays the number of dwelling units and the estimated population living in the 100-year floodplain in Charlemont. According to 2005 MassGIS Land Use data there are approximately 33 dwelling units located in the floodplain. Using this number and Charlemont’s average household size as of the 2010 U.S. Census, it is estimated that 75 people, or 5.9% of Charlemont’s total population, reside in the floodplain.

Table 3-14: Number of Dwelling Units and Percent of Total Population Residing in Flood Hazard Area

Total Town Population	Average # of People per Household	Number of Dwelling Units in Flood Hazard Area	Estimated Population in Flood Hazard Area	% of Total Population Residing in the Flood Hazard Area
1,266	2.26	33	75	5.9%

Source: 2010 U.S. Census; 2005 MassGIS Land Use data.

Table 3-15 shows that roughly 10.6 acres of commercial uses are located within the floodplain, or about 25% of all commercial uses in town. There are no industrial uses located within the floodplain. Roughly 2.8 acres of public/institutional uses are within the floodplain, making up 45% of land used for public/institutional uses in town.

Table 3-15: Acres of Commercial, Industrial, and Public/Institutional Land Use Within the Flood Hazard Area

Land Use	Total Acres in Town	Acres in Flood Hazard Area	% of Total Acres in Flood Hazard Area
Commercial	42.9	10.6	25%
Industrial	6.1	0.0	0%
Public/Institutional	6.1	2.8	45%

Source: 2005 MassGIS Land Use data.

The average assessed values of the residential, commercial, and industrial land uses located within the floodplain are displayed in Table 3-16. The total average assessed value for residential land use within the floodplain is \$4,547,228. Total assessed value in the floodplain for commercial uses is \$2,291,235. This is of concern because should a catastrophic flooding event befall Charlemont, the assessed values of these structures and facilities would likely be significantly reduced, which in turn would impact the town’s tax revenues.

Table 3-16: Average Assessed Value of Land Use in Flood Hazard Area

Land Use	Total Acres in Town	Total Assessed Value	Average Assessed Value Per Acre	Acres in Flood Hazard Area	Average Assessed Value in Flood Hazard Area
Residential	549.1	\$114,263,416	\$208,111	21.9	\$4,547,228
Commercial	42.9	\$9,306,105	\$217,179	10.6	\$2,291,235
Industrial	6.1	\$754,900	\$124,366	0.0	\$0

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2011; 2005 MassGIS Land Use data.

Table 3-17 identifies the average assessed value of all residential, commercial, and industrial land uses located in the floodplain in Charlemont, and the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a major flooding event.

Table 3-17: Potential Estimated Loss in Flood Hazard Area by Land Use

Land Use	Average Assessed Value of Land in Floodplain	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	\$4,547,228	\$45,472	\$227,361	\$454,723
Commercial	\$2,291,235	\$22,912	\$114,562	\$229,123
Industrial	\$0	\$0	\$0	\$0
Total	\$6,838,463	\$68,385	\$341,923	\$683,846

Source: Massachusetts Dept. of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010.

Actual 2012 assessed building values were collected from the Charlemont Assessors Office for significant structures located in or adjacent to the floodplain in Charlemont (Table 3-18). The value of the building contents was estimated using the percentages listed in Table 3-16 for different classes of buildings and facilities. The value is presented as a percentage of the replacement value of the building (the assessed value of the structure) based on the class of structure. The percentages vary for certain classes because the replacement cost of the contents is different from institution to business to service. All of the structures fall within a class that has a 100% building contents value. The total value of the structures is estimated to be \$23,742,000. This is just a sample of the structures that could be impacted by a major flood in Charlemont. There are other businesses, residences, and agricultural lands that are within or adjacent to the floodplain that could be impacted.

Table 3-18: Assessed Values for Significant Structures within or Adjacent to the Floodplain in Charlemont

Structure	Building Structure Value* in Floodplain	Building Contents Value in Floodplain	Total Building Value in Floodplain
Wastewater Treatment Facility	\$350,000	\$350,000	\$700,000
Hawlemont Regional Elementary School	\$7,738,900	\$7,738,900	\$15,477,800
Fire Station	\$88,500	\$88,500	\$177,000
Highway Department	\$449,500	\$449,500	\$899,000
Town Hall	\$375,600	\$375,600	\$751,200
Federated Church of Charlemont	\$624,000	\$624,000	\$1,248,000
Academy at Charlemont	\$1,208,000	\$1,208,000	\$2,416,000
Zoar Outdoor	\$741,400	\$741,400	\$1,482,800
CrabApple Whitewater	\$295,100	\$295,100	\$590,200
Avery's Store & warehouse	\$181,000	\$181,000	\$362,000
Charlemont Inn	\$368,100	\$368,100	\$736,200
Rice Oil Propane	\$67,200	\$100,800	\$168,000
Total	\$12,487,300	\$12,520,900	\$25,008,200

* Building value includes all structures on the property, but excludes land value.

Source: 2012 Charlemont Assessor Data.

Table 3-19: Estimates of Building Contents by Class

Occupancy Class	Contents Value % (as a percentage of building replacement value)
Residential (including temporary lodging, dormitory, and nursing homes)	50%
Commercial (including retail, wholesale, professional, services, financial, entertainment & recreation)	100%
Commercial (including hospital and medical office/clinic)	150%
Commercial Parking	50%
Industrial (including heavy, light technology)	150%
Agriculture	100%
Religion/Non-Profit	100%
Government Emergency Response	150%
Government General Services	100%
Education Schools/Libraries	100%
Education Colleges/Universities	150%

Source: Natural Hazard Mitigation Plan for Thurston County, Washington, September 2009.

Table 3-20 presents 1%, 5%, and 10% damage loss estimates for the structures listed in Table 3-18 in the event of a flood. A flood damaging 10% of all structures would cause an estimated \$2,500,820 in damages.

Table 3-20: Potential Estimated Loss in Flood Hazard Area for Significant Structures in Charlemont

Structure	Total Building Value in Flood Hazard Area	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Wastewater Treatment Facility	\$700,000	\$7,000	\$35,000	\$70,000
Hawlemont Regional School	\$15,477,800	\$154,778	\$773,890	\$1,547,780
Fire Station	\$177,000	\$1,770	\$8,850	\$17,700
Highway Department	\$899,000	\$8,990	\$44,950	\$89,900
Town Hall	\$751,200	\$7,512	\$37,560	\$75,120
Federated Church of Charlemont	\$1,248,000	\$12,480	\$62,400	\$124,800
Academy at Charlemont	\$2,416,000	\$24,160	\$120,800	\$241,600
Zoar Outdoor	\$1,482,800	\$14,828	\$74,140	\$148,280
CrabApple Whitewater	\$590,200	\$5,902	\$29,510	\$59,020
Avery’s Store & warehouse	\$181,000	\$3,620	\$18,100	\$36,200
Charlemont Inn	\$368,100	\$7,362	\$36,810	\$73,620
Rice Oil Propane	\$67,200	\$1,680	\$8,400	\$16,800
Total	\$12,487,300	\$250,082	\$1,250,410	\$2,500,820

Source: 2012 Charlemont Assessor Data.

Population Impacts

The Town should be aware that senior and low income segments of Charlemont’s population may be more vulnerable to hazard events due to a number of factors. Senior and low income populations may be physically or financially unable to react and respond to a hazard event and require additional assistance. Access to information about the hazard event may be lacking, as well as access to transportation in the case of an evacuation. The location and construction quality of housing can also pose a significant risk. Table 3-21 displays the number of senior and low income residents in Charlemont. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Table 3-21: Senior and Low Income Populations in Charlemont Exposed to Natural Hazard Events

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	215	17.0%
Low Income (Persons with annual incomes less than \$25,000)*	280	22.1%
Total	495	39.1%

* Low income population was calculated by multiplying 2005-2009 American Community Survey (ACS) Households with Incomes of Less than \$25,000 (124) by the 2010 Census Average Household Size (2.26). Percentage of total population based on 2010 U.S. Census figures.

Source: 2010 U.S. Census; 2005-2009 American Community Survey.

Repetitive Loss Properties

Repetitive loss properties are those for which two or more losses of at least \$1000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since

1978. According to information obtained from MEMA (and the NFIP), as of June 30, 2013 there are three repetitive loss structures in Franklin County; none in Charlemont.

Overall Vulnerability Assessment

Flooding is common in New England, often causing significant impacts to roads, structures, facilities, utilities, and people. Existing and future mitigation efforts should continue to be developed and employed that will enable Charlemont to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure in the low-lying areas that can be impacted by flooding related to ice jams or rapid snow melt.

Data Deficiencies

In assessing the risks to Charlemont from flood hazards, the following data deficiencies were identified:

- Lack of available data on the number of vulnerable populations living in households in the floodplain.
- Lack of digital floodplain data to overlay on zoning to determine number of developable lots in the floodplain due to outdated FEMA floodplain maps.
- Records of damages to the built and natural environments due to floods in Charlemont are not consistently maintained. Data often resides with an individual and can be lost if that individual leaves his or her position. A more formal system of data collection and maintenance could be established and would help improve the Town's hazard mitigation planning. Better data could also increase the Town's chance of qualifying for various grants.

Severe Winter Storms

Severe snow and ice storms are common in Charlemont, often impacting the Towns' roads, structures, facilities, utilities, and population. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

Hazard Summary

Severe winter storms cause significant concern because they happen often and can be quite severe; they cost residents money; they require snow and ice removal, which can limit access to facilities and can cause health problems; they can cause utility failure and flooding from ice jams; and they put stress on community resources.

Data Collected and Used

According to the National Climatic Data Center (NCDC), there have been a total of 115 snow and ice events reported in Franklin County between 1993 and 2013, including heavy snow, snow, ice storms, snow squalls, freezing rain and winter storms. The NCDC web site has more detailed information about each of the listed storms. An average of 5 such events occurs each year. Over 21 years, winter storms have caused an average of \$3.9 million in damages per year in Franklin County.

Table 3-22: Severe Winter Storms in Franklin County (Heavy Snow/Ice)

Year	# of Heavy Snow/Ice Events	Annual Property Damage	Annual Crop Damage
2013	0	\$0	\$0
2012	2	\$0	\$0
2011	2	\$1.01 million	\$0
2010	3	\$30,000	\$0
2009	5	\$0	\$0
2008	12	\$6,020,000	\$0
2007	7	\$10,000	\$0
2006	0	\$0	\$0
2005	9	\$625,000	\$0
2004	3	\$0	\$0
2003	5	\$50,000	\$0
2002	7	\$1,605,000	\$0
2001	7	\$11,000,000	\$0
2000	7	\$0	\$0
1999	6	\$0	\$0
1998	3	\$0	\$0
1997	6	\$10,030,000	\$0
1996	10	\$47,000,000	\$0
1995	6	\$0	\$0
1994	8	\$5,050,000	\$0
1993	7	\$0	\$0
# of Years	Total # of Events	Average Annual Property Damage	Average Annual Crop Damage
21	115	\$3,925,238	\$0

Source: NOAA National Climatic Data Center. <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>.

Impact on the Community

Exposure and Loss Estimation

Heavy snowfall coupled with low temperatures often results in increases in traffic accidents; disruptions in transportation, commerce, government, and education; utility outages due to falling trees, branches, and other objects; personal injuries associated with slippery surfaces and freezing temperatures; and numerous other problems. Specific damages associated with severe winter storm (snow) events include the following primary concerns:

- Injuries and fatalities associated with accidents, low temperatures, power loss, falling objects and accidents associated with frozen and slippery surfaces and snow accumulation
- Increases in the frequency and impact of traffic accidents, resulting in personal injuries
- Ice-related damage to trees, building and infrastructure inventory, and utilities (power lines, bridges, substations, etc.)
- Roads damaged through freeze and thaw processes
- Stress on the local shelters and emergency response infrastructure
- Lost productivity that occurs when people cannot go to work, school, or stores due to inclement conditions

New England’s climate offers no immunity to the potential damaging effects of severe winter storms. Some minimum damage is anticipated annually, with potential extensive damage occurring about once every 10 years.

Property Damage

The entire built environment of Charlemont is vulnerable to a severe winter storm. Table 3-23 identifies the assessed value of all residential, commercial, and industrial land uses in Town, and the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a severe winter storm.

Table 3-23: Potential Estimated Loss by Land Use

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	\$114,263,416	\$1,142,634	\$5,713,171	\$11,426,342
Commercial	\$9,306,105	\$93,061	\$465,305	\$930,611
Industrial	\$754,900	\$7,549	\$37,745	\$75,490
Total	\$124,324,421	\$1,243,244	\$6,216,221	\$12,432,442

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2011.

Population Impacts

As discussed above, some traffic accidents associated with storm events include injuries and in limited cases, deaths. However, the number of injuries and deaths reported for accidents is generally low.

Populations considered most vulnerable to severe winter storm impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-24 summarizes the senior and low income populations in Charlemont. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Table 3-24: Senior and Low Income Populations in Charlemont Exposed to Natural Hazard Events

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	215	17.0%
Low Income (Persons with annual incomes less than \$25,000)*	280	22.1%
Total	495	39.1%

* Low income population was calculated by multiplying 2005-2009 American Community Survey (ACS) Households with Incomes of Less than \$25,000 (124) by the 2010 Census Average Household Size (2.26). Percentage of total population based on 2010 U.S. Census figures.
 Source: 2010 U.S. Census; 2005-2009 American Community Survey.

Overall Vulnerability Assessment

Severe winter storms are common in New England, often causing significant impacts to the roads, structures, facilities, utilities, and population of Charlemont. Existing and future mitigation efforts should continue to be developed and employed that will enable Charlemont to be prepared for these events when they occur. The cascade effects of severe winter storms include utility losses, transportation accidents, and flooding. Losses associated with flooding are discussed earlier in this section. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways and utilities that can be damaged by such storms and the low-lying areas that can be impacted by flooding related to ice jams or rapid snow melt.

Data Deficiencies

In assessing the risks to Charlemont from severe snow and ice storms, the following data deficiencies were identified:

- Records of damages to the built and natural environments due to severe snow and ice storms in Charlemont are not consistently maintained. Data often resides with an individual and can be lost if that individual leaves his or her position. A more formal system of data collection and maintenance could be established and would help improve the Town's hazard mitigation planning. Better data could also increase the Town's chance of qualifying for various grants.

Hurricanes and Tropical Storms

Hazard Summary

Hurricanes and tropical storms are rare in Charlemont but could cause severe impacts such as flooding, power outages, flying debris, damage to property and injury and loss of life. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

Hurricanes or tropical storms can spin off tornados and bring thunderstorms, high winds and, in coastal areas, storm surges in the sea, possibly resulting in beach erosion and loss or damage to property. Inland, hurricanes mainly bring heavy rains that can cause flooding.

Data Collected and Used

National weather databases and Town of Charlemont data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center website, and the Spatial Hazard Events and Losses Database (SHELDUS). This data was used to support an evaluation of exposure and potential impacts associated with this hazard. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on hurricanes and tropical storms hazard data and mitigation measures.

Impact on the Community

Exposure and Loss Estimation

High winds and heavy rain and/or hail associated with hurricanes and tropical storms can cause damage to utilities, structures, roads, trees (potentially causing vehicle accidents) and injuries and death. Other associated concerns are debris management issues including debris removal and identification of disposal sites. Table 3-22 shows hurricane and tropical storm events in Franklin County for the last 22 years, from 1990 to 2011.

Property Damage

As presented in Table 3-25, historic data for hurricane and tropical storm events indicate one hurricane and 17 tropical storms have been recorded in Franklin County. Hurricane Bob in 1991 caused over \$5.5 million in property damage in the county, and over \$500,000 in crop damage. In 2011, Tropical Storm Irene caused over \$25 million in property damage. Overall, tropical storms and hurricanes have caused an average annual property damage of just \$1.3 million over the last 24 years.

Table 3-25: Hurricane and Tropical Storm Events in Franklin County

Year	# of Hurricane/Tropical Storm Events	Annual Property Damage	Annual Crop Damage
2013	0	\$0	\$0
2012	0	\$0	\$0
2011	1	\$25,325,000	\$0
2010	0	\$0	\$0
2009	0	\$0	\$0
2008	0	\$0	\$0
2007	0	\$0	\$0
2006	5	\$277,861	\$0
2005	1	\$33,889	\$0
2004	1	\$37,778	\$0
2003	2	\$127,381	\$0
2002	0	\$0	\$0
2001	0	\$0	\$0
2000	0	\$0	\$0
1999	1	\$7,692	\$0
1998	2	\$63,269	\$0
1997	0	\$0	\$0
1996	0	\$0	\$0
1995	1	\$0	\$0
1994	1	\$35,714	\$0
1993	0	\$0	\$0
1992	0	\$0	\$0
1991	1	\$5,555,556	\$555,556

Year	# of Hurricane/Tropical Storm Events	Annual Property Damage	Annual Crop Damage
1990	2	\$7,142	\$0
# of Years	Total # of Events	Average Annual Property Damage	Average Annual Crop Damage
24	18	\$1,373,746	\$26,455

Source: Spatial Hazard Events and Losses Database for the United States (SHELDUS):

<http://webra.cas.sc.edu/hvri/products/sheldus.aspx>.

http://www.ncdc.noaa.gov/stormevents/listevents.jsp?beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1996&endDate_mm=08&endDate_dd=31&endDate_yyyy=2013&eventType=%28Z%29+Tropical+Storm&county=FRANKLIN&zone=WESTERN%20FRANKLIN&submitButton=Search&statefips=25%20MASSACHUSETTS

The preliminary estimate for damages from Tropical Storm Irene to public infrastructure and facilities in Charlemont is currently \$107,000 at the writing of this plan. **[Committee working on obtaining an updated figure]** Private property damages have not yet been assessed.

The entire built environment of Charlemont is vulnerable to the effects of a hurricane or tropical storm. Table 3-26 identifies the assessed value of all residential, commercial, and industrial land uses in Town, and the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a severe winter storm.

Table 3-26: Potential Estimated Loss by Land Use

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	\$114,263,416	\$1,142,634	\$5,713,171	\$11,426,342
Commercial	\$9,306,105	\$93,061	\$465,305	\$930,611
Industrial	\$754,900	\$7,549	\$37,745	\$75,490
Total	\$124,324,421	\$1,243,244	\$6,216,221	\$12,432,442

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2011.

Population Impacts

Populations considered most vulnerable to hurricane and tropical storm impacts in Charlemont are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-27 summarizes the senior and low income populations in Charlemont. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Table 3-27: Senior and Low Income Populations in Charlemont Exposed to Natural Hazard Events

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	215	17.0%
Low Income (Persons with annual incomes less than \$25,000)*	280	22.1%
Total	495	39.1%

* Low income population was calculated by multiplying 2005-2009 American Community Survey (ACS) Households with Incomes of Less than \$25,000 (124) by the 2010 Census Average Household Size (2.26). Percentage of total population based on 2010 U.S. Census figures.
 Source: 2010 U.S. Census; 2005-2009 American Community Survey.

Overall Vulnerability Assessment

Hurricanes and tropical storms occur sporadically in New England, and can impact property, crops, utilities and the population of Charlemont. Existing and future mitigation efforts should continue to be developed and employed that will enable Charlemont to be prepared for these events. The cascade effects of these severe storms include utility losses and transportation accidents and flooding. Losses associated with flood hazards are discussed earlier in this section. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways and utilities that can be damaged by such storms and the low-lying areas that can be impacted by flooding.

Data Deficiencies

In assessing the risks to Charlemont from hurricanes and tropical storms, the following data deficiencies were identified:

- Records of damages to the built and natural environment due to hurricanes and tropical storms in Charlemont are not consistently maintained. Data often resides with an individual and can be lost if that individual leaves his or her position. A more formal system of data collection and maintenance could be established and would help improve the Town’s hazard mitigation planning. Better data could also increase the Town’s chance of qualifying for various grants.

Tornados, Microbursts and Thunderstorms

Hazard Summary

Thunderstorms and microbursts are common in western Massachusetts and Charlemont and can cause significant damage from high winds and excessive rain. Tornados are less common in Charlemont but could cause severe impacts such as flooding, power outages, flying debris, damage to property and injury and loss of life. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

Thunderstorms and microbursts bring strong winds, rain and, at times, hail, potentially causing damage to property, crops and utilities and injuries or deaths to residents. Persistent rain can also cause flooding. Tornados can have devastating effects on infrastructure, property and human health. Striking at random, their conical winds leave trails of devastation, at times more than a

mile wide, in their wake. Small tornados, known as “gustnadoes,” have been known to strike in Franklin County, most recently in Sunderland in 2009. The gustnado does not appear in data compiled on tornados for this report, however, even gustnadoes can cause damage; the 2009 occurrence destroyed a barn and downed trees.

Data Collected and Used

National weather databases and Town of Charlemont data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration’s (NOAA) National Climatic Data Center website, and the Spatial Hazard Events and Losses Database (SHELDUS). This data was used to support an evaluation of exposure and potential impacts associated with this hazard. Available historic data are presented in the following tables. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on tornados, thunderstorms, and microbursts hazard data and mitigation measures.

Impact on the Community

Exposure and Loss Estimation

High winds, heavy rain, lightning and/or hail associated with tornados, thunderstorms and microbursts can cause damage to utilities, structures, roads, trees (potentially causing vehicle accidents) and injuries and death.

Property Damage

As presented in Table 3-28, historic data for tornado events indicate that between 1991 and 2013, 4 tornados were recorded in Franklin County. Over 23 years, tornados have caused an average of \$14,130 in property damages yearly.

Table 3-28: Tornado Events in Franklin County

Year	# of Tornado Events	Annual Property Damage	Annual Crop Damage
2013	0	\$0	\$0
2012	0	\$0	\$0
2011	0	\$0	\$0
2010	0	\$0	\$0
2009	0	\$0	\$0
2008	0	\$0	\$0
2007	0	\$0	\$0
2006	1	\$200,000	\$0
2005	0	\$0	\$0
2004	0	\$0	\$0
2003	0	\$0	\$0
2002	0	\$0	\$0
2001	0	\$0	\$0
2000	0	\$0	\$0
1999	0	\$0	\$0

Year	# of Tornado Events	Annual Property Damage	Annual Crop Damage
1998	0	\$0	\$0
1997	2	\$100,000	\$0
1996	0	\$0	\$0
1995	0	\$0	\$0
1994	0	\$0	\$0
1993	0	\$0	\$0
1992	1	\$25,000	\$0
1991	0	\$0	\$0
# of Years	Total # of Events	Average Annual Property Damage	Average Annual Crop Damage
23	4	\$14,130	\$0

Source: National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center Storm Events Database website: <http://www.ncdc.noaa.gov/stormevents/>.

Severe thunderstorms, and their associated hail and lightning events, brought about significant property wreckage in Franklin County in recent years. Thunderstorms with associated wind damage, 169 of them in the last 24 years, caused an average annual property loss of more than \$81,938 and an average annual crop damage of \$5,208 (Table 3-29). It is worth noting that the number of thunderstorms has increased in recent years; in the 1990s, there were an average of 3.8 storms per year, according to NOAA data. From 2000 to 2010, NOAA recorded an average of 8.9 storms per year, more than two times the previous decade. From 2007 through 2010, the most recent years with data available, 61 storms were recorded countywide for an average number of 15 storms over four years.

Table 3-29: Thunderstorm Events in Franklin County

Year	# of Thunderstorm Events	Annual Property Damage	Annual Crop Damage
2013	8	\$149,000	\$0
2012	8	\$34,000	\$0
2011	9	\$77,000	\$0
2010	30	\$590,500	\$0
2009	2	\$17,000	\$0
2008	21	\$602,000	\$1,250,000
2007	19	\$0	\$0
2006	6	\$315,000	\$0
2005	9	\$85,000	\$0
2004	4	\$30,000	\$0
2003	1	\$10,000	\$0
2002	6	\$25,000	\$0
2001	5	\$0	\$0
2000	3	\$20,000	\$0
1999	5	\$0	\$0
1998	8	\$2,000	\$0
1997	7	\$10,000	\$0
1996	5	\$0	\$0

Year	# of Thunderstorm Events	Annual Property Damage	Annual Crop Damage
1995	3	\$0	\$0
1994	4	\$0	\$0
1993	0	\$0	\$0
1992	2	\$0	\$0
1991	3	\$0	\$0
1990	1	\$0	\$0
# of Years	Total # of Events	Average Annual Property Damage	Average Annual Crop Damage
24	169	\$81,938	\$5,208

Source: National Oceanic and Atmospheric Administration’s (NOAA) National Climatic Data Center Storm Events Database website: <http://www.ncdc.noaa.gov/stormevents/>.
http://www.ncdc.noaa.gov/stormevents/listevents.jsp?beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1996&endDate_mm=08&endDate_dd=31&endDate_yyyy=2013&eventType=%28C%29+Thunderstorm+Wind&county=FRANKLIN&zone=WESTERN%20FRANKLIN&submitButton=Search&statefips=25%20MASSACHUSETTS

Six thunderstorms over the last fourteen years produced high winds in Charlemont that caused damage to trees, power lines, and private property (Table 3-30). According to the data for the fourteen year period, severe thunderstorm events caused an average annual property damage of \$4,714. No crop damages were reported for these events.

Table 3-30: Severe Thunderstorm Events in Charlemont

Year	# of Thunderstorm Events	Annual Property Damage	Annual Crop Damage
2010	1	\$5,000	\$0
2007	1	\$0	\$0
2006	1	\$5,000	\$0
2005	1	\$5,000	\$0
2003	1	\$10,000	\$0
1998	1	\$0	\$0
# of Years	Total # of Events	Average Annual Property Damage	Average Annual Crop Damage
14	6	\$1,786	\$0

Source: NOAA National Climatic Data Center. <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

As Table 3-31 shows, 84 hail storms in Franklin County between 1991 and 2013 have caused an average of approximately \$217 in property damage per year, and an average of \$2,174 of crop damage. The total amount of crop damage during this period resulted from a single incident on June 16, 2008 that caused \$50,000 in damage. Pea to marble size hail fell in a swath from Colrain to Shelburne damaging apple and peach orchards from Colrain to Shelburne to Deerfield. An estimated 45 acres of apples and two to three acres of peaches were damaged by the hail. This storm was also accompanied by lightning and thunderstorm winds. It is important to note that each reported hail event is counted in the total, even if they occurred in multiple towns on the same date.

Table 3-31: Hail Events in Franklin County

Year	# of Hail Events	Annual Property Damage	Annual Crop Damage
2013	7	\$0	\$0
2012	2	\$0	\$0
2011	9	\$0	\$0
2010	4	\$0	\$0
2009	2	\$0	\$0
2008	14	\$0	\$50,000
2007	15	\$0	\$0
2006	0	\$0	\$0
2005	3	\$5,000	\$0
2004	2	\$0	\$0
2003	1	\$0	\$0
2002	0	\$0	\$0
2001	3	\$0	\$0
2000	1	\$0	\$0
1999	0	\$0	\$0
1998	9	\$0	\$0
1997	1	\$0	\$0
1996	3	\$0	\$0
1995	4	\$0	\$0
1994	4	\$0	\$0
1993	0	\$0	\$0
1992	0	\$0	\$0
1991	0	\$0	\$0
# of Years	Total # of Events	Average Annual Property Damage	Average Annual Crop Damage
23	84	\$217	\$2,174

Source: National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center Storm Events Database website: <http://www.ncdc.noaa.gov/stormevents/>.

http://www.ncdc.noaa.gov/stormevents/listevents.jsp?beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=1996&endDate_mm=08&endDate_dd=31&endDate_yyyy=2013&eventType=%28C%29+Hail&county=FRANKLIN&zone=WESTERN%2BFRANKLIN&submitButton=Search&statefips=25%2CMASSACHUSETTS

The NOAA National Climatic Data Center records list five hail events for Charlemont, one occurring in 1995, and four occurring between 2005 and 2008. No damages were recorded for any of these storms. Twelve lightning events (Table 3-32) have caused an average of more than \$8,500 in property damage per year over the last 18 years in Franklin County. One lightning event was recorded for Charlemont, in July 1995. No damages were reported, however the strike resulted in one injury.

Table 3-32: Lightning Events in Franklin County

Year	# of Lightning Events	Annual Property Damage	Annual Crop Damage
2013	3	\$48,000	\$0
2012	1	\$6,900,000	\$0
2011	0	\$0	\$0
2010	1	\$15,000	\$0
2009	0	\$0	\$0
2008	1	\$10,000	\$0
2007	0	\$0	\$0
2006	0	\$0	\$0
2005	1	\$50,000	\$0
2004	1	\$35,000	\$0
2003	0	\$0	\$0
2002	1	\$15,000	\$0
2001	1	\$20,000	\$0
2000	0	\$0	\$0
1999	0	\$0	\$0
1998	0	\$0	\$0
1997	1	\$3,000	\$0
1996	0	\$0	\$0
1995	2	\$0	\$0
1994	2	\$0	\$0
# of Years	Total # of Events	Average Annual Property Damage	Average Annual Crop Damage
20	15	\$354,800	\$0

Source: National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center Storm Events Database website: <http://www.ncdc.noaa.gov/stormevents/>.

The entire built environment of Charlemont is vulnerable to the high winds and/or flooding from a tornado, thunderstorm or microburst. Table 3-33 identifies the assessed value of all residential, commercial, and industrial land uses in Charlemont, and the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of an extreme wind and rain storm.

Table 3-33: Potential Estimated Loss by Land Use

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	\$114,263,416	\$1,142,634	\$5,713,171	\$11,426,342
Commercial	\$9,306,105	\$93,061	\$465,305	\$930,611
Industrial	\$754,900	\$7,549	\$37,745	\$75,490
Total	\$124,324,421	\$1,243,244	\$6,216,221	\$12,432,442

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2011.

Population Impacts

As discussed above, some traffic accidents associated with storm events include injuries and deaths. However, the number of injuries and deaths reported for accidents is generally low.

Populations considered most vulnerable to tornado, microburst and thunderstorm impacts in Charlemont are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-34 summarizes the senior and low income populations in Charlemont. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Table 3-34: Senior and Low Income Populations in Charlemont Exposed to Natural Hazard Events

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	215	17.0%
Low Income (Persons with annual incomes less than \$25,000)*	280	22.1%
Total	495	39.1%

* Low income population was calculated by multiplying 2005-2009 American Community Survey (ACS) Households with Incomes of Less than \$25,000 (124) by the 2010 Census Average Household Size (2.26). Percentage of total population based on 2010 U.S. Census figures.
Source: 2010 U.S. Census; 2005-2009 American Community Survey.

Overall Vulnerability Assessment

Thunderstorms and microbursts are common in New England, and can impact property, crops, utilities and the population of Charlemont. Tornadoes are less common, but can cause significant damage when they do occur. Existing and future mitigation efforts should continue to be developed and employed that will enable Charlemont to be prepared for these events. The cascade effects of these storm events include utility losses and transportation accidents and flooding. Losses associated with the flood hazard are discussed earlier in this section. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways and utilities that can be damaged by such storms and the low-lying areas that can be impacted by flooding.

Data Deficiencies

In assessing the risks to Charlemont from tornadoes, microbursts and thunderstorms, the following data deficiencies were identified:

- Records of damages to the built and natural environment due to tornadoes, microbursts and thunderstorms in Charlemont are not consistently maintained. Data often resides with an individual and can be lost if that individual leaves his or her position. A more formal system of data collection and maintenance could be established and would help improve the Town's hazard mitigation planning. Better data could also increase the Town's chance of qualifying for various grants.

Earthquakes

Hazard Summary

Earthquakes are rare in Franklin County, however temblors are unpredictable and can cause significant damage to roads, structures, facilities, utilities, and population. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for earthquakes.

While rare in Franklin County, earthquakes have happened in New England. New England experiences an average of 30 to 40 earthquakes each year although most are not noticed by people.⁵⁹ Ground shaking from earthquakes can rupture gas mains and disrupt other utility service, damage buildings, bridges and roads, and trigger other hazardous events such as landslides, avalanches, flash floods (dam failure) and fires. Un-reinforced masonry buildings, buildings with foundations that rest on filled land or unconsolidated, unstable soil, and mobile homes not tied to their foundations are at risk during an earthquake.⁶⁰

Data Collected and Used

The National Oceanic and Atmospheric Administration recorded no earthquakes for Franklin County in the last 20 years. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2013 was also reviewed for information on earthquake hazard data and mitigation measures.

Impact on the Community

Exposure and Loss Estimation

A major earthquake could cause severe damage to Charlemont buildings, including older structures that were built before a 1975 law requiring new buildings to withstand earthquakes. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

Property Damage

Historic data for earthquake events indicate that between 1991 and 2010, no earthquakes were recorded in Franklin County during this period, causing no damage to property.

The entire built environment of Charlemont is vulnerable to earthquakes. Table 3-35 identifies the assessed value of all residential, commercial, and industrial land uses in Charlemont, and the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of an earthquake.

⁵⁹ Northeast States Emergency Consortium web site: www.nesec.org/hazards/earthquakes.cfm

⁶⁰ Federal Emergency Management Agency web site: www.fema.gov/hazards/earthquakes/quake.shtm.

Table 3-35: Potential Estimated Loss by Land Use

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	\$114,263,416	\$1,142,634	\$5,713,171	\$11,426,342
Commercial	\$9,306,105	\$93,061	\$465,305	\$930,611
Industrial	\$754,900	\$7,549	\$37,745	\$75,490
Total	\$124,324,421	\$1,243,244	\$6,216,221	\$12,432,442

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2011.

Population Impacts

Populations considered most vulnerable to earthquake impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-36 summarizes the senior and low income populations in Charlemont. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Table 3-36: Senior and Low Income Populations in Charlemont Exposed to Natural Hazard Events

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	215	17.0%
Low Income (Persons with annual incomes less than \$25,000)*	280	22.1%
Total	495	39.1%

* Low income population was calculated by multiplying 2005-2009 American Community Survey (ACS) Households with Incomes of Less than \$25,000 (124) by the 2010 Census Average Household Size (2.26). Percentage of total population based on 2010 U.S. Census figures.

Source: 2010 U.S. Census; 2005-2009 American Community Survey.

Overall Vulnerability Assessment

Earthquakes, while rare, could cause significant impacts and losses to the roads, structures, facilities, utilities, and population of Charlemont. Existing and future mitigation efforts should continue to be developed and employed that will enable Charlemont to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, trailer homes and buildings erected before 1975, and infrastructure such as roadways and utilities that could be damaged by earthquakes. Fifty nine (59) percent of housing in Charlemont was built before 1970.⁶¹ According to members of the Committee, no earthquakes have impacted Charlemont in the last 20 years.

Data Deficiencies

In assessing the risks to Charlemont from earthquakes, no data deficiencies were identified.

⁶¹ 2005-2009 American Community Survey housing data.

Wildfires and Brushfires

Hazard Summary

Wildfires can damage woodlands, homes, utilities and buildings, and could cause injuries or deaths. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

Burn piles that blaze out of control, lightning strikes in forested land, campfires improperly managed, and arson can cause wildfires. Charlemont is vulnerable to these conflagrations, especially in times of drought. Fire suppression can be expensive and dangerous for firefighters, and wildfires can threaten wildlife habitat and human health.

Data Collected and Used

National weather databases and Town of Charlemont data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center website. Data from this website shows no wildfires have occurred in or impacted Franklin County in the last 20 years. According to data from Massachusetts Fire Incident Reporting System of the Massachusetts Department of Fire Services, the Charlemont Fire Department responded to 15 brushfires between 2004 and 2010. This is a relatively small amount compared to other towns in the region. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on wildland fires and brushfires hazard data and mitigation measures.

Impact on the Community

Exposure and Loss Estimation

A major out-of-control wildfire can damage property, utilities and forested land; create smoke that can cause breathing problems; and injure or kill people. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

Property Damage

No property damage, injuries or deaths have been recorded for the reported brushfires in Charlemont between 2004 and 2010.

Because portions of Charlemont are heavily wooded and there is significant fuel load in the forests from the 2008 ice storm, and the town has many historic wooden structures, the entire built environment of the Town is vulnerable to a wildfire. Table 3-37 identifies the building type and valuation of this inventory as well as the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a wildfire.

Table 3-37: Potential Estimated Loss by Land Use

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	\$114,263,416	\$1,142,634	\$5,713,171	\$11,426,342
Commercial	\$9,306,105	\$93,061	\$465,305	\$930,611
Industrial	\$754,900	\$7,549	\$37,745	\$75,490
Total	\$124,324,421	\$1,243,244	\$6,216,221	\$12,432,442

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2011.

Population Impacts

Populations considered most vulnerable to wildfire impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-38 summarizes the senior and low income populations in Charlemont. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Table 3-38: Senior and Low Income Populations in Charlemont Exposed to Natural Hazard Events

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	215	17.0%
Low Income (Persons with annual incomes less than \$25,000)*	280	22.1%
Total	495	39.1%

* Low income population was calculated by multiplying 2005-2009 American Community Survey (ACS) Households with Incomes of Less than \$25,000 (124) by the 2010 Census Average Household Size (2.26). Percentage of total population based on 2010 U.S. Census figures.

Source: 2010 U.S. Census; 2005-2009 American Community Survey.

Overall Vulnerability Assessment

While wildfires have caused minimal damage, injury and loss of life to date in Charlemont, their potential to destroy property and cause injury or death exists. Existing and future mitigation efforts should continue to be developed and employed that will enable Charlemont to be prepared for these events when they occur. Wildfires can also cause utility disruption and air-quality problems. Particular areas of vulnerability include low-income and elderly populations.

Data Deficiencies

In assessing the risks to Charlemont from wildfire hazards, no data deficiencies were identified.

Dam Failures

Hazard Summary

Dams hold back water, and when a dam fails, the potential energy of the stored water behind the dam is instantly released as water rushes in torrent downstream, flooding an area engineers refer to as an “inundation area.” The number of casualties and the amount of property damage will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

Areas adjacent to a river or stream or on low ground are in danger of being inundated by a large volume of water that could destroy structures, utilities, roadways and bridges, and cause injuries or deaths. Many dams in Massachusetts were built in the 19th century without the benefit of modern engineering design and construction oversight. Dams can fail because of structural problems due to age and/or lack of proper maintenance. Dam failure can also be the result of structural damage caused by an earthquake or flooding brought on by severe storm events.

Data Collected and Used

Data from the National Oceanic and Atmospheric Administration’s National Climatic Data Center website shows no dam failures have occurred in or impacted Franklin County in the last 20 years. According to the members of the Committee, no dam failures have occurred in Charlemont in the last 20 years.

Impact on the Community

Exposure and Loss Estimation

While dam failures are rare, their impacts can be devastating, including loss of property, disruption to infrastructure, and injury and death. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

Property Damage

Historic data for dam failure events indicate that between 1993 and 2010, no events were recorded in Franklin County, causing no property damage or population impacts.

Structures that lie in the inundation area of each of the dams in Charlemont are vulnerable to a dam failure. The number of homes and businesses that lie within inundation areas in town is not known at this time. Table 3-39 identifies the building type and valuation for all residential, commercial, and industrial uses in Town, as well as the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a dam failure.

Table 3-39: Potential Estimated Loss by Land Use

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	\$114,263,416	\$1,142,634	\$5,713,171	\$11,426,342
Commercial	\$9,306,105	\$93,061	\$465,305	\$930,611
Industrial	\$754,900	\$7,549	\$37,745	\$75,490
Total	\$124,324,421	\$1,243,244	\$6,216,221	\$12,432,442

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2011.

Population Impacts

Populations considered most vulnerable to dam failure are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-40 summarizes the senior and low income populations in Charlemont. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Table 3-40: Senior and Low Income Populations in Charlemont Exposed to Natural Hazard Events

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	215	17.0%
Low Income (Persons with annual incomes less than \$25,000)*	280	22.1%
Total	495	39.1%

* Low income population was calculated by multiplying 2005-2009 American Community Survey (ACS) Households with Incomes of Less than \$25,000 (124) by the 2010 Census Average Household Size (2.26). Percentage of total population based on 2010 U.S. Census figures.

Source: 2010 U.S. Census; 2005-2009 American Community Survey.

Overall Vulnerability Assessment

Dam failures, while rare, can destroy roads, structures, facilities, utilities, and impact the population of Charlemont. Existing and future mitigation efforts should continue to be developed and employed that will enable Charlemont to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, buildings in the floodplain or inundation areas, and infrastructure such as roadways and utilities that can be damaged by such events.

Beaver dam locations are shown on the Critical Facilities and Infrastructure map included with this report.

Data Deficiencies

In assessing the risks to Charlemont from dam failure hazards, the following data deficiencies were identified:

- It is unknown exactly how many homes and businesses are located in inundation areas in town.

- Lack of available data on the number of vulnerable populations living within inundation areas in town.

Landslides

Hazard Summary

Landslides rarely occur in Franklin County but in March 2011, following a period of heavy rain and melting snow, a landslide occurred at the Green River Cemetery in Greenfield. Cars were trapped and properties were covered in mud, silt, and other debris. Emergency personnel evacuated nearby homes and the town used heavy equipment to clean up the mud. Landslides have also occurred in the eastern part of the state: Following heavy rains in March 2010, Walpole and Topsfield experienced landslides that destroyed a storage building and closed a portion of Route 1. The Topsfield slide resulted in a tree landing on a passing car, but no injuries were reported. Earlier that month, a mudslide at a construction site brought mud within 12 feet of train tracks at the Wellesley Hills station of the Massachusetts Bay Transportation Authority in Wellesley.

Landslides are most often caused by heavy rains destabilizing slopes but can have other causes, including clearing land for development, earthquakes, and vibrations from machinery or blasting. Landslides can be dangerous because they are unexpected and fast. They can bury structures with little warning and rescue efforts can be threatened by new slides.

Data Collected and Used

National Oceanic and Atmospheric Administration's National Climatic Data Center website shows no landslide events in Franklin County for the last 20 years. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2013 was also reviewed for information on landslide hazard data and mitigation measures.

Impact to the Community

Exposure and Loss Estimation

While landslides are rare, their impacts can be devastating, including loss of property, disruption to infrastructure, and injury and death. Continued development, particularly on steep slopes or unstable soils, increases the chances that landslides will be a danger. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

Property Damage

Historic data for landslide events indicate that between 1993 and 2013, no landslide events were recorded in Franklin County.

It is unknown exactly how many homes and businesses in town are vulnerable to landslides. Table 3-41 identifies the assessed value of all residential, commercial, and industrial uses in Town, as well as the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a massive landslide.

Table 3-41: Potential Estimated Loss by Land Use

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	\$114,263,416	\$1,142,634	\$5,713,171	\$11,426,342
Commercial	\$9,306,105	\$93,061	\$465,305	\$930,611
Industrial	\$754,900	\$7,549	\$37,745	\$75,490
Total	\$124,324,421	\$1,243,244	\$6,216,221	\$12,432,442

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2011.

Population Impacts

Populations considered most vulnerable to landslide impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-42 summarizes the senior and low income populations in Charlemont. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Table 3-42: Senior and Low Income Populations in Charlemont Exposed to Natural Hazard Events

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	215	17.0%
Low Income (Persons with annual incomes less than \$25,000)*	280	22.1%
Total	495	39.1%

* Low income population was calculated by multiplying 2005-2009 American Community Survey (ACS) Households with Incomes of Less than \$25,000 (124) by the 2010 Census Average Household Size (2.26). Percentage of total population based on 2010 U.S. Census figures.

Source: 2010 U.S. Census; 2005-2009 American Community Survey.

Overall Vulnerability Assessment

Landslides, while rare in Franklin County, can destroy roads, structures, facilities, utilities, and impact the population of Charlemont. Existing and future mitigation efforts should continue to be developed and employed that will enable Charlemont to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, and buildings, roadways, and utilities near the foot of slopes, especially when slopes are destabilized. According to the members of the Committee, only minor landslides have occurred in the last 20 years in Charlemont.

Data Deficiencies

In assessing the risks to Charlemont from landslides, the following data deficiencies were identified:

- The number of homes and businesses vulnerable to landslides is unknown.
- Lack of available data on the number of vulnerable populations who live in areas susceptible to landslides.

Ice Jams

Hazard Summary

Ice jams (or ice dams) occur when water builds up behind a blockage of ice. Ice jams can occur in various ways, but in New England they predominantly form on rivers and streams and mainly threaten infrastructure.

When the upstream part of a river thaws first and the ice is carried downstream into the still-frozen part of the watercourse, ice can form an ice dam and flood low lying areas upstream of the jam. Also, once an ice dam breaks apart, the sudden surge of water that breaks through the dam can flood areas downstream of the jam. The resulting flow of water when an ice jam is broken can cause flooding downstream, threatening infrastructure, structures, and roadways.

Data Collected and Used

The National Oceanic and Atmospheric Administration's National Climatic Data Center website shows no ice jam events or damage in Charlemont over the last 20 years. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2013 was also reviewed for information on ice jam hazard data and mitigation measures.

Impact to the Community

Exposure and Loss Estimation

Losses to ice jams include the rising waters along the river or stream that is being dammed, and the rush of water downstream when the dam either melts or is broken up by human intervention. Buildings, roadways and utilities are threatened by ice blockages.

Property Damage

Data on ice jams in Franklin County indicate that no property damage or injuries or deaths occurred as the result of ice jams in the last 20 years.

The structures and people most at risk from an ice jam are those within the floodplain. The average assessed values of the residential, commercial, and industrial land uses located within the floodplain, and the damage loss estimates for 1%, 5%, and 10% of this inventory, are displayed in Table 3-43.

Table 3-43: Potential Estimated Loss in Flood Hazard Area by Land Use

Land Use	Average Assessed Value of Land in Floodplain	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	\$4,547,228	\$45,472	\$227,361	\$454,723
Commercial	\$2,291,235	\$22,912	\$114,562	\$229,123
Industrial	\$0	\$0	\$0	\$0
Total	\$6,838,463	\$68,385	\$341,923	\$683,846

Source: Massachusetts Dept. of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010.

Population Impact

Populations considered most vulnerable to ice jam impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-44 summarizes the senior and low income populations in Charlemont. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Table 3-44: Senior and Low Income Populations in Charlemont Exposed to Natural Hazard Events

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	215	17.0%
Low Income (Persons with annual incomes less than \$25,000)*	280	22.1%
Total	495	39.1%

* Low income population was calculated by multiplying 2005-2009 American Community Survey (ACS) Households with Incomes of Less than \$25,000 (124) by the 2010 Census Average Household Size (2.26). Percentage of total population based on 2010 U.S. Census figures.
Source: 2010 U.S. Census; 2005-2009 American Community Survey.

Overall Vulnerability Assessment

Ice jams occur throughout New England, often causing significant impacts and losses to roads, structures, facilities, utilities, and the population. Existing and future mitigation efforts should continue to be developed and employed that will enable Charlemont to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways near rivers and streams and utilities and low-lying areas. According to the members of the Committee, ice jams have occurred in recent years on the Deerfield River in East Charlemont.

Data Deficiencies

In assessing the risks to Charlemont from ice jams, the following data deficiencies were identified:

- Lack of available data on the number of vulnerable populations living in households in the floodplain.

Manmade Hazards

Hazard Summary

Manmade hazards are being assessed at the local level for the first time in this plan update. A preliminary assessment was made only of those manmade hazards of an accidental nature, such as transportation accidents or fixed-facility accidents involving hazardous materials. The Committee evaluated the potential for these types of hazardous materials accidents as quite high – particularly transportation related, given the proximity of Routes 2, 8A, and the railroad to more densely populated areas of Town. No formal vulnerability assessment was done on

manmade hazards, however the potential for accidents, the unknown impact of such accidents and the lack of well-analyzed data make this hazard a high priority on the Action Plan.

Data Deficiencies

- Need to research available models and data requirements to adequately evaluate the potential impact of hazardous materials transportation and fixed-facility accidents on drinking water supplies and on public health.

DRAFT

HAZARD ANALYSIS METHODOLOGY

In updating Charlemont's 2005 Local Natural Hazard Mitigation Plan, the Franklin Regional Council of Governments developed the All Hazards Risk Assessment methodology for assessing the risk of hazards. The All Hazards Risk Assessment is an interactive table that the Charlemont Multi-Hazard Mitigation Planning Committee completed with the FRCOG staff to evaluate all the natural hazards that can impact the town based on probability of occurrence, severity of impacts, area of occurrence and preparedness. This assessment builds on the information gleaned in each individual hazard assessment. The completed table gives the town an overall understanding of the natural hazards, provides guidance on which hazards the Town may want to focus mitigation efforts on, reaffirms that Charlemont's planning and preparedness is on track, and shows residents that town departments and agencies are organized in case of a natural disaster. Note that the Assessment does not include manmade hazards, given lack of data assessed for this plan. In rating the hazards, the Committee considered the following issues for three of the categories:

Probability of Occurrence

- 1) Known risk
- 2) Historical data (previous occurrences)

Severity of Impacts

- 1) Building stock
- 2) Critical facilities
- 3) Transportation systems
- 4) Lifeline utility systems
- 5) Communications systems and networks
- 6) High potential loss facilities
- 7) Hazardous material facilities
- 8) Economic elements
- 9) Special consideration areas
- 10) Historic, cultural, and natural resource areas
- 11) Natural resources

Preparedness

- 1) Status of current plans
- 2) Training status
- 3) Availability of backup systems
- 4) Community resources (equipment, personnel, etc.)

The following rating charts were used to determine the rating for each event.

Table 3-45: Probability of Occurrence Rating Chart

Classification	#	Probability of Occurrence
Very High	5	events that occur at least once each year (100% per year)
High	4	events that occur from once in 2 years to once in 4 years (25% to 50% per year)
Medium	3	events that occur from once in 5 years to once in 50 years (2% to 20% per year)
Low	2	events that occur from once in 50 years to once in 100 years (1% to 2% per year)
Very Low	1	events that occur less frequently than once in 100 years (less than 1% per year)

Table 3-46: Severity of Impacts Rating Chart

Classification	#	Severity of Multiple Impacts
Catastrophic	4	Multiple deaths and injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of facilities for 30 days or more.
Critical	3	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
Limited	2	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.
Minor	1	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.

Table 3-47: Severity of Impacts Definitions

Severity of Impact Category	Severity of Impact Category Definitions
Built	Building Stock includes residential, commercial, industrial, and institutional buildings.
Built	Hazardous Material Facilities include facilities housing industrial/hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins.
Built	Historic, Cultural, and Natural Resource Areas may include buildings, structures, objects, sites, national and local historic or significant districts, and historical archival storage facilities.
Infrastructure	Critical Facilities are essential to the health and welfare of the whole population and are especially important following hazard events. Since vulnerability is based on service losses as well as building structure integrity and content value, assess the effects on the service function interruption of critical facilities as well as their physical aspects. For purposes of this mitigation planning guidance, critical facilities may include emergency service facilities such as hospitals and other medical facilities, jails and juvenile detention centers, police and fire stations, emergency operations centers, public works facilities, evacuation shelters, schools, and other uses that house special needs populations.
Infrastructure	Transportation Systems include airways (including airports, heliports, etc.), roadways (including highways, bridges, tunnels, roadbeds, overpasses, transfer centers, etc.), railways and public transit (including trackage, tunnels, bridges, rail yards, depots, etc.), and waterways (including canals, locks, seaports, ferries, harbors, dry-docks, piers, etc.).
Infrastructure	Lifeline Utility Systems such as potable water, wastewater, oil, natural gas, electric power, substations, power lines, etc.
Infrastructure	Communications Systems and Networks such as telephones, emergency service radio systems, repeater sites and base stations, television and radio stations, etc.
Natural	Natural Resources include agricultural land, water supply lands, rivers.

Severity of Impact Category	Severity of Impact Category Definitions
Population	High Potential Loss Facilities include facilities that would have a high loss associated with them, such as nuclear power plants or dams.
Population	Economic Elements include major employers, financial centers, and other business or retail districts in the community that could significantly affect the local or regional economy if interrupted.
Population	Special Consideration Areas include areas of high density residential, commercial, institutional, and industrial development that, if damaged, could result in economic and functional losses and in high death tolls and injury rates.

Table 3-48: Area of Occurrence Rating Chart

Classification	#	Percentage of Town Impacted
Large	3	More than 50% of the town affected.
Medium	2	10 to 50% of the town affected.
Isolated	1	Less than 10% of the town affected.

Table 3-49: Preparedness Rating Chart

Classification	#
Poor	3
Fair	2
Good	1

To determine the final hazard index for each hazard, each category was assigned a weight. Probability of Occurrence was given the most weight (45%), followed by Severity of Impacts (30%), Area of Occurrence (15%), and Preparedness (10%). Ratings were entered into a spreadsheet that calculated the Weighted Hazard Index for each hazard. Hazards with higher index scores represent the events most in need of organization focus and resources for emergency planning and mitigation projects.

The results of the All Hazards Risk Assessment can be seen in Table 3-50. The hazards are listed in order from highest weight to lowest weight in terms of risk to the town. Among the hazards ranking at the top of the list are two that occur very infrequently, but if they were to occur, could cause catastrophic damage to the town. Earthquakes (Hazard Index of 6.3) occur very infrequently, but because a majority of the town’s buildings and infrastructure are not built to withstand a major earthquake, significant damage could occur to a large part of the town. Similarly, if a dam failure (Hazard Index of 5.8) were to occur, Charlemont village center and a large swath of property along the Deerfield River would be heavily damaged. Tied with dam failure at 5.8 are severe winter storms and ice storms. These types of events occur yearly, and have the potential to cause significant damage to the built environment, infrastructure, and the residents of town.

Hurricanes and tropical storms (Hazard Index of 5.2) occur less frequently, but also have the potential to cause significant damage in town. Tornados, microbursts, and thunderstorms (Hazard Index of 4.9) and flooding (Hazard Index of 4.3) occur yearly, but typically cause less damage than other storm events. Wildfires and brushfires (Hazard Index of 3.3) occur frequently, but do little damage and affect only small portions of the town at one time. Similarly, landslides and ice

jams (Hazard Indexes of 1.9) are isolated events, impacting a small portion of town with limited damage. Overall the Committee felt that the Town of Charlemont is well prepared for all hazard events.

DRAFT

TABLE 3-50: All Hazards Risk Assessment Table

EVENTS	Probability of Occurrence*	POC Weighted Value	Severity of Impacts*				SOI Weighted Value	Area of Occurrence*	Add Weighted Value	Preparedness	Prep. Weighted Value	Weighted Hazard Index
ASSIGNED WEIGHTING FACTOR	45%		30%					15%		10%		
INDEX VALUE	1-5		Built 1-4*	Natural 1-4*	Population 1-4*	Infrastructure 1-4*		1-3		1-3		
NATURAL HAZARDS												
Earthquakes	2	0.9	4	4	4	4	4.8	3	0.5	1	0.1	6.3
Severe Winter Storms/Ice Storms	5	2.3	3	1	3	3	3.0	3	0.5	1	0.1	5.8
Dam Failures	1	0.5	4	4	4	4	4.8	3	0.5	1	0.1	5.8
Hurricanes and Tropical Storms	3	1.4	3	2	3	3	3.3	3	0.5	1	0.1	5.2
Tornados, microbursts, thunderstorms	5	2.3	2	1	2	2	2.1	3	0.5	1	0.1	4.9
Floods	5	2.3	2	1	1	2	1.8	1	0.2	1	0.1	4.3
Wild Fires and Brush Fires	4	1.8	1	1	1	1	1.2	1	0.2	1	0.1	3.3
Landslides	1	0.5	1	1	1	1	1.2	1	0.2	1	0.1	1.9
Ice Jams	1	0.5	1	1	1	1	1.2	1	0.2	1	0.1	1.9

* See rating charts in Tables 3-45 through 3-49

DEVELOPMENT TRENDS ANALYSIS

In assessing development trends for the Town of Charlemont - and the impact those trends might have on hazard mitigation - the Committee was asked to evaluate the probability of development in town and areas most likely to be targeted for development. The committee was also asked about changes in industry, proposed housing and retail development, and any major highway or public transit improvements that might change accessibility to parts of town. Additionally, data such as number of building permits issued, change in population, current zoning bylaws and the acres of developable land were considered.

According to U.S. Census data collected for new privately-owned residential building permits issued in Charlemont, 41 permits for new single family homes were issued between 2000 and 2010 (no data was available for the number of permits issued in 2002). In 2009 and 2010, no permits were issued in town, reflecting the nation-wide recession and slow housing market. Over the same period of time there has been no major new commercial development in town, according to the Committee, with the exception of Zoar Outdoor and CrabApple Whitewater rafting companies completing minor facility improvements.

Between 1971 and 1999 the predominant land use change in the Town of Charlemont has been the conversion of forest to residential development along existing town roads. Another important change is the increase in participatory recreational uses. The locations of the new residential development are spread throughout town with an atypical concentration in East Charlemont off Hawk Hill and Deer Run Lane.⁶² Since 2000, new construction in town has been rare, and usually happens along Legate Hill Road, which is the most dense area in town outside of the village center.

Due to a change in technology and in methodology, the most recent MassGIS Land Use Data from 2005 cannot be accurately compared to previous data sets (such as 1999 and 1971). In 2005, roughly 515 acres in town (3.1% of the total acreage) was categorized as low to very low density residential use. Approximately 34 acres (0.2% of town) was categorized as medium (1/4-1/2 acre lot) to high (less than 1/4 acre lot) density or multifamily residential use. Approximately 1,254 acres were in agricultural use (7.4% of town), 43 acres (less than 1 percent) were categorized as commercial use, and 6 acres (less than 1 percent) were in industrial use. The majority of the town is forested (14,243 acres, or 84%).⁶³

The Town of Charlemont has a total population of 1,266, as reported by the 2010 U.S. Census. Charlemont is located in western Franklin County and is part of the Mohawk Trail Regional School District, which includes other western Franklin County towns and the Town of Plainfield in Hampshire County. This ten-town surrounding West County region⁶⁴ had a total population of 12,450 in 2010.

⁶² 2004 Charlemont Open Space and Recreation Plan.

⁶³ 2005 MassGIS Land Use Data.

⁶⁴ For the purposes of this report, West County is defined as the towns of Ashfield, Buckland, Charlemont, Colrain, Conway, Hawley, Heath, Plainfield, Rowe and Shelburne.

The Charlemont population for 2010 reflects a loss of 92 people from 2000 and is only slightly greater than the population count of 1,249 in 1990. Since 2000 in particular, population growth has slowed statewide. From 2000 to 2010, Charlemont, West County and Franklin County all lost population. The decline in population growth in this area of the state has been attributed to multiple factors, including a flat birth rate and the migration of workers out of state.⁶⁵ Overall there are fewer people per household, due to smaller average family size and the increase in the number of people living alone.

As a result, Charlemont had a low population growth rate of 1.4% for the period of 1990 through 2010. This low population growth rate over the past twenty years is consistent with trends in West County and Franklin County, which had population growth rates of 2.3% and 1.8% respectively. There is a presence of second homeowners in Town who are not captured in the Census figures, though the exact number is not known.

Tourism is becoming a dominant driver of the town's economy. It is unclear at this time how the changing local economy will impact the town's population in the future. As baby boomers age, Charlemont may become an attractive location for retirees wishing to live in a scenic setting that also offers a wide array of cultural and recreational opportunities. New industries that are less tied to specific locations may find Charlemont an attractive location that offers a high quality of life to its employees. If recreational tourism related to the Deerfield River and other natural and cultural amenities in the region grows, the increased influx of tourists could lead to demand for more businesses in town that support tourism.

There are two principle highways in the Town of Charlemont, State Route 2 and State-numbered 8A. State Route 2, also known as the Mohawk Trail, is the primary east-west highway in Northern Massachusetts. It passes through Charlemont's village center and the southern section of the town. Route 2 connects Charlemont to Greenfield and Interstate 91 to the east, and North Adams and New York to the west. Traffic volumes vary from approximately 4,000 vehicles per day in east Charlemont, to approximately 2,000 vehicles per day near Zoar Road, west of the village center.⁶⁶ Traffic counts along Route 2 in Charlemont have generally declined over the last decade, a trend consistent with the rest of the region.⁶⁷

There is one active rail line in Charlemont, which closely follows along Route 2 as it passes through town. This rail line is owned by Pan Am Systems and is used for freight transport. However the rail line does not service commercial or industrial businesses in Charlemont. Access to rail could help attract large-scale commercial or light industrial uses to Charlemont.

During the summer and fall of 2007, the FRCOG evaluated transit services and needs in western Franklin County, an area with limited transit service. At the time of the study, the Franklin Regional Transit Authority's (FRTA) bus route to the West County area ran only during the school year, and only twice each weekday, at times that were not useful for most West County

⁶⁵ The Massachusetts Regional Benchmarking Project University of Massachusetts Donahue Institute Economic and Public Policy Research Unit in collaboration with the UMass Lowell Center for Industrial Competitiveness, December 31, 2005.

⁶⁶ 2008 count data. Average Annual Traffic County Data, 2000-2010. Franklin Regional Council of Governments, 2011.

⁶⁷ Draft 2011 Regional Transportation Plan. Franklin Regional Council of Governments.

residents. The route also only went as far as the Academy at Charlemont. Comments from some Charlemont residents requested service to be extended to the village center in Charlemont.⁶⁸ Since completion of the study, the FRTA has used the information to apply for additional funds to expand transit service to West County and make it more consistent. As of June 2010, Route 41 from Greenfield to the village center in Charlemont began operating four times per weekday, year round. Route 41 has one of the lower ridership counts among the FRTA routes, but annual ridership has been rising steadily. In FY 2010, annual ridership was 6,014 passengers, compared to 4,989 in FY 2007.⁶⁹

As discussed in the Vulnerability Assessment Section of this plan, current development in the floodplain includes approximately 22 acres of land used for residential purposes, 11 acres of commercial land, 3 acres of public/institutional uses, and no industrial uses within the floodplain. Much of the 815 acres of land in the floodplain is forest or farmland, located along the Deerfield River, the Mill Brook, the Chickley River, Bozrah Brook, and the Cold River. Charlemont has one zoning district that covers the entire town. Minimum lot size for all developments is 45,000 square feet or larger depending on the site conditions or specifics of the project. Further GIS analysis beyond the scope of the current project would be necessary to determine the exact number of developable acres in and along the floodplain.

The Town has a floodplain district bylaw to regulate development within the 100-year floodplain. The bylaw requires development within the floodplain district to comply with state building code, wetlands regulations, and Title 5 Septic regulations. In addition the bylaw states: “encroachments are prohibited in the regulatory floodway which would result in any increase in flood levels within the community during the occurrence of the base flood discharge.” The bylaw also requires all subdivision proposals within the floodplain district must be designed to assure that:

- a) Such proposals minimize flood damage;
- b) All public utilities and facilities are located and constructed to minimize or eliminate flood damage; and
- c) Adequate drainage is provided to reduce exposure to flood hazards.

When issuing a Special Permit, the Planning Board considers the “Environmental impact of the proposal, including the degree to which the proposal results in water, air, noise or light pollution; topographic change; removal of mature trees or other botanical assets; removal of cover vegetation; risk of erosion or siltation, increased storm water runoff from the site; or displacement of natural habitat.”⁷⁰

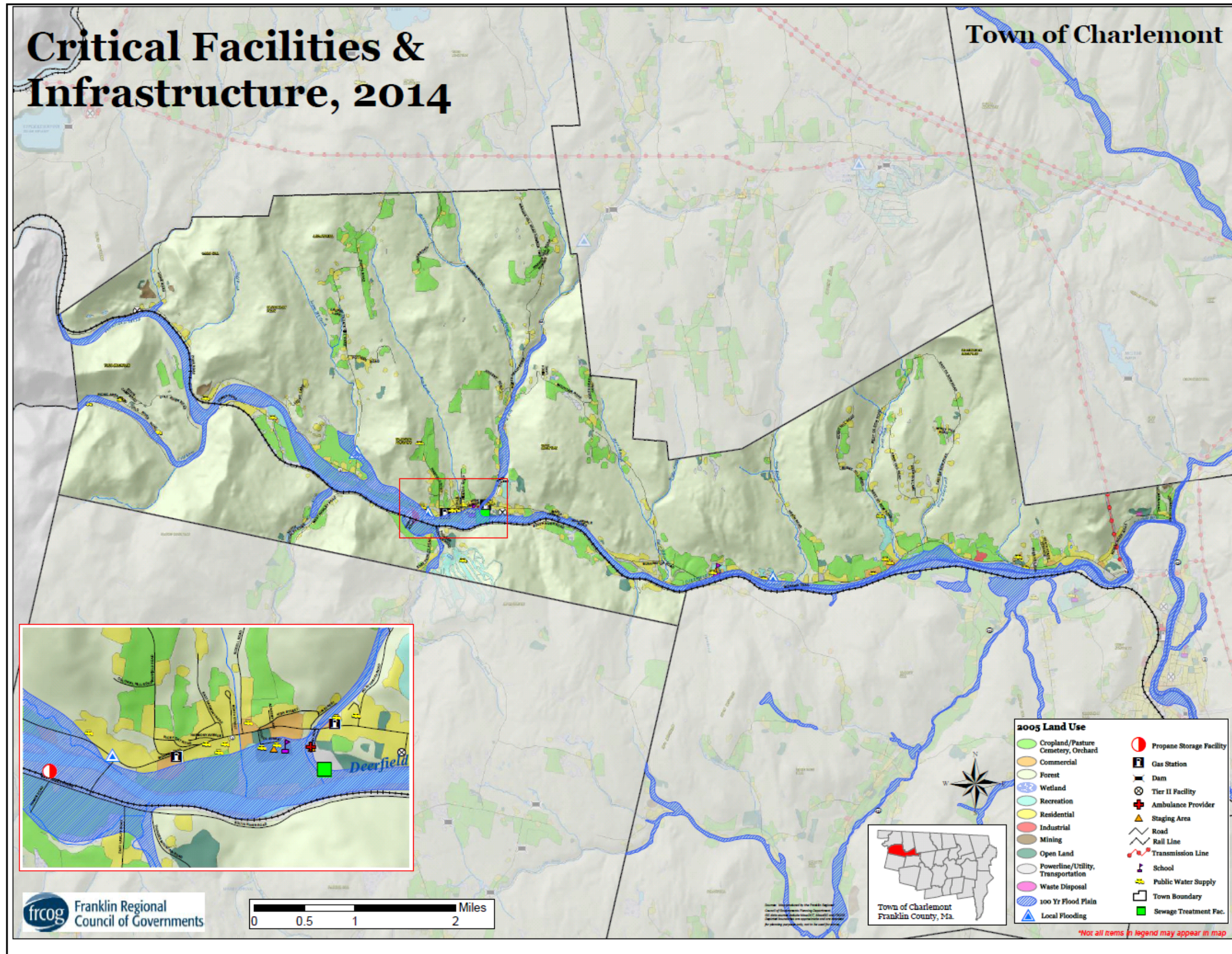
NOTE: Charlemont currently does not have an official Zoning Map. As mentioned above, the entire town is one zoning district.

⁶⁸ Transit Services and Needs in Western Franklin County, Volume II: Submitted Comments for the West County Transit Study. Franklin Regional Council of Governments, 2008.

http://www.frcog.org/services/transportation/trans_WestCoTransit.php.

⁶⁹ Franklin Regional Transit Authority.

⁷⁰ Charlemont Land Use Performance Standards, Section 23.9.



4 –MITIGATION STRATEGIES

One of the goals of this Multi-Hazard Mitigation Plan is to evaluate all of the town's existing policies and practices related to hazards and identify potential gaps in protection. This section presents mitigation strategies to reduce the potential exposure and losses identified as concerns in the risk assessment based on the frequency, severity, and impact of each hazard and as summarized in Table 3-47: All Hazards Vulnerability Assessment. This section also reviews the general mitigation measures for each hazard already in place in Charlemont, assesses any potential changes suggested for the existing measures, and evaluates whether the 2005 suggested changes were implemented, or if not, are still relevant and should be updated and carried forward to the 2012 plan. Any additional suggested changes are also included. This section addresses both mitigation activities that are specific to particular hazards, and approaches that could apply to multiple hazards.

CURRENT MITIGATION STRATEGIES

Flooding

Mapping

The Critical Facilities, Infrastructure, 2005 Land Use & Hazards Map for the Town of Charlemont shows the 100-year flood zone identified by FEMA flood maps. The 100-year flood zone is the area that will be covered by water as a result of a flood that has a 1% chance of occurring in any given year. The map also shows the areas in Charlemont that are subject to localized flooding problems.

The major floods recorded in the Franklin County area during the 20th century have been the result of rainfall alone or rainfall combined with snowmelt or hurricanes and tropical storms.

Management Plans

The Comprehensive Emergency Management (CEM) Plan for Charlemont lists the following generic mitigation measures for flood planning:

- Identify areas in the community that are flood prone and define methods to minimize the risk. Review National Flood Insurance Maps.
- Disseminate emergency public information and instructions concerning flood preparedness and safety.
- Community leaders should ensure that Charlemont is enrolled in the National Flood Insurance Program.
- Strict adherence should be paid to land use and building codes, (e.g., Wetlands Protection Act), and new construction should not be built in flood prone areas.

- Ensure that flood control works⁷¹ are in good operating condition at all times.
- Natural water storage areas⁷² should be preserved.
- Maintain plans for managing all flood emergency response activities including addressing potentially hazardous dams.
- Maintain plans for managing all flood emergency response activities including addressing potentially hazardous dams.

The Comprehensive Emergency Management (CEM) Plan for Charlemont lists the following generic preparedness and response measures for floods:

- Place emergency operations center (EOC) personnel on standby during stage of flood ‘watch’ and monitor NWS/New England River Forecast Center reports.
- Ensure that public warning systems are working properly and broadcast any information that is needed at this time.
- Review mutual aid agreements.
- Monitor levels of local bodies of water.
- Arrange for all evacuation and sheltering procedures to be ready for activation when needed.
- Carry out, or assist in carrying out needed flood-proofing measures such as sand bag placement, etc.
- Regulate operation of flood control works such as flood gates.
- Notify all emergency management related groups that will assist with flood response activities to be ready in case of flood ‘warning.’
- Broadcast warning/notification of flood emergency.
- Coordinate traffic control and proceed with evacuation of affected populations as appropriate.
- Open and staff shelters and reception centers.
- Undertake, or continue to carry out flood proofing measures.
- Dispatch search and rescue teams and emergency medical teams.

Evacuation Options

The majority of land subject to the 100-year floodplain in Charlemont is forest or farmland, though there are a number of homes, businesses, and two schools located in or adjacent to the floodplain along the Deerfield River. The Charlemont CEM Plan identifies Route 2 and South River Road as evacuation routes. These routes run adjacent to the Deerfield River, and are adjacent to or within the floodplain at various points. Additional evacuation routes should be identified for major flooding events. Of great concern as well is the potential for flooding due to

⁷¹ Refers to manmade levees, dikes and dams. This definition includes dams not specifically constructed for flood control.

⁷² Refers to ponds, lakes, vernal pools and other such bodies of water. Wetlands are not included in this definition.

dam failure, which would require the village of Charlemont to evacuate. Emergency management personnel should assess existing floodplain and dam failure data to determine an appropriate evacuation plan.

In addition to the Deerfield River, there are several creeks and tributaries of the river that run through populated areas and have the potential to cause flooding in town. Charlemont has a number of bridges situated either in or near the 100-year floodplain, which could make evacuation efforts as a result of flooding or dam failure more difficult. Some of the roads that residents would most likely take to reach safety travel through flood-affected areas.

Note should also be taken of the fact that the town's wastewater treatment facility lies within the floodplain. There is potential for the release of hazardous waste from this facility during a flood.

The two designated shelters in town are located within or adjacent to the floodplain. The Hawlemont Regional Elementary School is within the floodplain, and could not be used as a shelter during Tropical Storm Irene in 2011 due to flooding in the building and on the site. The Academy at Charlemont is outside of the floodplain, but directly adjacent to it. Additionally both shelters are located along Route 2, which may be impassable during a major flooding event. The Town also has four designated Helicopter Landing Zones: Mohawk Bridge, Hawlemont School, Levitt Cemetery, and South River Road. These locations are approved sites for medical evacuation, and are identified on the Critical Facilities and Infrastructure Map. These sites may be needed if parts of the town are inaccessible by road during a flood. This scenario played out in neighboring Hawley during Tropical Storm Irene, when the town was only accessible via helicopter in the immediate aftermath of the flooding.

Flood Control Structures

FEMA has identified no flood control structures within the Town of Charlemont.

Land Use Regulations that Mitigate Impacts from Flooding⁷³

The Town of Charlemont has adopted several land use regulations that serve to limit or regulate development in floodplains, to manage stormwater runoff, and to protect groundwater and wetland resources, the latter of which often provide important flood storage capacity. These regulations are listed below and their effectiveness evaluated in Table 4-1. For more detailed summaries of the regulations, see Appendix 1.

Charlemont Zoning By-Laws

The Zoning By-Laws include several provisions that mitigate the potential for flooding, including:

- Section 23.9 - Special Permit Criteria
- Section 34.3 - Erosion Control

⁷³ All bulleted items and direct quotes in the Charlemont Local Multi-Hazard Mitigation Plan are taken from the Town of Charlemont's zoning and subdivision regulations. Other references to those documents contained herein are paraphrases of the same.

- Section 45 – Floodplain District

Subdivision Rules and Regulations

The Subdivision Rules and Regulations contain several provisions that mitigate the potential for flooding, including:

- Section IV B 2 - Definitive Plan – Contents
- Section IV B 6 - Definitive Plan - Performance Guarantee
- Section VI A 6 - Required Improvements – Curbing

River and Stream Protection

The Town of Charlemont follows the standards established by the Wetlands Protection Act, which protects water bodies and wetlands through the town Conservation Commission. Towns can elect to institute local bylaws that are stricter than the standards set forth in the Wetlands Protection Act. Charlemont does not have specific wetlands bylaws.

Charlemont Open Space and Recreation Plan

In 2004, the town completed its Open Space and Recreation Plan. The intent of the document is not to address hazard mitigation or flood control in a direct or comprehensive way. However, it inventories the natural features and environments in the town, many of which, such as wetlands, aquifer recharge areas, farms, rivers, streams, and brooks, contain floodplain, dam failure inundation or localized flooding areas.

The plan highlights the importance of balancing future development with the preservation of the community's natural and scenic resources. The preservation of open space and farmland will provide flood storage capacity which reduces the amount of impervious surfaces in an area, as well as other benefits not directly related to natural hazard mitigation.

National Flood Insurance Program

The Town of Charlemont participates in the National Flood Insurance Program. As of November 2013, there were 11 policies in effect in Charlemont for a total of \$2,720,600 worth of insurance. The town is not a member of the Community Rating System, which entitles policyholders to a discount on flood insurance premiums. The CRS ranking is based on the steps that a town has taken to control flood losses.

The Community Rating System reduces flood insurance premiums to reflect what a community does above and beyond the National Flood Insurance Program's (NFIP) minimum standards for floodplain regulation. The objective of the CRS is to reward communities for what they are doing, as well as to provide an incentive for new flood protection activities. To participate in the CRS, a community must fill out an application and submit documentation that shows what it is doing and that its activities deserve at least 500 points. More information can be found in Section 5.

Table 4-1: Existing Flood Hazard Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
Zoning					
Floodplain Overlay District	<p>The town adopted a floodplain overlay district in 2011.</p> <p>The town follows the standards set by the Wetlands Protection Act.</p>	<p>Special Flood Hazard Areas (Zones A1 – A30 on the FIRM and FBFM Maps and the floodway designated on the FBFM maps.)</p>	<p>Can be effective for controlling development in flood prone areas.</p>	<p>Consider limiting new development within the 100-year floodplain.</p>	<p>New Recommendation, included in Action Plan. Floodplain Bylaw adopted in 2011.</p>
Special Permits	<p>Prior to issuing of a Special Permit, the Planning Board will consider potential topographic change, removal of cover vegetation, risk of erosion or siltation and increased storm water runoff.</p>	<p>Entire town.</p>	<p>Effective for ensuring that permitted projects do not increase flooding potential.</p>	<p>None.</p>	<p>No changes recommended.</p>
Erosion Control	<p>A Special Permit is required for grading or construction on slopes greater than 25 percent.</p> <p>The Building Inspector may require that design of proposed development be modified to prevent erosion or uncontrolled surface water runoff.</p>	<p>Entire town.</p>	<p>Effective for mitigating or preventing localized flooding of roads and other infrastructure.</p> <p>Effective for controlling impacts from stormwater runoff.</p>	<p>Consider requiring for all new construction.</p>	<p>Carried over from 2005 plan. Still relevant, included in Action Plan.</p>

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
Subdivision Rules and Regulations					
Definitive Plan	Requires a Definitive Plan for new subdivisions, including topography, location of storm drainage systems, water ways and natural drainage courses.	Entire town.	Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure.	Definitive plan should identify impacts and include flooding mitigation measures.	Carried over from 2005 plan. Still relevant, included in Action Plan.
			Somewhat effective for controlling impacts from stormwater runoff.	Consider implementing standards to require temporary and permanent erosion control measures for streams and surface water bodies.	Carried over from 2005 plan. Still relevant, included in Action Plan.
				Consider requiring Impact Statements for construction beyond a certain number of lots.	Carried over from 2005 plan. Still relevant, included in Action Plan.
				Consider updating subdivision regulations to prohibit permanent alterations of watercourses or streams.	Carried over from 2005 plan. Still relevant, included in Action Plan.
Performance Guarantee	Performance guarantee ensures that subdividers cover the cost of construction and improvements for projects.	Entire Town	Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure. Somewhat effective for controlling impacts from stormwater runoff.	None.	No changes recommended.
Curbing	Curbing in new subdivisions will be installed at the discretion of the Planning	Entire Town	Somewhat effective for mitigating or preventing localized flooding of roads and other	Consider updating the Subdivision Rules and Regulations to require a Stormwater Management	New recommendation. Included in Action Plan.

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
	<p>Board.</p> <p>Adequate drainage is required for disposal of surface water runoff.</p>		<p>infrastructure.</p> <p>Somewhat effective for controlling impacts from stormwater runoff.</p>	<p>Plan that would allow water to infiltrate on-site, to the extent feasible, incorporate Low Impact Development (LID) strategies, and require drainage to be designed based on a 100-year storm.</p>	
Other Protections					
Town of Charlemont Open Space and Recreation Plan	<p>Inventories natural features and promotes natural resource preservation in the town, including areas in the floodplain; such as wetlands, aquifer recharge areas, farms and open space, rivers, streams and brooks.</p>	<p>Entire town.</p>	<p>Effective in identifying sensitive resource areas, including floodplains.</p> <p>Encourages open space and farmland preservation to provide flood storage capacity.</p>	<p>Consider implementing the Five-Year Action Plan strategies, particularly those dealing with protection of forests, farmland and floodplain forests.</p>	<p>Carried over from 2005 Plan. The 2004 Open Space and Recreation Plan has expired. Consider updating the plan and incorporating hazard mitigation measures into the Action Plan where applicable.</p>
Participation in the National Flood Insurance Program	<p>As of November 2013, there were 11 property owners with flood insurance policies.</p>	<p>Areas identified by the FEMA maps.</p>	<p>Somewhat effective, provided that the town remains enrolled in the National Flood Insurance Program.</p>	<p>The Town should evaluate whether to become a part of FEMA’s Community Rating System.</p>	<p>Carried over from 2005 Plan. Still Relevant, included in Action Plan.</p>
Emergency Shelters	<p>The Town has designated the Hawlemont Regional Elementary School and the Academy at Charlemont as emergency shelters.</p>	<p>Entire Town</p>	<p>Limited. The Hawlemont School is located within the floodplain, and the Academy is located adjacent to the floodplain.</p>	<p>Identify shelters that are not in close proximity to the floodplain, have a backup power supply, and are accessible to residents on both sides of the Deerfield River. Agreements may need to be made with neighboring towns for use of shelters outside of town.</p>	<p>The Emergency Management Director researched new shelter locations and presented his findings to the Select Board in 2013.</p>

Severe Winter Storms

Winter storms can be especially challenging for emergency management personnel because, although the storm has usually been forecast. The Massachusetts Emergency Management Agency (MEMA) serves as the primary coordinating entity in the statewide management of all types of winter storms and monitors the National Weather Service (NWS) alerting systems during periods when winter storms are expected.⁷⁴

Management Plans

The CEM Plan for Charlemont lists the following generic mitigation measures for severe winter storms:

- Develop and disseminate emergency public information concerning winter storms, especially material that instructs individuals and families how to stock their homes, prepare their vehicles, and take care of themselves during a severe winter storm.
- As it is almost guaranteed that winter storms will occur annually in Massachusetts, local government bodies should give special consideration to budgeting fiscal resources with snow management in mind.
- Maintain plans for managing all winter storm emergency response activities.

To the extent that some of the damages from a severe winter storm can be caused by flooding, all of the flood protection mitigation measures described previously in Table 4-1 can also be considered as mitigation measures for severe winter storms.

The CEM Plan for Charlemont lists the following generic preparedness and response measures for severe winter storms:

- Ensure that warning/notification and communications systems are in readiness.
- Ensure that appropriate equipment and supplies, (especially snow removal equipment), are in place and in good working order.
- Review mutual aid agreements.
- Designate suitable shelters throughout the community and make their locations known to the public.
- Implement public information procedures during storm ‘warning’ stage.
- Prepare for possible evacuation and sheltering of some populations impacted by the storm (especially the elderly and special needs).
- Broadcast storm warning/notification information and instructions.
- Conduct evacuation, reception and sheltering activities.

⁷⁴ Comprehensive Emergency Management Plan for the Town of Charlemont, 2010.

- If appropriate, activate media center. Refer to Resource Manual for media center information.
- Dispatch search and rescue and emergency medical teams.
- Take measures to guard against further danger from power failure, downed trees and utility lines, ice, traffic problems, etc.
- Close roads and/or limit access to certain areas if appropriate.
- Provide assistance to homebound populations needing heat, food and other necessities.
- Provide rescue and sheltering for stranded/lost individuals.

Restrictions on Development

There are no restrictions on development that are directly related to severe winter storms. The Town of Charlemont Subdivision Rules and Regulations set grade limits on streets, and restrictions on utility placement, which, although not specified as weather hazard mitigation, can serve to minimize accident potential and power loss from severe winter storms (see Appendix 1 for more details):

- Section 5 B 2 - Design Standards – Alignment and Design Standards Part f Maximum Grade of Streets
- Article VI Section B - Utilities

Other Mitigation Measures

Severe snowstorms or ice storms can often result in a small or widespread loss of electrical service. The public water supply wells are not equipped with standby power sources. The distribution system often functions by gravity; therefore, no auxiliary power is needed. The water treatment plant is equipped with limited backup power. The town does own several small generators. The Hawlemont Regional Elementary School and the Academy at Charlemont, the designated emergency shelters in town, do not have a back-up power supply.

State Building Code

For new or recently built structures, the primary protection against snow-related damage is construction according to the State Building Code, which addresses designing buildings to withstand snowloads. The Town of Charlemont is a member of the Franklin County Cooperative Building Inspection Program, which provides building inspection services.

Table 4-2: Existing Severe Winter Storm Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
Subdivision Regulations					
Design Standards for Roads	Standards include street grade regulations (seven to nine percent maximum).	Entire town.	Effective.	None.	No recommended changes.
Utilities (electric and telephone)	The town requires all utilities within sight distance of Route 2 be placed underground.	Entire town.	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development.	Consider requiring utility lines be placed underground in all new subdivisions.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
				Work with utility companies to underground existing utility lines in locations where repetitive outages occur.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
				Encourage utility companies to underground new utility lines.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
				Encourage utility companies to continue to implement five-year action plans, which include regular tree maintenance to reduce the number of limbs near overhead power lines.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
Other Protections					
State Building Code	The Town of Charlemont has adopted the Massachusetts State Building Code.	Entire town.	Effective.	None.	No recommended changes.
Emergency Shelters	The Town has designated the Hawlemont Regional Elementary School and the Academy at Charlemont as emergency shelters.	Entire town.	Limited. Neither emergency shelter is equipped with a back-up power supply.	Equip designated shelters with a back-up power supply to allow operation during a power outage.	New recommendation. Included in Action Plan.

Hurricanes and Tropical Storms

Of all the natural disasters that could potentially impact Charlemont, hurricanes and tropical storms provide the most lead warning time because of the relative ease in predicting the storm's track and potential landfall. MEMA assumes "standby status" when a hurricane's location is 35 degrees North Latitude (Cape Hatteras) and "alert status" when the storm reaches 40 degrees north Latitude (Long Island).⁷⁵ The flooding associated with hurricanes can be a major source of damage to buildings, infrastructure and a potential threat to human lives. Therefore, all of the flood protection mitigation measures described in Table 4-1 can also be considered hurricane mitigation measures. High winds that oftentimes accompany hurricanes can also damage buildings and infrastructure.

Management Plans

The CEM Plan for Charlemont includes the following generic mitigation measures for hurricane planning and response:

- Develop and disseminate emergency public information and instructions concerning hurricane preparedness and safety.
- Community leaders should ensure that Charlemont 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.
- Maintain plans for managing all hurricane emergency response activities.

The CEM Plan for Charlemont includes the following generic preparedness and response measures for hurricanes:

- Ensure that warning/notification systems and equipment is ready for use at the 'hurricane warning' stage.
- Review mutual aid agreements.
- Designate suitable wind and flood resistant shelters in the community and make their locations known to the public.
- Prepare for coordination of evacuation from potentially impacted areas including alternate transportation systems and locations of special needs facilities.
- Activate warning/notification systems to inform public of protective measures to be taken, including evacuation where appropriate.
- Conduct evacuation of affected populations.
- Open and staff shelters and reception centers.

⁷⁵ Comprehensive Emergency Management Plan for the Town of Charlemont, 2010.

- Dispatch search and rescue and emergency medical teams.
- Activate mutual aid activities.
- Take measures to guard against further danger from downed trees and utility lines, debris, etc.

Evacuation Options

The 2010 Charlemont CEM Plan does not identify any areas in town that are prone to damage from high winds resulting from a hurricane. The Plan identifies Route 2 and South River Road as hurricane evacuation routes.

Restrictions on Development

The only restrictions on development that are wind-related are the provisions in the zoning bylaw related to wireless communications facilities and mobile home parks and campgrounds, and utility placement standards in the Subdivision Rules and Regulations (See Appendix 1 for summaries of these sections).

Zoning Bylaws

- Section 44 - Cell Tower Regulations
- Section 42 – Mobile Home Parks and Campgrounds

Subdivision Rules and Regulations

- Article VI Section B - Utilities

State Building Code

For new or recently built structures, the primary protection against wind-related damage is construction that adheres to the State Building Code, which, when followed, results in buildings that withstand high winds. The Town of Charlemont is a member of the Franklin County Cooperative Building Inspection Program, which provides building inspection services.

Table 4-3: Existing Hurricane and Tropical Storm Hazard Mitigation Measures (Wind related. Also applies to Tornados, Microbursts and Thunderstorms)

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
Zoning Bylaws					
Wireless Communications Facilities	Requires a Special Permit from the Planning Board. Wireless facilities should not be erected nearer to a property line than a distance equal to twice the vertical height of the structure. Facilities are not permitted within 800 feet of any existing residential structure.	Entire town.	Effective.	Consider adding safety and prevention of wind-related damage as a stated purpose.	Recommended in 2005 Plan. Measure is effective, no changes needed.
New Mobile Homes	Town of Charlemont Zoning Bylaw requires a Special Permit for all mobile homes, mobile home parks and campgrounds.	Entire town.	Does not address potential damage to existing mobile homes.	Consider using Community Development Block Grant home rehabilitation funds to assist homeowners in retrofitting grandfathered mobile homes.	Carried over from 2005 Plan. Still relevant, included in Action Plan. The Franklin County Housing and Redevelopment Authority administers the CDBG home rehabilitation program for Charlemont.
Subdivision Regulations					
Utilities (electric and telephone)	The town requires all utilities within sight distance of Route 2 be placed underground.	Entire town.	Somewhat effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential	Consider requiring utility lines be placed underground in all new subdivisions.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
				Encourage utility companies to underground existing utility lines in locations where repetitive outages occur.	Carried over from 2005 Plan. Still relevant, included in Action Plan.

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
			development.	Encourage utility companies to underground new utility lines.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
				Encourage utility companies to continue to implement five-year action plans, which include regular tree maintenance to reduce the number of limbs near overhead power lines.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
Other Protections					
State Building Code	The Town of Charlemont has adopted the Massachusetts State Building Code.	Entire town.	Effective.	None.	No recommended changes.
Debris Management Plan	A debris management plan could be developed. ⁷⁶	Entire town.	Effective.	Consider participation in the creation of a Regional Debris Management Plan.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
Shelters	No shelters for victims of hurricanes and tornados have been identified for Charlemont.	Entire town.	Not effective.	Identify shelters for all natural disasters.	Carried over from 2005 Plan. Emergency shelters have been identified.
				Ensure that identified shelters have sufficient back-up utility service in the event of primary power failure.	Carried over from 2005 Plan. Still relevant, included in Action Plan.

²⁹ Natural disasters can precipitate a variety of debris, including trees, construction and demolition materials and personal property. After a natural disaster, potential threats to the health, safety and welfare of impacted citizens can be minimized through the implementation of a debris management plan. Such a plan can be critical to recovery efforts after a disaster, including facilitating the receipt of FEMA funds for debris clearance, removal and disposal. Additional information is available at <http://www.fema.gov/rrr/pa/dmgbroch.shtm>.

Tornados, Microbursts and Thunderstorms

Most damage from tornados, microbursts, and thunderstorms, and associated storm events including hail and lightning, comes from flash floods and high winds that can fell trees and electrical wires and can generate hurtling debris. Thus, the existing mitigation measures for Tornados, Microbursts and Thunderstorms are similar to those listed for Hurricanes and Tropical Storms, and Flooding. See preceding sections for more information.

Management Plans

The CEM Plan for Charlemont includes the following generic mitigation measures for tornado planning and response:

- 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*.

The CEM Plan for Charlemont includes the following generic preparedness and response measures for tornados:

- Designate appropriate shelter space in the community that could potentially withstand tornado impact.
- Periodically test and exercise tornado response plans.
- Put emergency management on standby at tornado ‘watch’ stage.
- At tornado ‘warning’ stage, broadcast public warning/notification safety instructions and status reports.
- Conduct evacuation, reception and sheltering services to victims.
- Dispatch search and rescue and emergency medical teams.
- Activate mutual aid agreements.
- Take measures to guard against further injury from such dangers as ruptured gas lines, downed trees and utility lines, debris, etc.
- Acquire needed emergency food, water fuel and medical supplies.
- Take measures relating to the identification and disposition of remains of the deceased.

Restrictions on Development

See Hurricanes and Tropical Storms, and Flooding sections.

State Building Code

See Hurricanes and Tropical Storms, and Flooding sections.

Wildfires and Brushfires

Franklin County has approximately 356,174 acres of forested land, which accounts for 77% of total land area. Forest fires, therefore, are a potentially significant problem. In Charlemont, roughly 84% of the town (14,243 acres) is forested, so wildfires and brushfires could impact a significant portion of Charlemont. Between 2004 and 2010, the Charlemont Center Fire Department responded to 15 brush fires.⁷⁷ Generally, these fires involve grass, mulch or other debris being burned by a homeowner.

Management Plans

The CEM Plan for Charlemont includes the following generic mitigation measures for wildfire planning and response:

- Promote fire safety measures such as fire-safe landscaping and construction practices to the public and business communities.

The CEM Plan for Charlemont includes the following generic preparedness and response measures for wildfires:

- Restrict outside burning etc. based on moisture levels, fuels supply conditions such as drought.
- Identify high vulnerability or problem areas.
- Utilize mutual aid, including the State Fire Mobilization Plan, as needed.

Burn Permits

Burn permits for the Town of Charlemont are issued from the Charlemont Dispatch Control Center of the Massachusetts State Police. Approximately 314 permits were issued in Charlemont in 2010. During this process, the applicant is read the State Law, which includes guidelines for when and where the burn may be conducted as well as fire safety tips provided by the control center. Specific burn permit guidelines are established by the state, such as the burning season and the time when a burn may begin on a given day. It may be beneficial for the state to change some of their regulations to prevent wildfires and brushfires. Currently, the burning season extends from January 15th to May 1st. If the burning season were to start in November or December and end in April, this would allow for a longer season during the months found to be, traditionally, the least dry in Massachusetts. Currently, residents may only burn between 10 a.m. and 4 p.m. If state guidelines were changed to allow for an earlier start time, this would allow for most of the burning to be conducted in the morning when winds are often calmest.

⁷⁷ Massachusetts Fire Incident Reporting System (MFIRS).

Subdivision Review

The Charlemont Fire Department reviews subdivision plans to ensure that their trucks will have adequate access and that the water supply is adequate for firefighting purposes.

Public Education/Outreach

The Charlemont Fire Department has an ongoing educational program in the schools to teach fire safety, particularly during Fire Prevention Week, which falls during the first week of October.

Restrictions on Development

There are currently no restrictions on development that are based on the need to mitigate the hazards of wildfires/brushfires.

DRAFT

Table 4-4: Existing Wildfire and Brushfire Hazard Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
Burn Permits	Residents are permitted to obtain burn permits over the phone. State police personnel provide information on safe burn practices.	Entire town.	Effective.	Coordinate with the FRCOG and other appropriate agencies to request that the State revise burn permit guidelines.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
Subdivision Review	The fire department is involved in the review of subdivision plans.	Entire town.	Effective.	None.	No recommended changes.
Debris Management Plan	A debris management plan could be developed.	Entire town.	Effective.	Consider participation in the creation of a Regional Debris Management Plan.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
Public Education/Outreach	The fire department has an ongoing educational program in the schools.	Entire town.	Effective.	None.	No recommended changes.

Earthquakes

Although there are five mapped seismological faults in Massachusetts, there is no discernable pattern of previous earthquakes along these faults nor is there a reliable way to predict future earthquakes along these faults or in any other areas of the state. Consequently, earthquakes are arguably the most difficult natural hazard to plan for. Most buildings and structures in the state were constructed without specific earthquake resistant design features. Earthquakes can involve several potentially devastating secondary effects including:

- The collapse of buildings, bridges, roads, dams, and other vital structures;
- Rupture of utility pipelines;
- Flooding caused by dam failure;
- Landslides;
- Major transportation accidents, (railroad, chain highway crashes, aircraft, and marine);
- Extended power outage;
- Fire and/or explosion;
- HAZMAT accident; and,
- Water contamination.

Management Plans

The Charlemont CEM Plan lists the following generic mitigation measures for earthquakes:

- Community leaders in cooperation with Emergency Management Personnel should obtain local geological information and identify and assess structures and land areas that are especially vulnerable to earthquake impact and define methods to minimize the risk.
- Strict adherence should be paid to land use and earthquake resistant building codes for all new construction.
- Periodic evaluation, repair, and/or improvement should be made to older public structures.
- Emergency earthquake public information and instructions should be developed and disseminated.
- Earthquake drills should be held in schools, businesses, special care facilities and other public gathering places.

The Charlemont CEM Plan lists the following generic preparedness and response measures for earthquakes:

- Earthquake response plans should be maintained and ready for immediate use.
- All equipment, supplies and facilities that would be needed for management of an earthquake occurrence should be maintained for readiness.
- Emergency management personnel should receive periodic training in earthquake response.

- If the designated EOC is in a building that would probably not withstand earthquake impact, another building should be chosen for an earthquake EOC.
- Mass Care shelters for earthquake victims should be pre-designated in structures that would be most likely to withstand earthquake impact.
- It is assumed that all special needs facilities could be affected to some extent by earthquake effects therefore preparedness measures should be in place to address the needs of all facilities listed in the Resource Manual.
- Most likely the entire population of the community will be affected by a seismic event. Estimate the maximum peak population affected, considering peak tourism, special event populations, and work hours.
- EOC will be activated and response will immediately be engaged to address any and all earthquake effects.
- Emergency warning/notification information and instructions will be broadcast to the public.
- Search and rescue and emergency medical teams will be dispatched.
- Firefighters will address fires/explosions and HAZMAT incidents.
- Law enforcement personnel will coordinate evacuation and traffic control as well as protecting critical facilities and conducting surveillance against criminal activities.
- Reception centers will be opened and staffed.
- Animal control measures will be taken.
- Immediate life-threatening hazards will be addressed such as broken gas lines, or downed utility wires.
- Emergency food, water and fuel will be acquired.
- Activate mutual aid.
- Measures will be taken by the chief medical examiner relating to identification and disposition of remains of the deceased.

State Building Code

State and local building inspectors are guided by regulations put forth in the Massachusetts State Building Code. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975 and included specific earthquake resistant design standards. These seismic requirements for new construction have been revised and updated over the years and are part of the current, 6th Edition of the Massachusetts State Building Code. Given that most structures in Massachusetts were built before 1975, many buildings and structures do not have specific earthquake resistant design features. According to the 2005-2009 American Community Survey, approximately 59 percent of the housing in Charlemont was built before 1970. In addition, built areas underlain by artificial fill, sandy or clay soils are particularly vulnerable to damage during

an earthquake. The Town of Charlemont is a member of the Franklin County Cooperative Building Inspection Program, which provides building inspection services.

Restrictions on Development

There are no seismic-related restrictions on development.

Emergency Shelters

In determining the most appropriate emergency shelter for victims of an earthquake, it is important to know if the structure was constructed using earthquake-resistant design standards, in addition to the other standard information (i.e., presence of a back-up generator, occupancy capacity, etc.). According to the Charlemont CEM Plan, the emergency shelters identified are the Hawlemont Regional Elementary School and the Academy at Charlemont. The town should identify whether these shelters were built before 1975, if significant renovations have occurred since 1975, and evaluate if repair or improvements are needed to mitigate potential damage from earthquakes. If significant improvements are needed, alternative shelters may need to be identified.

DRAFT

Table 4-5: Existing Earthquake Hazard Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
State Building Code	The Town of Charlemont has adopted the 8 th Edition of the State Building Code.	Entire town but applies to new construction and renovations only.	Effective for new buildings or renovations only.	Evaluate older structures, particularly schools and shelters, to determine if they are earthquake resistant. If not, identify alternate structures as shelters for earthquake events.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
Debris Management Plan	A debris management plan could be developed.	Entire town.	Effective.	Consider participation in the creation of a Regional Debris Management Plan.	Carried over from 2005 Plan. Still relevant, included in Action Plan.
Shelters	Shelters for victims of natural hazards in Charlemont have been identified.	Entire town.	Effective.	Ensure that identified shelters have sufficient back-up utility service in the event of primary power failure.	Carried over from 2005 Plan. Still relevant, included in Action Plan.

Dam Failure

The only mitigation measures in place are the state regulations that control the construction and inspection of dams. The Charlemont CEM Plan states that there are three categories of dam failure or overspill and that action should be taken according to hazard rating:

Type 1: Slowly developing condition

- Activate EOC;
- Activate all communication networks. Establish communications with command post on a 24-hour basis;
- Release public information;
- Notify MEMA area headquarters, the American Red Cross and downstream communities;
- Review plans for evacuation and sheltering, including availability and capacity; food, supplies and equipment; shelter owners and managers and other communities (if out of town sheltering is required); and,
- Require 'stand by' status of designated response forces.

Type 2: Rapidly developing condition

- Establish 24-hour communication from the damsite to EOC;
- Assemble, brief and assign specific responsibilities to emergency response forces;
- Release public information;
- Obtain and prepare required vehicles/equipment for movement; and,
- Prepare to issue warning.

Type 3: Practically instantaneous failure

- Issue warning;
- Commence immediate evacuation;
- Commit required resources to support evacuation;
- Activate shelters or coordinate activation of shelters located outside the community;
- Notify MEMA area headquarters and the Red Cross; and,
- Initiate other measures as required to protect lives and property.

Management Plans

The Charlemont CEM Plan contains the following generic mitigation measures for dam failure:

- Develop and conduct public education programs concerning dam hazards.
- Maintain up-to-date plans to deal with threat and actual occurrence of dam overspill or failure.
- Emergency management and other local government agencies should familiarize themselves with technical data and other information pertinent to the dams that impact Charlemont. This should include determining the probable extent and seriousness of the effect to downstream areas.
- Dams should be inspected periodically and monitored regularly.

- Repairs should be attended to promptly.
- As much as is possible burdens on faulty dams should be lessened through stream re-channeling.
- Identify dam owners.
- Determine minimum notification time for downstream areas.

The Charlemont CEM Plan contains the following generic preparedness and response measures for dam failure:

- Pre-place adequate warning/notification systems in areas potentially vulnerable to dam failure effects.
- Develop procedures for monitoring dam site conditions at first sign of any irregularity that could precipitate dam failure.
- Identify special needs populations, evacuation routes and shelters for dam failure response.
- Have sandbags, sand and other items to reinforce dam structure or flood proof flood prone areas.
- Disseminate warning/notification of imminent or occurring dam failure.
- Coordinate evacuation and sheltering of affected populations.
- Dispatch search and rescue teams.
- Coordinate evacuation and sheltering of affected populations.
- Activate mutual aid if needed.
- Acquire additional needed supplies not already in place, such as earthmoving machinery.
- Establish incident command post as close to affected area as safely possible.
- Provide security for evacuated public and private property.
- Refer to *Resource Manual* (Core Functions) for information regarding transportation providers.

According to the DCR Office of Dam Safety and the 2010 Charlemont CEM Plan, there are no dams located in Charlemont. The area of Charlemont most affected by catastrophic dam failure is along the Deerfield River. Of particular concern are the Harriman and Sherman dams, High Hazard dams located upstream on the Deerfield River.

Evacuation Options

In the event of the catastrophic failure of an upstream dam, there is potential for devastating damage to the town. Developing an evacuation plan for the town is problematic given that the town's main road – Route 2 – runs along the river and is therefore most likely to be affected by flooding that occurs as a result of dam failure. The number of bridged brooks in the town could further complicate or hamper evacuation efforts, as the majority of residential development is

adjacent to either the river or one of its feeder brooks. Town offices and schools are also within or directly adjacent to the floodplain and will most likely be affected by inundation.

The most likely evacuation routes lead towards Rowe and Heath to the north and Hawley and Buckland to the south. Emergency responders should review inundation areas and identify possible evacuation routes.

Permits Required for New Dam Construction

Massachusetts State Law (M.G.L. Chapter 253 Section 45) regulates the construction of new dams. A permit must be obtained from the Department of Conservation and Recreation (DCR) before construction can begin. DCR does have the authority to deny a permit if it is determined that the design and/or location of the dam is not acceptable. One of the permit requirements is that all local approvals or permits must be obtained.

Dam Inspections

The DCR requires that dams rated as Low Hazard Potential be inspected every ten (10) years, dams rated as Significant Hazard Potential be inspected every five (5) years, and dams rated as High Hazard Potential be inspected every two (2) years. Owners of dams are responsible for hiring a qualified engineer to inspect their dams and are responsible for reporting the results to the DCR. Owners of High Hazard Potential dams and certain Significant Hazard Potential dams are also required to prepare, maintain, and update Emergency Action Plans. Potential problems may arise if the ownership of a dam is unknown or contested. Additionally, the cost of hiring an engineer to inspect a dam or to prepare an Emergency Action Plan may be prohibitive for some owners.

Restrictions on Development

There is no mention made regarding the construction of new dams in the Town of Charlemont zoning or subdivision regulations.

There are no town restrictions on dam locations. The DCR issues permits for new dams and does have the authority to deny a permit if it is determined that the design and/or location of the dam is not acceptable.

Table 4-6: Existing Dam Failure Hazard Mitigation Measures

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
Permits required for new dam construction	State law requires a permit for the construction of any dam.	Entire town.	Effective. Ensures dams are adequately designed.	None.	No recommended changes.
Dam Inspections	DCR has an inspection schedule that is based on the hazard rating of the dam (low, significant, high hazard). FERC requires Emergency Action Plans for all high hazard dams it oversees.	Entire town.	Low. The DCR does not have adequate staff and resources to inspect dams according to the required schedule.	Map inundation areas for dams not under FERC oversight.	Carried over from 2005 Plan. Still relevant. Obtain inundation maps, when available, for high hazard and significant hazard dams in other towns that would impact Charlemont.
				Emergency action plans should be prepared for all high hazard dams impacting the town.	Carried over from 2005 Plan. TransCanada updated the Emergency Action Plans for the Somerset, Harriman, and Sherman dams in 2011.
Evacuation Plans	Comprehensive evacuation plans would ensure the safety of the citizens in the event of dam failure.	Inundation areas in town.	None.	Owners of high hazard dams should prepare up to date evacuation plans in cooperation with the town.	Carried over from 2005 Plan. The Town should review the latest inundation mapping for the TransCanada dams on the Deerfield River and prepare evacuation plans in cooperation with other towns that would be impacted.
				Residents and businesses within the inundation areas in town should be encouraged to develop their own emergency evacuation plans.	New recommendation. Included in Action Plan.
				Ensure the Hawlemont Regional Elementary School and the Academy at Charlemont have up-to-date evacuation plans to evacuate	New recommendation. Included in Action Plan.

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
				staff and students in the event of a dam failure.	
				A communication plan should be in place to receive updates and warnings on the estimated arrival and magnitude of the flood, and to relay information to downstream communities as to the magnitude and rate of the flood and status of evacuations.	New recommendation. Included in Action Plan.
				An emergency evacuation plan should be developed for municipal facilities that are expected to become inundated.	New recommendation. Included in Action Plan.
Emergency Shelters	The Hawlemont Regional Elementary School and the Academy at Charlemont are the identified shelters in town.	Entire town.	Not effective.	Alternate shelters should be identified on the north and south sides of the Deerfield River. Agreements with neighboring towns may need to be executed.	New recommendation. Both shelters are located within the inundation zone for the Harriman and Sherman dams. Included in Action Plan.

Landslides

Regulating land use and development to avoid construction on steep slopes and ensuring that construction does not reduce slope stability is one way to mitigate the hazard potential of landslides. The following regulations contain strategies that help reduce the risk of landslides in Charlemont.

Management Plans

The Charlemont CEM Plan does not contain any generic mitigation measures for landslides.

Restrictions on Development

The Town of Charlemont Zoning Bylaw contains the following regulations that could mitigate the potential for a landslide occurrence:

- Section 23.9 - Special Permit Criteria
- Section 34.3 - Erosion Control

The Subdivision Rules and Regulations contain several provisions that mitigate the potential for landslides, including,

- Section IV B – Definitive Plan
- Section V D – Protection of Natural Features
- Section VI A 6 – Curbing
- Section VI B 1 – Adequate disposal of surface water

Please see Appendix 1 for relevant excerpts from these regulations.

Table 4-7: Existing Landslide Hazard Mitigation Measures

Type of Existing Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
Zoning Bylaws					
Special Permits	Prior to issuing of a Special Permit, the Planning Board will consider potential topographic change, removal of cover vegetation, risk of erosion or siltation and increased storm water runoff.	Entire town.	Effective for ensuring that permitted projects do not increase flooding potential.	None.	No recommended changes.
Erosion Control	A Special Permit is required for grading or construction on slopes greater than 25 percent. The Building Inspector may require that design of proposed development be modified to prevent erosion or uncontrolled surface water runoff.	Entire town.	Effective for mitigating or preventing localized flooding of roads and other infrastructure. Effective for controlling impacts from stormwater runoff.	Consider requiring for all new construction.	New recommendation. Included in Action Plan.
Subdivision Rules and Regulations					
Definitive Plan	Requires a Definitive Plan for new subdivisions, including topography, location of storm drainage systems, water ways and natural drainage courses.	Entire town.	Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure.	Definitive plan should identify landslide mitigation measures.	New recommendation. Included in Action Plan.
			Somewhat effective for controlling impacts from stormwater runoff.	Consider implementing standards to require temporary and permanent erosion control measures for streams and surface water bodies.	New recommendation. Included in Action Plan.
				Consider requiring Impact Statements for construction beyond a certain number of lots.	New recommendation. Included in Action Plan.

Type of Existing Protection	Description	Area Covered	Effectiveness	Proposed Changes	Status
				Consider updating subdivision regulations to prohibit permanent alterations of watercourses or streams.	New recommendation. Included in Action Plan.
Protection of Natural Features	Due regard shall be shown for all natural features, including large trees and water courses, which, if preserved, will add to the attractiveness and value of the subdivision and the community	Entire town.	Not effective for mitigating landslides.	Consider amending the standards to require the preservation of existing vegetation and mature trees to the maximum extent possible in order to mitigate erosion and landslide potential.	New recommendation. Included in Action Plan.
Curbing	Curbing in new subdivisions will be installed at the discretion of the Planning Board. Adequate drainage is required for disposal of surface water runoff.	Entire Town	Somewhat effective for controlling impacts from stormwater runoff.	Consider updating the Subdivision Rules and Regulations to require a Stormwater Management Plan that would allow water to infiltrate on-site,	New recommendation. Included in Action Plan.
Utilities – surface water	Adequate disposal of surface water shall be provided through roadside ditches with drainage pipes, or through catch basins.	Entire town.	Somewhat effective for controlling impacts from stormwater runoff.	to the extent feasible, incorporate Low Impact Development (LID) strategies, and require drainage to be designed based on a 100-year storm.	

Ice Jams

The most common hazard associated with ice jams is flooding upstream of the ice jam. Therefore strategies to mitigate flooding are also appropriate for mitigating the impacts of ice jams. See Table 4.1: Existing Flood Hazard Mitigation Measures and the preceding section for complete information.

DRAFT

Manmade Hazards

Timely, informative and accurate notification of a hazardous material emergency is critical for an effective emergency response and for the safety and protection of Charlemont's citizens. With the transportation of hazardous materials via Routes 2 and 8A, as well as via the railroad – and with the close proximity of these routes to homes and water bodies - the possibility exists of a catastrophic accident or spill. Strategies to plan for the evacuation of residents and for the cleanup of any chemical spill are key to hazard mitigation.

Management Plans

The following are generic preparedness and response measures for manmade hazards listed in the Charlemont CEM Plan, specifically hazardous materials emergencies:

- The immediate notification of the community emergency coordinator and the State is required when a release of an extremely hazardous substance or hazardous chemical in an amount above the Reportable Quantity (RQ) occurs. Specific information is required by the notification such as chemical name, method of release, health effects, medical attention and protective actions.
- The Hazardous Materials Release Report Form must be used in the event of the release of a hazardous substance
- Both local and State response personnel, including the DEP must be notified immediately of a release. The local point of contact is the local fire department through the 911 dispatch Center.

Evacuation Options

Evacuation of an incident site could be required upon the recommendation of the on-scene commander. The routes of evacuation and staging areas for the evacuees will be determined by the Incident Commander. Once the incident site has been evacuated, law enforcement officials will support expanded evacuation if required. The necessity for additional evacuation will be determined by the Incident Commander.

Restrictions on Development

The Charlemont Zoning Bylaws do not place any specific restrictions on the use or storage of hazardous substances. Section 34.2 Hazard states that “No use shall be allowed which would create hazard due to explosion, fire or other causes. Other potentially hazardous conditions shall be fenced, covered or otherwise rendered safe.”

Table 4-8: Existing Manmade Hazard Mitigation Measures

Type of Existing Protection	Description	Area Covered	Effectiveness	2011 Potential Changes	Status
Zoning Bylaw: Hazard	Potentially hazardous use that could result in explosion, fire, or other unsafe conditions are not allowed or must be rendered safe through fencing, covering, or other methods.	Entire Town	Not effective in protecting against hazardous substance spills.	The Town should consider adopting performance standards for commercial and industrial uses to regulate the storage and use of hazardous materials.	New recommendation. Included in Action Plan.
				The Town should consider adopting a Floodplain District bylaw which could prohibit the storage or use of hazardous materials within the district.	New recommendation. Included in Action Plan.
				The town should consider adopting a Water Supply Protection Overlay District to preserve and maintain existing and potential groundwater and surface water resources within the town.	New recommendation. Included in Action Plan.

FUTURE MITIGATION STRATEGIES

Hazard Mitigation Goal Statements and Action Plan

As part of the multi-hazard mitigation planning process undertaken by the Committee, existing gaps in protection and possible deficiencies were identified and discussed. The Committee developed general Goal Statements and Action Items that, when implemented, will help to reduce risks and future damages from natural hazards. The Goal Statements, Action Items, town department(s) responsible for implementation, and the proposed timeframe for implementation for each category of natural hazard are described below. Also, the Committee developed several Action Items that apply to multiple hazards that, if implemented, will mitigate or prevent damages from more than one type of natural hazard.

2014 Action Plan

Prioritization of Hazards

The Committee examined the results of the All Hazards Vulnerability Assessment (see Section 3) and used the results to prioritize the identified hazards.

The All Hazards Vulnerability Assessment is an interactive table that the Committee completed with the FRCOG staff to evaluate all the natural hazards that can impact the town based on frequency of occurrence, severity of impacts, area of occurrence and preparedness. The completed table gives the town an overall understanding of the natural hazards, provides guidance on which hazards the Town may want to focus mitigation efforts on, reaffirms that Charlemont’s planning and preparedness is on track, and shows residents that town departments and agencies are organized in case of a natural disaster. Those hazards receiving the highest Weighted Hazard Index number were assigned the highest priority. Hazards were rated as follows:

Table 4-9: Hazard Index Range

Weighted Hazard Index	Priority Level
> 5.5	High
4.0 – 5.5	Medium
< 4.0	Low

Table 4-10: Summary of All-Hazards Vulnerability Assessment

Natural Hazard	Weighted Hazard Index	Priority Level
Earthquakes	6.3	High
Severe Winter Storms/ Ice Storms	5.8	High
Dam Failure	5.8	High
Hurricanes & Tropical Storms	5.2	Medium

Tornados, Microbursts, & Thunderstorms	4.9	Medium
Floods	4.3	Medium
Wildfires & Brushfires	3.3	Low
Landslides	1.9	Low
Ice Jams	1.9	Low

Identification of Most Important Hazards

To identify the hazards most important to the Town of Charlemont and to develop a range of mitigation actions for the most important hazards, the Committee discussed the hazard prioritization information (Table 4-10), assessed which hazards most often impact Western Massachusetts and considered the results of the Risk Assessment (Section 3). The Committee also discussed damages from recent hazard events, including Tropical Storm Irene, and determined that the hazards most important to Charlemont are earthquakes, severe winter storms/ice storms, and dam failure.

In addition, the Committee realized that some Action Items could mitigate several hazards and thus created a category labeled “Multiple Hazards.” This category of Multiple Hazards is among the hazards considered most important to the town.

Table 4-11: Hazards Most Important to Charlemont

Natural Hazard	Priority Level from Weighted Hazard Index	Hazard Most Important to Charlemont
Earthquakes	High	✓
Severe Winter Storms/ Ice Storms	High	✓
Dam Failure	High	✓
Hurricanes & Tropical Storms	Medium	
Tornados, Microbursts, & Thunderstorms	Medium	
Floods	Medium	
Wildfires & Brushfires	Low	
Landslides	Low	
Ice Jams	Low	
Multiple Hazards	Not Applicable	✓
Manmade Hazards	Not Applicable	✓

With respect to Manmade Hazards, the Committee evaluated the potential for fixed facility and transportation hazardous materials accidents as quite high – particularly transportation related accidents, given the proximity of Routes 2, Route 8A, and the railroad to more densely populated

areas of Town. However, no formal vulnerability assessment was done for manmade hazards due to the lack of available data to use in an appropriate assessment model. The consensus of the Committee was that the potential for these types of manmade hazards to occur, the unknown impact of such accidents on the town’s population, infrastructure, and the natural and built environment, and the lack of available and well-analyzed data make this hazard and the implementation of associated Action Items a high priority. The Committee suggested a number of Action Items relating to this hazard that are included on the Preparedness and Response Action Plan (Table 4-14). Manmade Hazards are among the hazards considered to be most important to the town.

Goal Statements and Action Items

Action items from the 2005 plan were evaluated by the Committee and, if still relevant, were carried forward to the 2014 plan, with some modifications where necessary. Those action items that have been completed since the last plan are listed below in the following table.

Table 4-12: Completed Action Items from the 2005 Charlemont Hazard Mitigation Plan

Action Item	Responsible Department / Board	Estimated Completion Date	Status
Examine current notification system including feasibility of Reverse 911 or purchase of weather alert radios. Develop a preliminary project proposal and cost estimate.	Emergency Management Director, Police Department, Fire Department	2006	Complete. Charlemont utilizes the ConnectCTY reverse call system for public notification.
Adopt a Floodplain District Overlay Zoning Bylaw to regulate development within the 100-year flood zone.	Planning Board	2011	Complete.

Some of the 2005 action items were identified as preparedness or response actions and were, therefore, separated from the mitigation action items in the 2014 plan and added to any new preparedness or response actions identified by the Committee for the plan update (see Table 4-14).

Prioritization of Action Items

The Committee worked to prioritize the mitigation Action Items for the hazards identified as the most important to Charlemont. For most, if not all, of the Action Items, project costs are not specifically known so only a generalized estimate could be used during the prioritization process. Due to the lack of detailed cost information for the mitigation Action Items, a more detailed prioritization process such as STAPLEE could not be used. However, Action Items may be reprioritized by the town once a cost is developed and a Benefit Cost Analysis is conducted on specific projects. The Committee used a qualitative ranking system of High, Medium or Low to prioritize the mitigation Action Items for the hazards most important to Charlemont.

High	71-100 points
Medium	31-70 points
Low	0-30 points

The ranking system consists of the following criteria, each assigned a points value. The maximum number of points = 100:

1. What are the anticipated benefits (including avoided costs such as loss of life and the costs incurred to repair damaged infrastructure, buildings and natural resources) from the implementation of the action item to the town's population (10 points), infrastructure (10 points), and to the built (10 points) and natural environment (10 points)?
2. Can the town provide the necessary maintenance (future costs that must be included in the town's budget) when the mitigation measure is completed? Yes (10 points); No (0 points).
3. Does the town have the technical and administrative capability (staff costs and in-kind costs of volunteer boards and committee members) to carry out the mitigation measures? Yes (10 points); No (0 points).
4. Based on the evaluation of the above criteria, do the costs (if known or can be reasonably estimated) seem reasonable when considering the size of the problem and likely benefits from mitigation? Yes (20 points); No (0 points).
5. Is there political support and public support to implement the mitigation measures? Yes (20 points); No (0 points).

Even when the political will exists to implement the Action Items, the fact remains that Charlemont is a small town that relies heavily on a small number of paid staff, many of whom have multiple responsibilities, and a dedicated group of volunteers who serve on Town boards. However, some Action Items, when implemented by Town staff and volunteers, result in a large benefit to the community for a relatively small cost.

For larger construction projects, the town has limited funds to hire consultants and engineers to assist them with implementation. For these projects, the Town will seek assistance through the Franklin Regional Council of Governments (FRCOG) or other funding sources such as those listed in Table 5-1 on page 133 of this document. Limited technical assistance is available from the FRCOG. However, the availability of FRCOG staff can be constrained by the availability of grant funding.

The final 2014 Charlemont Multi-Hazards Mitigation Prioritized Action Plan is shown in Table 4-13. Potential funding sources for mitigation action items are also listed in Table 4-13. Other potential funding sources are listed in Table 5-1 on page 133 of this document. The town should request assistance from MEMA and/or FRCOG to explore which of these funding sources might supplement or replace town funding for the mitigation action items in Table 4-13. When Town funds are listed as a source to fund hazard mitigation projects or activities, either in part (match) or in full, these funds would be obtained from the town's "general fund."

The timeframe for implementation of the mitigation action items are listed as Year 0-1, which is the first year following plan adoption, and subsequent years after plan adoption through the 5

year life of the plan (Year 2, Year 3, Year 4 and Year 5). The Committee recognized that many mitigation action items have a timeframe that is ongoing due to either funding constraints that delay complete implementation and/or the action item should be implemented each of the five years of the plan, if possible. Therefore, a category of *Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate* was added.

The 2005 Charlemont Local Natural Hazards Mitigation Plan did not prioritize Action Items, so it is not possible to evaluate any change in priorities since the last plan. The 2014 action plan is prioritized so in future updates to the plan it will be possible to document any changes in priorities. The 2005 planning process did include a vulnerability assessment that rated hazards according to the risk to the Town from each hazard (the 2005 plan did not evaluate landslides or ice jams). The methodology of the 2005 assessment differs greatly from the methodology used in the 2014 All Hazards Vulnerability Assessment, making it difficult to compare the two.

DRAFT

Table 4-13: 2014 Charlemont Local Multi-Hazard Mitigation Prioritized Action Plan

GOAL STATEMENT: To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to natural disasters.

Action Item	Responsible Department / Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Priority for Implementation / Status
HAZARDS IDENTIFIED AS MOST IMPORTANT TO THE TOWN OF CHARLEMONT The priority for implementation of each Action Item is ranked as High, Medium or Low					
MULTIPLE HAZARDS					
Collect, periodically update, and disseminate information on which local radio stations provide emergency information, what to include in a 'home survival kit,' how to prepare homes and other structures to withstand flooding and high winds, and the proper evacuation procedures to follow during a natural disaster.	Police Department, Fire Department, Emergency Management Director	B, P	Town	Years 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	High / Ongoing from 2005 plan. A list of what to include in a home survival kit will be added to the Emergency Management page on the Town website.
Records of damages to the built and natural environment due to natural hazards are not consistently maintained. Data often resides with an individual and can be lost if that individual leaves his or her position. The town should consider implementing a formal system of data collection and maintenance which would help improve the Town's hazard mitigation planning. Better data could also increase the Town's chance of qualifying for various grants.	Select Board, Emergency Management Director	B, N, P, I	Town	Year 2	High / New Action Item. The Select Board has identified this as an issue and has been working on developing solutions to better maintain and back-up Town records.
MANMADE HAZARDS					
Conduct outreach to farmers and owners of property with old barns to ask what chemicals they have stored on-site, and if they need assistance with disposing of old chemicals that are no longer in use.	Select Board, Emergency Management Director, Fire Department, Police Department, Agricultural Commission	B, N, P	Town, Volunteers	Year 0-1	High / New Action Item.
Consider adding performance standards for commercial and industrial uses to the Zoning Bylaws to regulate the storage and use of hazardous materials.	Planning Board	B, N, P, I	Town, Volunteers	Year 4	Medium / New Action Item. The Planning Board currently addresses potential impacts of new development through the broad but comprehensive Special Permit criteria.
Update the Floodplain District bylaw to prohibit the storage or use of hazardous materials within the 100-year floodplain.	Planning Board	B, N, P, I	Town, Volunteers, MEMA, FRCOG	Year 2	Medium / New Action Item. The FRCOG has a model floodplain district overlay bylaw available for reference.
Consider implementing a Water Supply Protection District to preserve and maintain existing and potential groundwater and surface water resources within the town.	Planning Board, Select Board, Conservation Commission	N, P	Town, Volunteers, FRCOG	Year 4	Medium / New Action Item.
HIGH PRIORITY – Weighted Hazard Index > 5.5					
EARTHQUAKES					
Inspect municipal buildings and structures to determine if they are particularly vulnerable to earthquake damage (built prior to 1975) and determine if any retrofitting measures could mitigate this vulnerability.	Building Inspector, Emergency Management Director, Select Board	B, P	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	Medium / Carried over from 2005 plan.
Conduct education and outreach to schools, businesses, and residents about proper procedures to follow during and after an earthquake.	Emergency Management Director, Building Inspector, Select Board	P	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	Medium / New Action Item.
SEVERE WINTER STORMS					
Revise the subdivision regulations to require all new utilities be placed underground.	Planning Board	B, N, P, I	Town	Year 2	Medium / Carried over from 2005 plan. The Town has not had a subdivision in approximately 40 years, therefore the Subdivision Regulations have not been revised in recent years.

Action Item	Responsible Department / Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Priority for Implementation / Status
Work with utility companies to underground new utility lines and existing lines in locations where repetitive outages occur.	Select Board	B, N, P, I	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	High / Carried over from 2005 plan.
Ensure that utility companies implement five-year action plans, which include regular tree maintenance to reduce the number of limbs near overhead power lines, to reduce risk to infrastructure from severe winter storms.	Select Board, Tree Warden	B, N, P, I	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	High / Carried over from 2005 plan. National Grid has a new five-year action plan.
Encourage regular tree maintenance to reduce number of limbs near overhead power lines to reduce risk to infrastructure from severe winter storms.	Select Board, Planning Board, Highway Superintendent, Tree Warden	B, N, P, I	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	High / New Action Item.
DAM FAILURE					
Incorporate Dam Safety into Subdivision Regulations. Applicants should consult Inundation Maps during their preparation of subdivision plans. The applicant should assess the risk to the potential development from the dam and supply that information along with mitigation measures to the town as part of the review process.	Emergency Management Director, Planning Board	B, N, P, I	Town, Volunteers	Year 4	Medium / New Action Item. The Town has not had a subdivision in approximately 40 years, therefore the Subdivision Regulations have not been revised in recent years.
MEDIUM PRIORITY – Weighted Hazard Index 4.0 – 5.5					
HURRICANES and TROPICAL STORMS (Wind Related) - For flood related action items, see FLOODING section					
Consider using Community Development Block Grant home rehabilitation funds to assist homeowners in retrofitting grandfathered mobile homes.	Select Board	B, P	CDBG, Town, Volunteers	Year 2	Medium / Carried over from 2005 plan. The Town should contact the Franklin County Housing and Redevelopment Authority to find out the status of funding available through this program.
Consider adding requirements to Section 42: Mobile Home Parks and Campgrounds of the Charlemont Zoning Bylaws to ensure adequate support and anchoring systems are used for temporary and permanent mobile homes.	Building Inspector, Planning Board	B, P, I,	Town	Year 3	Medium / New Action Item.
Revise the subdivision regulations to require all new utilities be placed underground.	Planning Board	B, N, P, I	Town	Year 2	Medium / Carried over from 2005 plan. The Town has not had a subdivision in approximately 40 years, therefore the Subdivision Regulations have not been revised in recent years.
Work with utility companies to underground new utility lines and existing lines in locations where repetitive outages occur.	Select Board	B, N, P, I	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	High / Carried over from 2005 plan.
Ensure that utility companies implement five-year action plans, which include regular tree maintenance to reduce the number of limbs near overhead power lines, to reduce risk to infrastructure from high winds associated with hurricanes and tropical storms.	Select Board, Tree Warden	B, N, P, I	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	High / Carried over from 2005 plan. National Grid has a new five-year action plan.
Encourage regular tree maintenance to reduce number of limbs near overhead power lines to reduce risk to infrastructure from high winds associated with hurricanes and tropical storms.	Select Board, Planning Board, Highway Superintendent, Tree Warden	B, N, P, I	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	High / New Action Item.

Action Item	Responsible Department / Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Priority for Implementation / Status
TORNADOS, SEVERE THUNDERSTORMS and MICROBURSTS (Wind Related) – For flood related action items, see FLOODING section					
Consider using Community Development Block Grant home rehabilitation funds to assist homeowners in retrofitting grandfathered mobile homes.	Select Board	B, P	CDBG, Town, Volunteers	Year 2	Medium / Carried over from 2005 plan. The Town should contact the Franklin County Housing and Redevelopment Authority to find out the status of funding available through this program.
Consider adding requirements to Section 42: Mobile Home Parks and Campgrounds of the Charlemont Zoning Bylaws to ensure adequate support and anchoring systems are used for temporary and permanent mobile homes.	Building Inspector, Planning Board	B, P, I,	Town	Year 3	Medium / New Action Item.
Revise the subdivision regulations to require all new utilities be placed underground.	Planning Board	B, N, P, I	Town	Year 2	Medium / Carried over from 2005 plan. The Town has not had a subdivision in approximately 40 years, therefore the Subdivision Regulations have not been revised in recent years.
Work with utility companies to underground new utility lines and existing lines in locations where repetitive outages occur.	Select Board	B, N, P, I	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	High / Carried over from 2005 plan.
Encourage utility companies to continue to implement five-year action plans, which include regular tree maintenance to reduce the number of limbs near overhead power lines.	Select Board, Tree Warden	B, N, P, I	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	High / Carried over from 2005 plan. National Grid has a new five-year action plan.
Encourage regular tree maintenance to reduce number of limbs near overhead power lines.	Select Board, Planning Board, Highway Superintendent, Tree Warden	B, N, P, I	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	High / New Action Item.
FLOODING					
Review and amend the Floodplain District Overlay Zoning Bylaw using the FRCOG Model Floodplain District Bylaw to reduce the risk of flooding and damage to infrastructure and natural resources. Special consideration should be given to further restricting or limiting new development within the 100-year floodplain and dam breach inundation areas and requiring more detailed standards for review of storm water plans for developments.	Planning Board	B, N, P, I	Town, Volunteers, MEMA, FRCOG	Year 4	Medium / New Action Item. A Floodplain District Bylaw was adopted in 2011. The Planning Board currently addresses potential impacts of new development through the broad but comprehensive Special Permit criteria.
Using Assessors' data and other available information expand and update the Vulnerability Assessment for properties located within the 100-year floodplain.	Emergency Management Director	B	Town, Volunteers	Year 4	Medium / Carried over from 2005 plan. Still relevant.
Amend the Definitive Plan requirements for a subdivision to include identifying any potential flooding impacts and include flooding mitigation measures, if appropriate.	Planning Board, Conservation Commission	B, N, P, I	Town, Volunteers	Year 4	Medium / Carried over from 2005 plan. The Town has not had a subdivision in approximately 40 years, therefore the Subdivision Regulations have not been revised in recent years.
Consider implementing standards to require temporary and permanent erosion control measures for streams and surface water bodies and prohibiting permanent alterations of watercourses or streams.	Planning Board, Conservation Commission	B, N, P, I	Town, Volunteers	Year 4	Medium / Carried over from 2005 plan. The Planning Board currently addresses potential impacts of new development through the broad but comprehensive Special Permit criteria.
Consider requiring Impact Statements for construction beyond a certain number of lots.	Planning Board	B, N, P, I	Town, Volunteers	Year 4	Medium / Carried over from 2005 plan. The Planning Board currently addresses potential impacts of new development through the broad but comprehensive Special Permit criteria.

Action Item	Responsible Department / Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Priority for Implementation / Status
Support local and regional, watershed-wide open space protection efforts, particularly in floodplain areas. Research options for amending Charlemont's zoning so that it supports local and regional open space protection efforts, particularly in floodplain areas.	Planning Board, Select Board, Open Space Committee	B, N, P, I	Town, Volunteers	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	Low / Ongoing from 2005 plan. Since 2002, Charlemont has participated in a land protection project through the National Scenic Byway Program that has protected approximately 130 acres along Route 2.
The Town should consider becoming a part of FEMA's Community Rating System.	Planning Board, Select Board, Conservation Commission	B,N,P,I	Town, Volunteers	Year 2	High / Carried over from 2005 plan. Still relevant.
Consider adding flood prevention and mitigation to the list of criteria evaluated by the Planning Board when reviewing a Special Permit application.	Planning Board	B, N, P, I	Town, Volunteers	Year 2	High / New Action Item. The Planning Board currently addresses potential impacts of new development through the broad but comprehensive Special Permit criteria.
Consider updating the Subdivision Rules and Regulations to require a Stormwater Management Plan that would allow water to infiltrate on-site to the extent feasible, incorporate Low Impact Development (LID) strategies, and require drainage to be designed based on a 100-year storm.	Planning Board	B, N, P, I	Town, Volunteers	Year 4	Medium / New Action Item. The Town has not had a subdivision in approximately 40 years, therefore the Subdivision Regulations have not been revised in recent years.
LOW PRIORITY – Weighted Hazard Index < 4.0					
WILDFIRES and BRUSH FIRES					
Seek funding to increase the staff of the Fire Department's inspection and safety unit.	Fire Department	B, N, P, I	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	Medium / Carried over from 2005 plan. Still relevant.
Coordinate with the FRCOG and other appropriate agencies to request that the State revise burn permit guidelines.	Fire Department	B, N, P, I	Town	Year 5	Low / Carried over from 2005 plan. Still relevant.
Continue to distribute information on fire safety and prevention.	Fire Department	B, N, P, I	Town	Year 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	High / Carried over from 2005 plan. The Fire Department conducts regular fire safety and prevention outreach and education.
LANDSLIDES					
Consider adding erosion control measures to the Zoning Bylaws that would require the site design, materials, and construction processes be designed to avoid erosion damage, sedimentation or uncontrolled surface water runoff and regulate slope and vegetative cover.	Planning Board, Conservation Commission	B, N, P, I	Town, Volunteers	Year 4	Medium / New Action Item. The Planning Board currently addresses potential impacts of new development through the broad but comprehensive Special Permit criteria.
Consider amending the Subdivision Rules and Regulations to address impacts of uncontrolled surface water runoff and sedimentation of streams and surface water bodies by requiring temporary and permanent erosion control measures.	Planning Board, Conservation Commission	B, N, P, I	Town, Volunteers	Year 5	Medium / New Action Item. The Town has not had a subdivision in approximately 40 years, therefore the Subdivision Regulations have not been revised in recent years.
Consider amending the Subdivision Rules and Regulations to require Impact Statements for construction beyond a certain number of lots.	Planning Board	B, N, P, I	Town, Volunteers	Year 4	Medium / New Action Item. The Town has not had a subdivision in approximately 40 years, therefore the Subdivision Regulations have not been revised in recent years.
Consider updating the Subdivision Rules and Regulations to require a Stormwater Management Plan that would allow water to infiltrate on-site to the extent feasible, incorporate Low Impact Development (LID) strategies, and require drainage to be designed based on a 100-year storm.	Planning Board	B, N, P, I	Town, Volunteers	Year 4	Medium / New Action Item. The Town has not had a subdivision in approximately 40 years, therefore the Subdivision Regulations have not been revised in recent years.
Consider amending the Subdivision Rules and Regulations to require the preservation of existing vegetation and mature trees to the maximum extent possible.	Planning Board	B, N, P, I	Town, Volunteers	Year 4	Medium / New Action Item. The Town has not had a subdivision in approximately 40 years, therefore the Subdivision Regulations have not been revised in recent years.

Action Item	Responsible Department / Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Priority for Implementation / Status
ICE JAMS					
See Flood-related Action Items					

Table 4-14: Charlemont Local Multi-Hazard Mitigation Preparedness and Response Action Plan

Goal Statement: To provide adequate shelter, water, food and basic first aid to residents in the event of a natural disaster; and to provide adequate notification, emergency information, and evacuation procedures to residents in the event of a natural disaster.

Action Item	Responsible Department / Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Status
HIGH PRIORITY					
MULTIPLE HAZARDS					
Identify potential locations for new shelters that are equipped with an auxiliary power supply, are earthquake resistant as well as outside of floodplain and dam inundation areas. Disseminate this information to appropriate town departments.	Building Inspector, Emergency Management Director	P	Town	Year 2	Carried over from 2005 plan. Still relevant. The Emergency Management Director researched new shelter locations and presented his findings to the Select Board in 2013.
Equip existing shelters with back-up power supplies.	Building Inspector, Emergency Management Director	P	Town	Year 1	New Action Item. In process.
Acquire portable generators for critical Town facilities, such as Town Hall, Police Station, and Highway Garage.	Building Inspector, Emergency Management Director	P	Town	Year 1	New Action Item. In process.
Inventory supplies at existing shelters and develop a needs list and storage requirements. Establish MOUs with local or neighboring vendors for supplying shelters with potable water, food and first aid supplies in the event of a natural disaster.	Emergency Management Director, Planning Board, Fire Department, Police Department	P	Town, Volunteers	Year 2	Carried over from 2005 plan. Still relevant. Since Tropical Storm Irene, the Town developed templates for requesting assistance from the National Guard, including a request for potable water supplies.
Create, maintain, and train a volunteer base for assisting town emergency management staff during and after emergencies. Encourage Charlemont residents to join the Franklin County Citizen Emergency Response Team (CERT) or Medical Reserve Corps (MRC).	Emergency Management Director, Fire Department, Police Department, Board of Health	B, N, P, I	Town, Homeland Security, FRCOG	Years 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	New Action Item.
Consider assisting the FRCOG and the Regional Emergency Planning Committee (REPC) in updating and implementing the Draft 2009 Regional Debris Management Plan.	Emergency Management Director	B, N, P, I	FEMA	Year 2	Modified from 2005 plan. Coordinate regionally. Need to identify a debris storage location in Town.
MANMADE HAZARDS					
Research appropriate vulnerability assessment models for fixed facility and transportation hazardous materials accidents, collect relevant data, and populate model to further prioritize manmade hazard action items.	Emergency Management Director, Franklin County Regional Emergency Planning Committee (REPC), FRCOG	B, N, P, I	FEMA	2015	New Action Item.
Develop an evacuation plan and notification system in the event of a chemical spill in a fixed structure or in a transportation setting such as Route 2, Route 8A, or the railroad.	Emergency Management Director, Fire Department	P	FEMA	Years 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	New Action Item. Since the 2005 plan, the Town implemented a telephone notification system to alert residents of emergency situations.

Action Item	Responsible Department / Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Status
Request Evacuation Plans and information about drills from facilities in town that use hazardous materials and coordinate town emergency response with facilities' emergency response staff.	Emergency Management Director, Fire Department	B, N, P, I	Town, private hazardous materials facilities	Years 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	New Action Item.
DAM FAILURE					
Ensure all public safety officials in town have copies of the most recent Emergency Action Plans and inundation maps for the Deerfield River high hazard dams.	Emergency Management Director	B, N, P, I	Town	Years 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	Modified from 2005 plan. TransCanada issued new EAPs and inundation maps to the EMD in 2011.
Prepare evacuation plans for dam failures on the Deerfield River using inundation maps from Emergency Action Plans, available evacuation plans for critical facilities like the Hawlemont Regional Elementary School and the Academy at Charlemont (if available) and the recommendations contained in the <i>Draft Town Recommendations: Supplement to the Failure of the Harriman Dam Evacuation Planning Report</i> (July 6, 2010).	Emergency Management Director, Police Department, Fire Department, Highway Department.	P	Town, Volunteers, Homeland Security	Years 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	Modified and expanded from 2005 plan. The Town is actively working on developing evacuation plans for a dam failure event.
Identify shelters outside of the inundation zones for evacuees from a dam failure on the Deerfield River. If needed, execute MOUs with neighboring towns for use of shelters within those towns.	Emergency Management Director	P	Town, Homeland Security	Year 2	Modified from 2005 plan. The Emergency Management Director researched new shelter locations and presented his findings to the Select Board in 2013.
Ensure that the Hawlemont Regional Elementary School and the Academy at Charlemont have up-to-date evacuation plans for a dam failure on the Deerfield River.	Emergency Management Director	P	Town, Hawlemont Regional School, Academy at Charlemont	Year 1	New Action Item. The EMD has contacted both schools and offered to assist with reviewing and developing evacuation plans for each facility.
FLOODING					
Review evacuation procedures for the flood prone areas in town (identified on the Critical Facilities and Infrastructure Map) and update.	Emergency Management Director, Police Department, Fire Department	P	Town	Years 0-1, to be reviewed annually and implemented in subsequent years (Years 2-5), as appropriate.	Carried over from 2005 plan.
Coordinate with state and regional agencies to identify a location(s) for the temporary storage of contaminated/hazardous flood debris.	Emergency Management Director, Planning Board, Franklin County Regional Emergency Planning Committee (REPC)	N, P	Town, Volunteers	Year 2	Carried over from 2005 plan. Coordinate regionally. Need to identify a debris storage location in Town.

NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE

The U.S. Congress established the National Flood Insurance Program (NFIP) in 1968, with the passage of the National Flood Insurance Act of 1968. “For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, seawalls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses, nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

“In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.”⁷⁸

The State of Massachusetts, through its local communities,⁷⁹ complies with the NFIP in part by enforcing the Wetlands Protection Act (WPA), which helps restrict development in flood-prone areas, enforcing the State Building Code, which regulates building specifications and additional related zoning bylaws, such as a floodplain overlay district. At the local level, Buckland’s compliance with the NFIP is enforced through the building inspector and building code, the Conservation Commission and wetland and floodplain regulations, and the zoning bylaws and subdivision regulations related to flooding. While the local building code cannot be more restrictive than the state building code, the local Conservation Commission can restrict development above and beyond the requirements in the WPA. The ability of the Conservation Commission to further regulate development in flood prone areas could be a crucial tool in flood mitigation. In addition, the ability of the Select Board to adopt further bylaws such as a floodplain overlay district could also mitigate flooding.

The Town of Charlemont participates in the National Flood Insurance Program. The goals of the National Flood Insurance Program (NFIP) are to provide flood insurance to property owners, to encourage flood loss reduction activities by communities, and to save taxpayers’ money. As of November 2013, there were 11 policies in effect in Charlemont for a total of \$2,720,600 worth of insurance. The town is not a member of the Community Rating System, which entitles policyholders to a discount on flood insurance premiums. The CRS ranking is based on the steps the town has taken to control flood losses.

NFIP Community Rating System (CRS)⁸⁰

The town is not a member of the NFIP Community Rating System, which entitles policyholders to a discount on flood insurance premiums. The Community Rating System is a part of NFIP and provides incentives and tools to further these goals. The goals of the CRS are to recognize,

⁷⁸ <http://www.fema.gov/library/viewRecord.do?id=1404>

⁷⁹ Massachusetts is a Home Rule state, the local communities have significant authority to implement state regulations and many towns adopt their own wetland and floodplain regulations that are more stringent than state.

⁸⁰ <http://training.fema.gov/EMIWeb/CRS/>

encourage, and reward, by the use of flood insurance premium adjustments, community and state activities beyond the minimum required by the NFIP that:

- Reduce flood damage to insurable property,
- Strengthen and support the insurance aspects of the NFIP, and
- Encourage a comprehensive approach to floodplain management.

The Community Rating System reduces flood insurance premiums to reflect what a community does above and beyond the National Flood Insurance Program's (NFIP) minimum standards for floodplain regulation. The objective of the CRS is to reward communities for what they are doing, as well as to provide an incentive for new flood protection activities. It provides lower insurance premiums under the National Flood Insurance Program. The premium reduction is in the form of a CRS Class, similar to the classifications used for fire insurance. For example, a Class 1 provides a 45% premium reduction while a Class 10 provides no reduction. The CRS Class is based on the floodplain management activities a community implements. In many cases, these are activities already implemented by the community, the state, or a regional agency. The more activities implemented, the better the CRS class.

Benefits of participating in the Community Rating System:

- Money stays in the community instead of being spent on insurance premiums.
- Every time residents pay their insurance premiums, they are reminded that the community is working to protect them from flood losses, even during dry years.
- The activities credited by the CRS provide direct benefits to the community, including:
 - Enhanced public safety,
 - Reduction in damage to property and public infrastructure,
 - Avoidance of economic disruption and losses,
 - Reduction of human suffering, and
 - Protection of the environment.
- Local flood programs will be better organized and more formal.
- The community can evaluate the effectiveness of its flood program against a nationally recognized benchmark.
- Technical assistance in designing and implementing some activities is available at no charge.
- The community will have an added incentive to maintain its flood programs over the years.
- The public information activities will build a knowledgeable constituency interested in supporting and improving flood protection measures.

Costs to the local government to participate in the Community Rating System:

- The community must designate a CRS Coordinator who prepares the application papers and works with FEMA and the Insurance Services Office (ISO) during the verification visit.
- Each year the community must recertify that it is continuing to implement its activities. It must provide copies of relevant materials (e.g., permit records).
- The community must maintain elevation certificates, permit records, and old Flood Insurance Rate Maps forever.

- The community must maintain other records of its activities for five years, or until the next ISO verification visit, whichever comes sooner.

Community Rating System Process

One of the actions that Charlemont can take to improve their CRS rating (and subsequently lower their premiums) is to develop a CRS plan. The CRS 10-step planning process provides additional points for activities that communities can take during their planning process that go above the minimum described below, thus possibly lowering insurance rates. At a minimum, an *approved* multi-hazard mitigation plan that addresses floods could qualify for CRS credit. Although communities are not required to participate in CRS in order to receive approval of a Local Natural Hazards Mitigation Plan, FEMA encourages jurisdictions to integrate the CRS planning steps into their multi-hazard mitigation plans.

Credit is provided for preparing, adopting, implementing, evaluating, and updating a comprehensive floodplain management plan or repetitive loss area analyses. The Community Rating System does not specify what must be in a plan, but it only credits plans that have been prepared and kept updated according to CRS standard planning process. Credit is also provided for implementing a habitat conservation plan.

Community Rating System Credit Points⁸¹

A total of up to 359 points are provided for three elements. Up to 294 points are provided for adopting and implementing a floodplain management plan (FMP) that was developed using the following standard planning process. There must be some credit for each of the 10 planning steps:

Step	Maximum Points
• Organize to prepare the plan	10
• Involve the public	85
• Coordinate with other agencies	25
• Assess the hazard	20
• Assess the problem	35
• Set goals	2
• Review possible activities	30
• Draft an action plan	70
• Adopt the plan	2
• Implement, evaluate, and revise	15

Up to 50 additional points are provided for conducting repetitive loss area analyses (RLAA) and up to additional 15 points are provided for adopting and implementing a Habitat Conservation Plan (HCP).

More information is available at <http://www.fema.gov/business/nfip/crs.shtm>. A copy of the “Local Official’s Guide to Saving Lives, Preventing Property Damage, and Reducing the Cost of Flood Insurance” is including in the Appendix of this plan or can be downloaded at <http://www.fema.gov/library>.

⁸¹ FEMA Local Multi-Hazard Mitigation Planning Guidance, July 1, 2008.

5 – PLAN ADOPTION & IMPLEMENTATION

PLAN ADOPTION

The Franklin Regional Council of Governments (FRCOG) provided support to the Charlemont Local Multi-Hazard Mitigation Planning Committee as they underwent the planning process. Town officials were invaluable resources to the FRCOG and provided background and policy information and municipal documents, which were crucial to facilitating completion of the plan.

When the preliminary draft of the Local Multi-Hazard Mitigation Plan was completed, copies were distributed to the Charlemont Multi-Hazard Mitigation Planning Committee for comment and input. The Committee is comprised of representatives of many of the Town boards and departments who bear the responsibility for implementing the action items and recommendations of the completed plan.

Copies of the Final Draft Local Multi-Hazard Mitigation Plan for the Town of Charlemont were distributed to the Select Board, Planning Board, Fire Department, Police Department, Highway Department, and Emergency Management Director for their review and comment. A copy of the plan was also posted on the town website for public review. Once reviewed and approved by MEMA, the plan was sent to the Federal Emergency Management Agency (FEMA) for their approval. On [REDACTED], the Select Board voted to adopt the plan.

PLAN MAINTENANCE PROCESS

The implementation of the Charlemont Local Natural Hazard Mitigation Plan will begin following its formal adoption by MEMA, FEMA, and the Charlemont Select Board. As mentioned previously, work has begun on several of the mitigation strategies identified in the 2012 Charlemont Local Multi-Hazard Mitigation Prioritized Action Plan. Specific Town Departments will be responsible for ensuring the development of policies, bylaw revisions, and programs as described in the Action Plan. The Charlemont Multi-Hazard Mitigation Planning Committee will oversee Plan implementation.

Monitoring, Evaluating, and Updating the Plan

Implementation Schedule

Annual Meetings

The Charlemont Multi-Hazard Planning Committee will meet on an annual basis or as needed (i.e., following a natural disaster) to monitor the progress of implementation, evaluate the success or failure of implemented recommendations, and brainstorm for strategies to remove obstacles to implementation. Following these discussions, it is anticipated that the committee may decide to reassign the roles and responsibilities for implementing mitigation strategies to different Town departments and/or revise the goals and objectives contained in the plan. At a

minimum, the committee will review and update the plan every five years, beginning in the fall of 2016. Annual meetings of the committee will be organized by the Charlemont municipal administrative staff and facilitated by the Emergency Management Director.

Bi-Annual Progress Report

The Emergency Management Director, with the assistance of municipal administrative staff, will prepare and distribute a biannual progress report in years two and four of the plan. The progress report will be distributed to all of the local implementation group members and other interested local stakeholders. The progress report 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. This information will be used to prepare a report or addendum, as needed, to the multi-hazard mitigation plan. The Emergency Management Director and the Charlemont Multi-Hazard Planning Committee will have primary responsibility for tracking progress and updating the plan.

Five-Year Update Preparation

During the fourth year after initial plan adoption, the Emergency Management Director will convene the Committee to begin preparations 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 annual meetings and the biannual progress reports to identify the needs and priorities for the plan update.

The measure of success of the Charlemont Multi-Hazard Mitigation Plan will be the number of identified mitigation strategies implemented. In order for the Town to become more disaster resilient and be better equipped to respond to natural disasters, there must be a coordinated effort between elected officials, appointed bodies, Town employees, regional and state agencies involved in disaster mitigation, and the general public.

As is the case with many Franklin County towns, Charlemont’s government relies on few public servants filling many roles, on citizen volunteers and on limited budgets. The implementation of the recommendations of this plan could be a challenge to the Committee. As the Committee meets regularly to assess progress, it should strive to identify shortfalls in staffing and funding and other issues which may hinder Plan implementation. The Committee should seek technical assistance from the Franklin Regional Council of Governments to help alleviate some of the staffing shortfalls. The Committee could also seek assistance and funding from sources listed in Table 5-1.

Table 5-1: Potential Funding Sources for Hazard Mitigation Plan Implementation

Program	Type of Assistance	Availability	Managing Agency	Funding Source
National Flood Insurance Program	Pre-disaster insurance	Any time (pre & post disaster)	DCR Flood Hazard Management Program	Property Owner, FEMA

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Community Assistance Program	State funds to provide assistance to communities in complying with NFIP requirements	Annually	DCR	FEMA/NFIP
Community Rating System (Part of the NFIP)	Flood insurance discounts	Any time (pre & post disaster)	DCR Flood Hazard Management Program	Property Owner
Flood Mitigation Assistance Program	Cost share grants for pre-disaster planning & projects	Annual pre-disaster grant program	MEMA	75% FEMA/ 25% non-federal
Hazard Mitigation Grant Program	Post-disaster cost-share Grants	Post disaster program	MEMA	75% FEMA/ 25% non-federal
Pre-Disaster Mitigation Program	National, competitive grant program for projects & planning	Annual, pre-disaster mitigation program	MEMA	75% FEMA/ 25% non-federal
Severe Repetitive Loss	For SRL structures insured under the NFIP.	Annual	MEMA	Authorized up to \$40 million for each fiscal year 2005 through 2009
Small Business Administration Mitigation Loans	Pre- and post- disaster loans to qualified applicants	Ongoing	MEMA	Small Business Administration
Public Assistance	Post-disaster aid to state and local governments	Post Disaster	MEMA	FEMA/ plus a non-federal share
Dam Safety Program	Provides funding to state to promote dam safety through emergency action plans and exercises	Annual	DCR	FEMA
Homeland Security Grants	Multiple grant sources provide funding for homeland security activities, including THIRA development, planning, and training at the state and local levels	Annual	MEMA	DOJ, DHS, FEMA
National Fire Plan	Provides pre-disaster funds for wildfire mitigation and planning for all-hazards.	Annual	DCR	U.S. Land Management Agencies
Clean Water Act Section 319 Grants	Provides grants for wide variety of activities related to non-point source pollution runoff mitigation	Annual	MassDEP	EPA

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Economic Development Administration Grants and Investment	Provides grants for community construction projects, including mitigation activities	Annual	Massachusetts Office of Business Development	U.S. Department of Commerce, Economic Development Administration
Emergency Watershed Protection	Provides funding and technical assistance for emergency measures, e.g., floodplain easements in impaired watersheds	Annual	DCR	USDA NRCS
Forest Land Enhancement Program	Provides educational, technical, and financial assistance to help landowners implement sustainable forest management objectives.	Annual	DCR	U.S. Forest Service
Housing and Urban Development	Provides various grant programs related to safe-housing initiatives	Annual	Department of Housing and Community Development	U.S. Dept. of Housing and Urban Development
Reclamation and Development Grants Program	Provides funding for water-related projects, studies, etc.	Annual	MassDEP and others	EPA
National Wildlife Wetland Refuge System	Provides funding for acquisition of lands into federal wildlife refuge system	Annual	U.S. Fish and Wildlife Service	U.S. Fish and Wildlife Service
North American Wetland Conservation Fund	Provides funding for wetland conservation projects	Annual	U.S. Fish and Wildlife Service	U.S. Fish and Wildlife Service
Rural Development Grants	Provides grants and loans for infrastructure and public safety development and enhancement in rural areas	Annual	Department of Housing and Community Development	USDA, Rural Development
Rural Fire Assistance Grants	Funds fire mitigation activities in rural communities	Annual	DCR	National Interagency Fire Center
Chapter 90 Program	Funds maintaining, repairing, improving and constructing town and county ways and bridges which qualify under the State Aid Highway Guidelines	Annual	Mass DOT	State Transportation Bond
2013 MassWorks Infrastructure Program	Funds targeted investments in infrastructure such as roadways, streetscapes, water, and sewer	Annual	Executive Office of Housing and Economic Development (EOHED),	State Appropriation-Section 11 of Chapter 238 of the Acts of 2012

Program	Type of Assistance	Availability	Managing Agency	Funding Source
Accelerated Bridge Program	Funds bridge rehabilitation, replacement, preservation, maintenance, painting and cleaning projects	Rolling basis (bridges are pre-selected)	MassDOT and DCR	State Appropriation - Chapter 233 of the Acts of 2008
Dam, Levee and Coastal Infrastructure Repair and Removal Program	Funds grants and loans for the repair and removal of dams, levees, seawalls, and other forms of inland and coastal flood control.	Annual	Executive Office of Energy and Environmental Affairs (EEA)	State Revolving Loan
Conservation Partnership	Funds assist not-for-profit corporations in acquiring land and interests in lands suitable for conservation or recreation.	Annual	Executive Office of Energy and Environmental Affairs (EEA)	Executive Office of Energy and Environmental Affairs (EEA)
PARC - Parkland Acquisitions and Renovations for Communities	Provides grant assistance to cities and towns to acquire parkland, develop new parks, or renovate existing outdoor public recreation facilities (formerly the Urban Self-Help Program).	Annual	Executive Office of Energy and Environmental Affairs (EEA)	State Appropriations
Other Sources: www.grants.gov a source for federal government grants www.grants.com a source for private funding opportunities www.epa.gov/ogd/grants/funding_opportunities U.S. Environmental Protection Agency www.corporateservices.noaa.gov/grantsonline National Oceanic and Atmospheric Administration www.mass.gov/eea/agencies/massdep/water/grants/watersheds-water-quality.html for 604b and s.319 grants				

Incorporating the Plan into Existing Planning Mechanisms

Upon approval of the Charlemont Multi-Hazard Mitigation Plan by MEMA, the Committee will provide all interested parties and implementing departments with a copy of the plan. The committee should also consider initiating a discussion with each department on how the plan can be integrated into that department’s ongoing work. At a minimum, the plan should be distributed to and reviewed with the following entities:

- Fire Departments
- Emergency Management Director
- Police Department
- Public Works / Highway Department
- Planning Board
- Zoning Board of Appeals
- Conservation Commission
- Franklin County Regional Emergency Planning Committee
- Building Inspector
- Select Board
- Water Department

Below is a list of several possible planning mechanisms that could benefit from integration of elements of the 2012 Local Multi-Hazard Mitigation Plan, including:

- Incorporation of relevant hazard mitigation information into the update of the town's Open Space and Recreation Plan (OSRP). There are opportunities to discuss findings of the hazard mitigation plan and incorporate them into the Environmental Inventory and Analysis section of the OSRP and to include appropriate action items from the hazard mitigation plan in the OSRP Action Plan.
- Any future updates of the *Mohawk Trail Scenic Byway Corridor Management Plan* could incorporate relevant material from this plan into sections such as the Natural Resources section and any action plans.
- When the Final Draft Local Multi-Hazard Mitigation Plan for the Town of Charlemont is distributed to the Town boards for their review, a letter asking each board to endorse any action item that lists that board as a responsible party would help to encourage completion of action items.
- Each of the town boards and departments responsible for implementing actions listed in the Action Plan could include discussions of the action items they are responsible for in one meeting annually and assess their progress and report back to the Committee.
- The Planning Board could review the town's current Subdivision Rules and Regulations and Zoning Bylaws and consider the recommended revisions listed in this plan. Model bylaws and other technical assistance are available from the FRCOG to help the Planning Board update the town's current bylaws, as appropriate.

Continued Public Involvement

The Town of Charlemont is dedicated to continued public involvement in the hazard mitigation planning and review process. During all phases of plan maintenance, the public will have the opportunity to provide feedback. The 2014 Plan will be maintained and available for review on the Town website through 2019. Individuals will have an opportunity to submit comments for the Plan update at any time. Any public meetings of the Committee will be publicized. This will provide the public an opportunity to express their concerns, opinions, or ideas about any updates and changes that are proposed to the Plan.

APPENDICES

APPENDIX A: CHARLEMONT ZONING BYLAWS AND SUBDIVISION RULES AND REGULATIONS⁸²

Subdivision Rules and Regulations

Charlemont's Subdivision Rules and Regulations were adopted to "protect the safety, convenience and welfare of the inhabitants of the Town of Charlemont in the laying out and construction of ways with subdivisions, to provide adequate access to all lots, and to assure sound construction of roadways, good drainage and sanitary conditions." The Subdivision Rules and Regulations contain several provisions that mitigate the potential for flooding, including:

- 5) (Section IV B 2) Definitive Plan – Contents. Requires the proponent, in part, to identify:
 - 6) k. Existing and proposed topography at a suitable contour interval.
 - 7) l. The location of natural objects and surfaces such as waterways, natural drainage courses, ledge outcroppings, stone walls, etc.
 - 8) n. Proposed layout of storm drainage, water supply and sewage disposal systems, including profiles and layout of all underground utilities including all appurtenances.
- 9) (Section IV B 6) Definitive Plan - Performance Guarantee. Before approval of a Definitive Plan, the subdivider shall either file a performance bond, or deposit money or negotiable securities in an amount determined by the Board to be sufficient to cover the cost of the improvements shown on the Plan. Refund of the Bond shall be contingent on the completion of improvements, including a stormwater drainage system within two (2) years of date of bond or deposit. If the Board determines that said improvements have been completed as required, and that all costs due the Town have been paid, and recording requirements have been met, it shall release the interest of the Town in the bond. Approval with a covenant may be chosen as an alternate to the bond or deposit. Such covenant would provide that no lot be built upon or sold until all required improvements are completed and approved.
- 10) (Section VI A 6) Required Improvements – Curbing. Regulates the installation of curbing in subdivisions. Curbing will be required in new subdivisions "only where the Planning Board determines that special conditions of topography, drainage requirements, steep roadway grade or high traffic density so require. Unless these conditions exist, curbing will not be required, and the adjoining shoulder, grass plot and ditch shall be graded and treated so as to adequately carry the surface water runoff without erosion.

⁸² These are excerpts from the Town of Charlemont Zoning Bylaw, last amended May 3, 2011, which are relevant to the Local Multi-Hazard Mitigation Plan. These excerpts are for informational purposes only. Please check with the Town Clerk for the current and complete edition of the Town of Charlemont Zoning Bylaw.

Granite Curbs and blacktop curbs shall be provided at locations where, in the judgment of the Planning Board, existing conditions necessitate their installation.”

- (Section 5 B 2) Design Standards – Alignment and Design Standards Part f Maximum Grade of Streets. The maximum grade of streets shall be 7 percent for major streets and 9 percent for minor streets. The Planning Board may modify these requirements when, in its opinion, unusual topographic conditions so require, the resulting grades are maintained for only a minimum distance, no hazard or abnormal maintenance problems will result and if the subdivider makes provisions such as paved ditches or other measures to alleviate erosion.
- (Article VI Section B) Utilities. Adequate disposal of surface water shall be provided. Roadside ditches shall be drained at intervals of no more than 350 feet by the installation of drop inlets or crosspipes with suitable outlet. All drainage pipes shall have a diameter of no less than 12 inches. Where curbing is required or no other suitable method for disposal of surface water runoff from the pavement is provided, catch basins shall be provided at both sides of the roadway at low points, near street intersections and at intervals of no greater than 350 feet along the roadway. The strict enforcement of the drainage requirements may be waived by the Planning Board upon verification by the Town Highway Superintendent that he has viewed the proposed site and the design plans and has determined that the proposed drainage system is adequate. Any subdivision located within sight distance of Route 2 will be required to place all electrical and telephone utilities underground unless the applicant demonstrates to the satisfaction of the Planning Board that unique properties of the subdivided land justify an exemption from this section.

Charlemont Zoning By-Laws

The Town of Charlemont has established a set of bylaws designed in part to “secure safety from fire, flood, panic and other dangers; to provide adequate light and air; to prevent overcrowding of land; to avoid undue concentration of population; to facilitate the adequate provision of transportation, drainage, schools, parks, open space and other requirements.” The Zoning By-Laws include several provisions that mitigate the potential for flooding, including:

- 11) (Section 32.2) Special Permit Criteria. Before a Special Permit can be issued, the Planning Board will consider, among other criteria, “the degree to which the proposal results in topographic change, removal of mature trees or other botanical assets, removal of cover vegetation, risk of erosion or siltation, increased storm water runoff from the site, or displacement of natural habitats.”
- 12) (Section 34.3) Erosion Control. The Building Inspector may require for any proposed development that site design, building design, and construction procedures be modified so as to protect soil from erosion or excessive uncontrolled surface water runoff. No

grading or construction shall take place on slopes in excess of 25% except under Special Permit from the Planning Board, which shall be granted only upon demonstration that adequate provisions have been made to protect against erosion, soil instability, uncontrolled surface water runoff or other environmental degradation. To ensure compliance with these requirements, the Building Inspector or Planning Board may require topographic data prior to acting upon an application for a permit.

(Section 44) Cell Tower Regulations. “The purpose of these regulations is 1) to minimize the adverse impact of wireless communication towers, antennas, and facilities on Charlemont’s unique community character and natural amenities; 2) to minimize the overall number and height of such facilities; 3) to regulate the siting of towers in an effort to aid the provision of communication services; 4) to also ensure that no discrimination occurs with competing providers.” The bylaw requires a Special Permit from the Planning Board before such a facility can be erected.

- (Section 44 c) Cell Tower Regulation – Conditions. The height of any portion of the facility shall be limited so that it is no more than 30% higher than the height of any forest canopy within 1,000 feet.
- (Section 44 h) Cell Tower Regulation – Conditions. Any new tower or monopole shall not be erected nearer to a property line than a distance equal to twice the vertical height of the structure, nor shall it be allowed nearer than 800 feet to any existing residential structure;
- (Section 44 a) Cell Tower Regulation – Regulations. Adhere to all wetland regulations imposed by the Charlemont Conservation Commission.

Section 45: Floodplain District

Article I: Statement of Purpose

The purposes of the Floodplain District are to:

- 1) Ensure public safety through reducing the threats to life and personal injury;
- 2) Eliminate new hazards to emergency response officials;
- 3) Prevent the occurrence of public emergencies resulting from water quality, contamination, and pollution due to flooding;
- 4) Avoid the loss of utility services which if damaged by flooding would disrupt or shut down the utility network and impact regions of the community beyond the site of flooding;
- 5) Eliminate costs associated with the response and cleanup of flooding conditions;
- 6) Reduce damage to public and private property resulting from flooding waters.

Article II: Floodplain district Boundaries and Base Flood Elevation and Floodway Data

Section A. Floodplain District Boundaries and Base Flood Elevation Data

The Floodplain District is herein established as an overlay district. The district includes all special flood hazard areas designated on the Charlemont Flood Insurance Rate Map (FIRM) issued by the Federal Emergency Management Agency (FEMA) for the administration of the MFIP dated July 2, 1980 as Zone A, A1-30 and the FEMA Flood Boundary & Floodway Map dated July 2, 1980, both maps which indicate the 100-year regulatory floodplain. The exact boundaries of the District may be defined by the 100-year base flood elevations shown on the FIRM and further defined by the Flood Insurance study booklet dated January 1980. The FIRM, Floodway Maps and Flood Insurance Study booklet are incorporated herein by reference and are on file with the Town Clerk, Planning Board, Building Official and Conservation Commission.

Section B. Base Flood Elevation and Floodway Data

1. Floodway Data. In ones A and A1-30, along watercourses that have not had a regulatory floodway designated, the best available Federal, State, local, or other floodway data shall be used to prohibit encroachments in floodways which would result in any increase in flood levels within the community during the occurrence of the base flood discharge.

- Base Flood Elevation Data. Base flood elevation data is required for subdivision proposals or other developments greater than 50 lots or 5 acres, whichever is the lesser, within unnumbered A zones.

Article III. Notification of Watercourse Alteration

In a riverine situation, the Conservation Commission shall notify the following of any alteration or relocation of a watercourse:

- Adjacent Communities
- NFIP State Coordinator
Massachusetts Department of Conservation and Recreation
251 Causeway Street, Suite 800
Boston, MA 02114-2104
- NFIP Program Specialist
Federal Emergency Management Agency, Region I
99 High Street, 6th Floor
Boston, MA 02110

Article IV. Use Regulations

Section A. Reference to Existing Regulations

The Floodplain district is established as an overlay district to all other districts. All development in the district, including structural and non-structural activities, whether permitted by right or by

special permit must be in compliance with Chapter 131, Section 40 of the Massachusetts General Laws and with the following:

- Section of the Massachusetts State Building code which addresses floodplain and coastal high hazard areas (currently 780 CMR 3107, “Flood Resistant Construction”);
- Wetlands Protection Regulations, Department of Environmental Protection (DEP) (currently 310 CMR 10.00);
- Inland Wetlands Restriction, DEP (currently 310 CMR 13.00);
- Minimum Requirements for the Subsurface Disposal of Sanitary Sewage, DEP (currently 310 CMR 15, Title 5);

Any variances from the provisions and requirements of the above referenced state regulations may only be granted in accordance with the required variance procedures of the state regulations.

Section B. Other Use Regulations

- 1) In Zones A130, along watercourses that have a regulatory floodway designated on the Charlemont Flood Boundary & Floodway Map encroachments are prohibited in the regulatory floodway which would result in any increase in flood levels within the community during the occurrence of the base flood discharge.
- 2) All subdivision proposals must be designed to assure that:
 - d) Such proposals minimize flood damage;
 - e) All public utilities and facilities are located and constructed to minimize or eliminate flood damage; and
 - f) Adequate drainage is proved to reduce exposure to flood hazards.
- 3) Existing contour intervals of site and elevations of existing structures must be included on plan proposal.
- 4) There shall be established a “routing procedure” which will circulate or transmit one copy of the development plan to the Conservation Commission, Planning Board and Board of Health for comments which will be considered by the appropriate permitting board prior to issuing applicable permits.

Article V. Permitted Uses

The following uses of low flood damage potential and causing no obstructions to flood flows are encouraged provided they are permitted in the underlying district and they do not require structures, fill, or storage of materials or equipment:

- 1) Agricultural uses such as farming, grazing, truck farming, horticulture, etc.
- 2) Forestry and nursery uses.
- 3) Outdoor recreational uses, including fishing, boating, play areas, etc.

- 4) Conservation of water, plants, wildlife.
- 5) Wildlife management areas, foot, bicycle, and/or horse paths.
- 6) Temporary non-residential structures used in connection with fishing, growing, harvesting, storage, or sale of crops raised on the premises.
- 7) Buildings lawfully existing prior to the adoption of these provisions.

DRAFT

**APPENDIX B: MEETING AGENDAS, SIGN IN SHEETS, &
CORRESPONDENCE**

AGENDA

**Town of Charlemont
Multi-Hazard Mitigation Planning Committee
Charlemont Town Hall
157 Main Street
April 5, 2012
6:00 – 8:00 p.m.**

1. Introductions – Michael Walsh, Town Emergency Management Director
2. Purpose of a Multi-Hazard Mitigation Plan and overview of the update process – Alyssa Larose, Land Use Planner, FRCOG
3. Review of Section 3: Hazard Identification and Analysis - identification of past hazard events and potential mitigation projects – Committee members and Alyssa Larose
4. Completion of the All Hazards Risk Assessment – Committee members and Alyssa Larose
5. Next Steps – Alyssa Larose

MEMA Multi-Hazard Mitigation Project
Charlemont Meeting
 Attendance Sheet for Thursday, April 5, 2012

<u>Name</u>	<u>Email Address/Phone</u>	<u>Affiliation</u>
Michael Walsh	mfo6@msn.com	EMD
DAVID CUNNINGHAM	davecunningham@mc.com	Selectboard
Gordon Hathaway	CHH@bcn.net	Hwy Supt
Jared Bellars	SGFB@bcn.net	Police Chief
DANA Johnson	CHARAMB2000@hotmail.com	Ambulance
Kenneth Hall	Kenhall1@verizon.net	Fire Dept

DRAFT

AGENDA

**Town of Charlemont
Multi-Hazard Mitigation Planning Committee
Charlemont Town Hall
157 Main Street
June 6, 2013
5:00 – 7:00 p.m.**

1. Introductions – David Cunningham, Charlemont Select Board
2. Review of changes to the Draft Charlemont Multi-Hazard Mitigation Plan – Alyssa Larose, Land Use Planner, FRCOG
3. Completion of the All Hazards Risk Assessment – Committee members and Alyssa Larose
4. Review of the 2013 Action Plan - Committee members and Alyssa Larose
5. Next Steps – Alyssa Larose

MEMA Multi-Hazard Mitigation Project
Charlemont Meeting
 Attendance Sheet for Thursday, June 6, 2013

<u>Name</u>	<u>Email Address/Phone</u>	<u>Affiliation</u>
GORDON HATHAWAY	CHATHWAY@BCS.NET 413-539-4335 ext 29	Hwy SUPT
Kenneth Hall	Kendall I @ verizon .net 413-399-4335 - 31	Fire Chief
Michael Welch	mfboutremer@gmail.com 617-938-8560-11	EMD
Alyssa Larose	alarose@ fire ffcos.org	
JARED BELLOWS	413-834-1756	POLICE
DAVID CUNNINGHAM	davecunningham@me.com 834-7268	SERGEANT

March 30, 2012

Charlemont questions for the Committee (highlighted in green in the plan)

Page 11: Were there any damages to historic or cultural resources during Irene? From other storm events?

Page 11: Does the town have a formal agreement with GCC to use their facility as a shelter?

Page 12: Please provide an update on emergency planning efforts since Irene – has a new shelter or EOC been identified? Etc.

Page 16: What were the impacts from Irene throughout town? Does the town have damage estimates?

Page 16: Identify areas in town that experience chronic flooding.

Page 18: how was Charlemont impacted by the 2008 ice storm and the October 2011 snow storm? Identify other winter storms that caused damage in town.

Page 24: Does the town have Emergency Action Plans for the Fife Brook dam and Bear Swamp Reservoir?

Page 27: Are there any issues with beaver dams in town? If yes, identify where.

Page 27: confirm that there has been no damage from earthquakes in town.

Page 30: Have there been any landslide events in Charlemont in recent years? Are there areas in town particularly vulnerable to landslides?

Page 30: Have there been any ice jams in town in recent years?

Page 38: Are there additional structures that should be included in Table 3-15 – significant structures located within or adjacent to the floodplain?

Page 40: Are records of damages due to flooding consistently maintained?

Page 67: Development trends: has any new commercial, industrial, or public building development occurred since 2004? Identify where new housing has been developed since 2000.

Page 105: When did the Town begin using the Connect CTY system?

Insert Michael's report from first meeting

May 1 2012

Response to Charlemont report from first meeting

Page 16: Identify areas in town that experience chronic flooding.

Can you provide more detail on what locations on Route 2 experience chronic flooding?

Page 24: Does the town have Emergency Action Plans for the Fife Brook dam and Bear Swamp Reservoir? Michael to follow up. He has received the revised EAPs for the TransCanada dams.

Page 27: Are there any issues with beaver dams in town? If yes, identify where.

“there is a persistent occurrence with beaver dams on Legate Hill Road that needs to be addressed. The Highway Department regularly deals with the problem” Can you provide more detail about the problem – do beaver dams cause the road to flood? How does the Highway Department deal with the problem? Have other solutions been suggested?

Page 30: Have there been any landslide events in Charlemont in recent years? Are there areas in town particularly vulnerable to landslides?

Does “road drop” mean subsidence? Also can you provide a more detailed location along West Oxbow Road where this is occurring? (we can also identify the area at the next meeting, I will be bringing a map that we can mark up)

Page 30: Have there been any ice jams in town in recent years?

What are the impacts from the ice jams on the Deerfield River? Flooding etc.? What is meant by “surfaced previously with National Grid, regarding control of the River.”

Page 38: Are there additional structures that should be included in Table 3-15 – significant structures located within or adjacent to the floodplain?

I have added Avery’s Store, Charlemont Inn, and Rice Oil. I need street addresses for buildings within the historic district block in order to look up the assessment information.

Page 40: Are records of damages due to flooding consistently maintained?

Michael to follow up.

Page 67: Development trends: has any new commercial, industrial, or public building development occurred since 2004? Identify where new housing has been developed since 2000.

Ask the Planning Board if they can provide information on where new housing development has occurred over the last ten years. Alyssa can follow up with Gisela Walker or designated Planning Board member on the Committee.

Section 4 Current Mitigation Measures tables and Action Plan

The Planning Board should review the items related to Zoning and Subdivision Regulations and update. Alyssa can send the tables to Gisela Walker for review unless the town appointed a Planning Board member to the Hazard Mitigation Planning Committee, in which case all Planning Board-related questions should go to that person.

Charlemont Multi-Hazard Mitigation Plan

Follow up to June 6, 2013 Committee Meeting

Items highlighted in Green are for Michael to follow up on, and are listed below:

Page 16: Updated figure for damages to the Town from Tropical Storm Irene.

Page 19: Updated figure for the total cost of damages from the October 29, 2011 snowstorm, and the amount reimbursed by FEMA.

Page 46: Same figure for Tropical Storm Irene as above.

Page 76: Identify the locations for the helicopter landing zones in town.

Page 110: Identify date when shelter location recommendations will/were submitted to the Select Board.

Page 113: Same as above.

Correspondence with Charlemont Planning Board Chair

On Aug 6, 2013, at 3:40 PM, Alyssa Larose wrote:

Hi Gisela,

I want to check in with you to see if the Planning Board has had a chance to review the information for the Charlemont Hazard Mitigation Plan. Please let me know if there is any feedback on items in the plan, or if you have any questions. Also if you have information on where any recent housing development has occurred in town, that would be very helpful. I need to know if it has been spread out with no real concentration in one area, or if a new subdivision or concentration of new homes have been built in any one particular area.

Thank you for your assistance with this project.

Alyssa

Alyssa Larose
Land Use Planner
Franklin Regional Council of Governments
12 Olive Street, Suite 2
Greenfield, MA 01301
413-774-3167 x127
www.frcog.org
alarose@frcog.org
Connect with us on Facebook here: [<image001.gif>](#)

From: Anthony and Gisela Walker [<mailto:gitowalker@mtdata.net>]
Sent: Tuesday, August 06, 2013 5:50 PM
To: Alyssa Larose
Subject: Re: Planning Board input needed on Hazard Mitigation Plan

Hi Alyssa,

We went over the charts one by one and found that many of the items can be addressed within the broad but comprehensive Special Permit Criteria we have. Since all changes of use in town require one, this is what we do a lot. Paying better attention to erosion and stormwater issues is a matter of consciousness raising in that context since the criteria are there. Driveway slope we were told is a matter of town bylaw (?) 11% - I never heard of that; subdivision related items tend to be ignored as we have not had a new sub division in town in 40 years; flooding will remain an issue and I guess re new construction the building code will take care of that.. so I have no major initiative in mind to respond to your plan but it is an excellent consciousness raising tool!

New construction in town is rare and usually happens along Legate Hill Road which is the most dense area in town aside from the Village, otherwise we are working on a Village Center District and greater density there.

Gisela Walker

**APPENDIX C: CHARLEMONT SELECT BOARD ADOPTION
RESOLUTION**

CERTIFICATE OF ADOPTION

Town of Charlemont, MASSACHUSETTS

BOARD OF SELECTMEN

**A RESOLUTION ADOPTING THE *2014 Town of Charlemont Local Multi-Hazard
Mitigation Plan***

HAZARD MITIGATION PLAN

WHEREAS, the Town of Charlemont established a Committee to prepare the Hazard Mitigation plan; and

WHEREAS, the Town of Charlemont, participated in the development of the *2014 Town of Charlemont Local Multi-Hazard Mitigation Plan*; and

WHEREAS, the *2014 Town of Charlemont Local Multi-Hazard Mitigation Plan* and contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Charlemont, and

WHEREAS, a duly-noticed public meeting was held by the BOARD OF SELECTMEN on [REDACTED], 20[REDACTED] for the public and municipality to review prior to consideration of this resolution ; and

WHEREAS, the Town of Charlemont authorizes responsible departments and/or agencies to executes their responsibilities demonstrated in the plan, and

NOW, THEREFORE BE IT RESOLVED that the Town of Charlemont BOARD OF SELECTMEN, formally approves and adopts the *2014 Town of Charlemont Local Multi-Hazard Mitigation Plan*, in accordance with M.G.L. c. 40.

ADOPTED AND SIGNED this Month Day, 20[REDACTED]

ATTEST