

**The Town of Amherst**

# **Local Natural Hazards Mitigation Plan**

**Adopted by the Town of Amherst on**

**Prepared by:**

The Amherst Natural Hazards Mitigation Planning Committee

and

The Pioneer Valley Planning Commission  
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# 1: INTRODUCTION

## Hazard Mitigation

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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, etc. Mitigation efforts undertaken by communities will help to minimize damages 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 Amherst and the Pioneer Valley Planning Commission, 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 natural hazard mitigation plan before a disaster occurs can save the community money and 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. FEMA requires that a community adopt a pre-disaster mitigation plan as a condition for mitigation funding. For example, the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA), and the Pre-Disaster Mitigation Program are programs with this requirement.

## Planning Process

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The natural hazard mitigation planning process for the Town of Amherst included the following tasks:

- Identifying the natural hazards that may impact the community.
- Conducting a Vulnerability/Risk Assessment to identify the infrastructure at the highest risk for being damaged by the identified natural hazards, particularly flooding.
- Identifying and assessing the policies, programs, and regulations a community is currently implementing to protect against future disaster damages.
- Identifying deficiencies in the current strategies and establishing goals for updating, revising or adopting new strategies.
- Adopting and implementing the final Local Natural Hazards Mitigation Plan.

The key product of this process is the development of an Action Plan with a Prioritized Implementation Schedule.

### **Public Committee Meetings**

April 30, 2009, 1:00 pm: Informational and organizational meeting with EMD held at Amherst Fire Department Town Offices.

December 22, 2009, 1:00-3:00 noon: Telephone meeting held at Fire department.

January 29, 2010, 10:00-12:00 pm: Working committee meeting held at Town Hall and Fire Department.

February 4, 2010, 1:00-3:00 pm: Working committee meeting held at Town Hall

A mailing was made to each committee member prior to each meeting that contained information from the previous meeting, an agenda sheet, and information to be covered.

### **Public Meetings with the Select Board**

In 2005, the Select Board agreed to collaborate with the Pioneer Valley Planning Commission to develop a Local Hazard Mitigation Plan.

On \_\_\_\_\_, 2010: The Select Board adopted the Local Natural Hazard Mitigation Plan. Meeting held at Amherst Town Hall.

### **Participation by Public & Entities in Surrounding Communities**

On December 15, 2007 the Pioneer Valley Planning Commission sent a press release to all area media outlets to inform private citizens that the planning process for Amherst's Hazard Mitigation Plan had commenced and that all residents of Amherst were invited to attend plan development sessions. This press release (see Appendix E) resulted in a series of news articles that enhanced awareness of Amherst's Hazard Mitigation Planning Process. Subsequent media releases updates residents on the status of hazard mitigation planning in Amherst and surrounding communities.

In addition to media outreach, all public meetings were posted at the field Town Hall in compliance with the Commonwealth of Massachusetts' open meeting law. Hazard Mitigation planning was discussed at meetings of the Western Region Homeland Security Advisory Council (WRHSAC) from 2003 to the present. The WRHSAC comprises representatives of emergency management, public works, emergency response, police and fire, ambulance services, regional transit and municipal government. Representatives are charged with updating their peers and professional associations on information covered in all meetings. Thus surrounding communities have been aware of Amherst's hazard mitigation planning efforts.

On October 26, 2009 the Pioneer Valley Planning Commission sent a press release (see Appendix E) to all area media outlets to inform the public that a draft of Amherst's

Hazard Mitigation Plan had had been placed on PVPC's website and hard copies were available at PVPC's offices and that all residents, businesses and other concerned parties of Amherst and adjacent communities were encouraged to comment on the plan. The plans were made available in this manner for 30 days. Citizens from adjacent municipalities were also encouraged to comment on Amherst's plan.

## 2: LOCAL PROFILE

### **Community Setting**

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The Town of Amherst has maintained its small town atmosphere even as it has evolved from its earliest beginnings as an agricultural college community to a major educational and employment center with 34,874 residents.

Comprising almost 28 square miles, the Town is located east of the Connecticut River, on the northern edge of Hampshire County in western Massachusetts. It is bordered by Hadley on the west, Sunderland and Leverett on the north, Shutesbury, Pelham, and Belchertown on the east, and Granby and South Hadley on the south. It is 23 miles from Springfield, 50 miles from Pittsfield, and 87 miles from Boston.

Named for Lord Jefferey Amherst, British general of the French and Indian War, Amherst is home to the oldest college in Western Massachusetts, Amherst College, which opened in 1821. In 1867, the former Massachusetts Agricultural College opened its doors, a land grant college and the only exclusively agricultural college in the country. In the last fifty years, "Mass Aggie" evolved to become the University of Massachusetts, one of the region's largest employers and one of the leading research institutions in the nation. Hampshire College, the Town's newest college, was founded in 1970.

Amherst has a thriving central business district with a broad array of shops, restaurants, cafes, and book stores. There are a variety of housing choices and a growing number of technology-based companies.

The Dickinson House, home to 19<sup>th</sup> century poet Emily Dickinson, is a National Historic Landmark, and is owned by Amherst College. The Jones Library contains special collections of Dickinson and poet Robert Frost, who once taught at Amherst College. The Pratt Museum of Natural History holds one of the world's finest collections of dinosaur tracks, fossils, and meteorites. The town plays host to craft fairs, farmer's markets, and the biennial New England Artist's Festival and Showcase.

Despite a vibrant housing market, Amherst has worked to maintain its characteristic New England village landscape, with the majority of the Town either undeveloped or agricultural lands.

### **Infrastructure**

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With a healthy academic economy that relies on a variety of housing and transportation options, Amherst's infrastructure has evolved accordingly.

#### **Roads and Highways**

Downtown Amherst is centered on the intersection of Route 116 (north-south) and Route 9 (east-west). Route 9 is the main corridor to the town from Interstate 91,



traveling through Hadley. Other key routes include North and East Pleasant Street, University Drive, Amity Street and Main Street, and North Hadley Road.

### **Transit**

Both the Pioneer Valley Transit Authority (PVTA) and the Greenfield Montague Transit Authority provide bus service in and out of Amherst. UMass Transit operates PVTA bus routes around the Amherst area.

### **Rail**

There is also an Amtrak stop in Amherst, along the rail spur that runs north-south through the eastern edge of downtown.

### **Public Water and Sewer Service**

The Town currently provides public water and sewer service to the majority of town residents. The water department has seven sources that contribute to meeting the water demand: Atkins Reservoir, the Pelham Reservoir System, the South Amherst Wells (#1 & #2), The Brown Well (#3), the Lawrence Swamp Well (#4) and the Bay Road Well (#5). Both surface water supplies, Atkins and Pelham, and Wells 1, 2 & 3 are used year round to satisfy the required demands. These five sources supply approximately 90% of the total water produced. Wells #4 and #5 operate during high demand periods and summer months when the reservoirs are low.

## **Natural Resources**

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Amherst's undeveloped land and natural resources are essential to the Town's appearance, economy, and well-being. The Town recognizes that conservation land helps maintain the Town's rural atmosphere, provides adequate land area for traditional and modern forms of outdoor recreation, and protects important wildlife habitat for both game and non-game species.

Traditional resource-based economic activities such as agriculture and forestry, and traditional forms of recreation such as fishing and hunting continue to play major roles in Amherst. The Town's Open Space and Recreation Plan calls for the Conservation Commission and Conservation Department to continue to help keep those traditions and their associated cultural practices viable by working closely with farmers and farmland owners, encouraging the farm economy, carrying out ecologically sound forest and open land wildlife habitat management on Town watershed lands in four towns, and renting out fields for farm production and community gardening.

Amherst is tremendously diverse in its flora, landscapes, wildlife, and land use. The Town works to protect a full range of types of open space and farmland in order to help maintain that diversity in the face of mounting development pressures.

The Conservation Department is the main Town body which manages the area's natural resources. The Department manages 1,965 acres of conservation land, including more than 40 open fields. It also maintains some 80 miles of foot trails throughout the Town, and in cooperation with the Department of Public Works, carries

out a forest management program on 2,500 acres of Town watershed land in Shutesbury, Pelham, Belchertown, and Amherst. The Conservation Department has also been involved in the acquisition of Agricultural Preservation Restrictions over 1,842 acres of farmland on 32 properties and an additional 157 acres covered by Conservation Restrictions. Amherst also boasts an active Town Community Garden program and the public Cherry Hill Golf Course.

The Town is situated in a valley plateau, surrounded by hills, with the Holyoke Range forming the southern border. Agricultural land occupies much of the northern, eastern, and southern portions of town, continuing west into the Town of Hadley and northwest into the Town of Sunderland. The Mount Holyoke Range at the south end of town makes a natural barrier between Amherst and the towns of South Hadley and Granby. The Pelham Hills rise to the east toward the Quabbin Reservation, and the Leverett-Shutesbury hills rise to the north and northeast.

### **Water Resources**

The Town water supply system includes the Atkins Reservoir in Shutesbury and Amherst, the three Pelham Reservoirs (Hills, Hawley, and Intake), and 6 deep wells in South Amherst. Together the reservoirs supply about half the total water used, and the underground supplies the other half. These include the Brown Well in Belchertown, three wells in Lawrence Swamp, and Bay Road well in South Amherst. In FY 2009, average safe yield for the system was 6.65 million gallons per day (mgd), average daily demand was 3.19 mgd, and maximum daily demand was 4.5 mgd. About 98 percent of Amherst homes are served by the water supply system; the roughly 160 units on individual wells are located in the Flat Hills-High Point Drive section of town in northeastern Amherst.

Basing projected consumption rates on population increases, predictions that the peak daily rate in the year 2030 may exceed the available limit have been made. Population increase and commercial development may require that the town investigate additional water supply in the future. In response to this the Town and the Water Supply Protection Committee actively support appropriate measures that will protect both underground aquifers and their recharge areas, and above-ground reservoirs and their watersheds. For both of those, the Town will need to continue cooperation and assistance with neighboring towns, including Belchertown, Sunderland, Pelham, Shutesbury and Hadley, as the Town's deep and surficial water supplies transcend town boundaries (Town of Amherst OSRP, 2005).

In 1980 the Town experienced a significant drought, requiring both the University of Massachusetts and the Town of Amherst to send all students, an estimated 25,000, home for one week.

### **Sewer Service**

As of 2000, 8,127 dwelling units were served by the Town's sewage disposal system. About 1,300 units were on private septic systems. In 2003, the town launched a long-range sewer facilities planning process to prioritize all future sewer extensions, taking into account the incidence of septic system failure in target areas not sewered. Target areas include: the Bay Road-Hulst Road-Elf Hill area and the Flat Hills-High Point Drive area. They study is investigating the land use implications of sewer extensions, including

the degree of threat to prime open space or farmland possibly brought about by sewer extensions, and is also looking at the physical difficulties of extending sewer lines in each unsewered area.

### **Forests and Fields**

Native woodlands are the principle vegetation type in Amherst. Woodlands cover 7,591 acres of Amherst, approximately 43% of the Town's land area. Types of woodlands in Amherst include hardwood forests, coniferous forests, and mixed woods, and they provide habitat for numerous wildlife species. In addition, a relatively large percentage (19%) of Amherst's land is pasture and cropland, totaling approximately 3,519 acres. These lands provide unique habitat as well as other environmental benefits.

## **Development**

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Topography and history have been the major factors in the development of Amherst's landscape. The Town's fertile soils, scenic vistas, and an evolving academic "industry" supported the community's economic and cultural base. In the 1960's, however, the local "industry" began an exponential growth rate with continuous expansion at the University of Massachusetts and the founding and flourishing of Hampshire College. Since then the community has studied, debated, argued heatedly, and over time agreed enough to combat, shape, and to a large extent contain a strong housing market's physical incursions into the landscape. Seeing that market forces were also changing the social landscape through elevated housing prices, the community also studied, debated, reached philosophical and practical decisions, and worked to maintain community diversity through diverse housing types, including affordable options. During all these years and debates, Town Meeting has consistently provided financial support for the plans, programs, land acquisitions, and facilities needed to pursue development and conservation goals.

The Town's main development trends include:

- Compact and clearly defined Downtown and Village Centers, each with its own characteristic mix of land uses
- Large blocks of outlying open space, featuring farm fields, orchards, water resource areas, and the forested expanse of the Mount Holyoke Range
- Large landholdings of Amherst College, University of Massachusetts, and Hampshire College, each with its own plan of academic buildings and outlying open space.

In addition to other factors, zoning and other land use regulations constitute Amherst's "blueprint" for its future. Land use patterns over time will continue to look more and more like the town's zoning map until the town is finally "built out"—that is, there is no more developable land left. Therefore, in looking forward over time, it is critical that the town focus not on the current use and physical build-out today, but on the potential future uses and build-out that are allowed under the town's zoning map and zoning bylaws. Zoning is the primary land use tool that the town may use to manage development and direct growth to suitable and desired areas while also protecting

critical resources and ensuring that development is in keeping with the town's character.

In its current zoning, Amherst has fifteen base zoning districts and five overlay districts. The base districts define the allowed uses and dimensional requirements in all parts of the town, while the overlay districts provide for additional restrictions in certain areas.

Although appropriate zoning is all relevant to protecting the health and safety of the Town residents, Amherst has several zone districts which are specifically relevant to natural hazard mitigation. These are outlined here:

- FPC Flood-Prone Conservancy - The FPC District consists of those geographical areas which by virtue of their relationship to components of the natural hydrology of the Town of Amherst, have substantial importance to the protection of life and property against the hazards of floods, erosion, and pollution and in general are essential to the public health, safety, and welfare. To this end, the number and types of uses allowed are restricted.
- WP Watershed Protection - The WP District is an overlay district intended to provide additional protection to those lands which by virtue of their location, slope and soils, make up the watersheds of the public water supply.
- ARP Aquifer Recharge Protection - The ARP District is an overlay district intended to provide additional protection to those lands, which by virtue of their location, slope, soils, subsurficial geology and water tables, constitute the recharge area for Zones I, II and III of the public water supply wells of the Town of Amherst within the Lawrence Swamp Aquifer.
- WD Wetlands District - The WD District is an overlay district consisting of lands defined as wetlands by the provisions of the Massachusetts Wetlands Protection Act, M.G.L. Chapter 131, Section 40.

The Zoning Bylaw also establishes a Site Plan/Special Permit Approval procedure for specific uses and structures within Amherst. This review allows the Special Permit Granting Authority the ability to review development to ensure that the basic safety and welfare of the people of Amherst are protected, and includes several specific evaluation criteria that are relevant to natural hazards.

### **Current Development Trends**

Today, Amherst is home to approximately 34,874 residents. The majority of Amherst's 17,758 acres is undeveloped land, totaling nearly 8,400 acres. Residential land is the second most prolific land use, at approximately 4,000 acres, followed closely by agricultural land at approximately 3,660 acres. Land characterized as urban open/public land constitutes 892 acres throughout Town. The Town also boasts 444 acres of outdoor recreational land. The rest of Amherst is comprised of a mix of commercial and industrial land, as well as 48 acres of water.

Currently, development in Amherst is strongly encouraged by existing zoning and other land use regulations to seek areas where the environmental conditions and existing public utilities support such development. Setting aside conservation land and

farmland in outlying areas of Town is one aspect of Amherst's long-established planning goal: to direct new growth toward existing developed centers. This preserves Amherst's historic pattern of development (village centers separated by open land) and reduces the need for continual expansion of expensive systems of public utilities and services.

### ***Development in Hazard Areas***

Hazards identified in this plan are regional risks and, as such, all new development falls into the hazard area. The exception to this is flooding. According to the Community Information System (CIS) of FEMA, there were 81 structures located within the Special Flood Hazard Area (SFHA) in Amherst as of May 1999, the most current records in the CIS for the Town of Amherst.

# 3: HAZARD IDENTIFICATION & ANALYSIS

## Profiling the Natural Hazards

Historical research, conversations with local officials and emergency management personnel, available hazard mapping and other weather-related databases were used to identify and profile the natural hazards which are most likely to have an impact on Amherst.

Each of these hazards was assessed by the Committee for location of occurrence, extent, previous occurrences, and probability of future events. (See Appendix C for sources, methodology.) This resulted in a ranking of hazard, by risk, see Table 3.1. More detailed descriptions of each of the points of analysis are included in the Identification and Vulnerability Assessment (below).

**Table 3.1: Hazard Profiling and Risk Index Worksheet**

Type of Hazard	Location	Extent	Previous Occurrences	Probability of Future Events	Hazard Risk Index Rating
Flooding (100-year)	Large	Limited	Yes	Low	2
Flooding (localized)	Medium	Minor	Yes(extensive)	Very High	1
Severe Snow/Ice Storms	Large	Limited	Yes	Very High	1
Hurricanes/Severe Wind	Large	Minor	Yes (minimal)	Low	3
Tornado/Microburst	Small	Catastrophic	No	Low	3
Wildfire/Brushfire	Small	Minor	Yes (minimal)	Very High	3
Earthquake	Large	Catastrophic	No	Very Low	4
Dam Failure	Small	Minor	No	Very Low	5
Drought	Small	Minor	No	Very Low	5
Man-Made Hazard: Hazardous Materials	Large	Catastrophic	No	Low	3

## Natural Hazard Identification and Vulnerability Assessment

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The following is a description of natural and manmade disasters, and the areas affected by them, that have or could affect the Town of Amherst. The *Past and Potential Hazards/Critical Facilities Map* (Appendix D) reflects the contents of this analysis.

### Vulnerability Assessment Methodology

In order to determine estimated losses due to natural hazards in Amherst, each hazard area was analyzed with results shown below. The data below was calculated using FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Losses*, August 2001.

**Total value of all structures in Amherst (2006): \$2,465,442,562**

**Median value of a home in Amherst (2006): \$303,800**

**Average household size: 2.4 persons**

Human losses are not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. Most of these figures exclude both the land value and contents of the structure. The damage calculations are rough estimate and likely reflect worst-case scenarios. Computing more detailed damage assessment based on assessor's records is a labor-intensive task and beyond the scope of this project.

## Flooding

The average annual precipitation for Amherst and surrounding areas in northwestern Massachusetts is 46 inches. There are three major types of storms that bring precipitation to Amherst. 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, 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 can be 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. 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. Furthermore, flooding can be influenced by larger, global climate events. Global warming and climate change have the potential to shift current rainfall and storm patterns. Increased precipitation is a realistic result of global warming, and could potentially increase the frequency and intensity of flooding in the region. Currently, floods are one of the most frequent and costly natural hazards 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 (e.g., the loss of wetlands and the higher amounts of impervious surface area in urban areas).

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. Although periodic flooding of a floodplain area is a natural occurrence, past and current development and alteration of these areas will result in flooding that is a costly and frequent hazard. In addition to damage of buildings directly in the floodplain, development can result in a loss of natural flood storage capacity and can increase the water levels in water bodies. Flood levels may then increase, causing damage to structures not normally in the flood path.

The Floodplain Map for the Town of Amherst shows the 100-year and 500-year flood zones 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 one percent chance of occurring in any given year. Likewise, the 500-year flood has a 0.2 percent chance of occurring in any given year. In Amherst, there are several floodplain areas. In North Amherst along Rte 116 between Summer Street and State Street at Factory Hollow, along East Leverett Road, and along either side of Pelham Road after crossing Northeast Street. In South Amherst floodplain area is along the Fort Rover and Plum Brook and at the Lawrence Swamp. There are some smaller 500-year floodplains mapped as well, in several low-lying areas throughout Amherst.



The major floods recorded in Western Massachusetts during the 20th century have been the result of rainfall alone or rainfall combined with snowmelt. Amherst has experienced no major flooding events over the last decade. Generally, any small floods have had minor impacts, temporarily impacting roads and residents' yards.

### **Flooding (100-year base flood): Medium High Risk**

There are approximately 1,968 acres of land within the FEMA mapped 100-year floodplain and 254 acres of land within the 500-year floodplain within the Town of Amherst. According to the Community Information System (CIS) of FEMA, there were 81 structures (all residential) located within the Special Flood Hazard Area (SFHA) in Amherst as of May 1999, the most current records in the CIS for the Town of Amherst. Therefore, a vulnerability assessment for a 100-year flood equals approximately \$21.91 million of damage, with approximately 195 people impacted.

At this time the Town of Amherst has no repetitive loss properties as defined by FEMA's NFIP.

#### **Location**

##### Meadows Street

- This area is a mix of residential, apartments and open land
- Total Assessed Value of Primary Structure(s): \$ 661,600.00
- Approximate Number of Structures: 10
- Cost for repairing or replacing any power lines, telephone lines, and contents of structures are not included.

##### West Pomeroy Lane

- This area is predominantly single family residential with a small amount of commercial property and open space
- Total Assessed Value of Primary Structure(s): \$ 2,068,100.00
- Approximate Number of Structures: 14

##### Pomeroy Lane and Pomeroy Court

- This area is predominantly single family residential with a small amount of commercial property and open space

##### South East Street

- This area is a mix of single family residential, farmland and open land
- Total Assessed Value of Primary Structure(s): \$ 149,000.00
- Approximate Number of Structures: 1

## **Extent**

There are approximately 1,968 acres of land within the FEMA mapped 100-year floodplain and 254 acres of land within the 500-year floodplain within the Town of Amherst. According to the Community Information System (CIS) of FEMA, there were 81 structures (all residential) located within the Special Flood Hazard Area (SFHA) in Amherst as of May 1999, the most current records in the CIS for the Town of Amherst. Therefore, a vulnerability assessment for a 100-year flood equals approximately \$21.91 million of damage, with approximately 195 people impacted.

## **Previous Occurrences**

According to the National Climactic Data Center, there were 34 FLOOD event(s) reported in Hampshire County, Massachusetts between 01/01/1950 and 12/31/2009. None of these were reported in Amherst, but one, on 7/7/94 was classified as "urban flooding" which might have included Amherst. Local officials who developed this Hazard Mitigation plan indicated at least one past occurrence of 100 year flooding, but do not have official records of details of a specific event when they developed this plan. In the 34 flood events reported in Hampshire county in the last 59 years, no deaths or injuries resulted.

## **Probability of Future Events**

Based on past experiences and local knowledge, members of the Amherst Natural Hazards Mitigation Planning Committee estimate a low probability of future events.

## **Flooding (localized) – High Risk**

In addition to the floodplains mapped by FEMA for the 100-year and 500-year flood, Amherst often experiences minor flooding at isolated locations due to drainage problems, or problem culverts.

Most of the flood hazard areas listed here were identified due to known past occurrence in the respective area. There are many areas with no record of previous flood incidents that could be affected in the future by heavy rain and runoff. Additionally, the vast majority of culverts throughout town tend to be impacted by beavers, so localized flooding can potentially occur at any culvert crossing.

To determine the vulnerability of the Town to localized flood events, the property within identified areas was visually analyzed using aerial photography (Pictometry), which allowed structures to be identified and tallied. Specific vulnerability assessments were estimated for sites which have been susceptible to localized flooding in the past, and are described below.

## **Location**

### **College Street and Route 9**

- This area is predominantly commercial and business occupancies with some residential units
- Total Assessed Value of Primary Structure(s): \$ 4,189,100.00

- Approximate Number of Structures: 16
- Total Assessed Value of Out Building(s): \$ 197,300.00
- Approximate Number of Structures: 2

Fearing Street, Cottage Street, Triangle Street

Tan Brook

- This area located at the north end of the center of Town is comprised of residential and commercial property
- The underground brook causes street flooding and closures and impact adjacent property
- Total Assessed Value of Primary Structure(s): \$ 13,028,000.00
- Approximate Number of Structures: 53
- Cost for repairing or replacing any power lines, telephone lines, and contents of structures are not included.

W. Pomeroy Lane and Pondview Drive and Markert's Pond

- This area is predominantly single family residential with a small amount of commercial property and open space
- Total Assessed Value of Primary Structure(s): \$ 2,068,100.00

Hickory Ridge Country Club

- Total Assessed Value of Primary Structure(s): \$ 811,200.00
- Approximate Number of Structures: 4
- Total Assessed Value of Out Building(s): \$ 42,800.00
- Approximate Number of Structures: 2
- Approximate Number of Structures: 14

Pomeroy Lane and Pomeroy Court

- This area is predominantly single family residential with a small amount of commercial property and open space

Main Street at the Fort River

- This area is predominantly residential and includes the Fort River Elementary School and some commercial property
- Total Assessed Value of Primary Structure(s): \$ 2,354,500.00
- Approximate Number of Structures: 16
- Total Assessed Value of Out Building(s): \$ 25,400.00
- Approximate Number of Structures: 8

North Pleasant Street, near 902

- This area north of the University includes residential property, the Marks Meadow Elementary School, DMH Intermediate Care Facilities and University buildings.
- Total Assessed Value of Primary Structure(s): \$ 412,400.00
- Approximate Number of Structures: 2
- Total Assessed Value of Out Building(s): \$ 300.00
- Approximate Number of Structures: 1

#### South East Street near the railroad bridge

- This area is a mix of single family residential, farmland and open land
- Total Assessed Value of Primary Structure(s): \$ 149,000.00
- Approximate Number of Structures: 1
- Total Assessed Value of Out Building(s): \$ 0.00
- Approximate Number of Structures: 0

#### Station Road

- This area is mainly open land and farm land. The road is a main travel route.
- Total Assessed Value of Primary Structure(s): \$ 519,600.00
- Approximate Number of Structures: 3

#### Summer Street

- Total Assessed Value of Primary Structure(s): \$ 4,589,500.00
- Approximate Number of Structures: 30
- Total Assessed Value of Out Building(s): \$ 37,900.00
- Approximate Number of Structures: 7

#### Meadows Street

- This area is a mix of residential, apartments and open land
- Total Assessed Value of Primary Structure(s): \$ 661,600.00
- Approximate Number of Structures: 10
- Cost for repairing or replacing any power lines, telephone lines, and contents of structures are not included.

#### University Drive

- This area includes commercial and business occupancies, an assisted living facility and extended care facility
- Total Assessed Value of Primary Structure(s): \$ 5,220,400.00
- Approximate Number of Structures: 3
- Total Assessed Value of Out Building(s): \$ 60,600.00

- Approximate Number of Structures: 2

### **Extent**

Flooding events in these hazard areas could cost the residents a total estimated \$33,371,700 and affect an estimated 174 structures, but there is extremely low likelihood of death or injury.

### **Previous Occurrences**

Based on local knowledge, these areas have been subject to extensive previous occurrences of localized flooding, but the Town has no official records detailing the events. According to the National Climactic Data Center, there were 34 FLOOD event(s) reported in Hampshire County, Massachusetts between 01/01/1950 and 12/31/2009. None of these were reported in Amherst, but one, on 7/7/94 was classified as "urban flooding" which might have included Amherst.

### **Probability of Future Events**

This is a low area and is subject to flooding with heavy rain. Members of Amherst's Natural Hazard Mitigation planning committee predict a very high probability of future events.

## **Severe Snow/Ice Storm – High Risk**

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 also 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.

Amherst's recent history has not recorded any loss of life due to the extreme winter weather, but there are usually several incidents of property damage or personal injury each winter. In addition, during heavy snow years, accumulations can reach several feet deep. Amherst's rolling topography creates some steep grades, sometimes making plowing difficult and causing snow and ice hazards. Many of the farms and open meadows and fields throughout town cause snow drifts.

### **Location**

Areas of higher elevation are at most risk for impact from ice accumulation. Areas in the northeastern part of town including Flat Hills Road, High Point Drive, Shutesbury Road and the area south of Bay Road are above 500'.

All areas of town are susceptible to damage from snow accumulation, particularly wet snow. The low elevation of most areas of town is likely to receive wet snow while areas of higher elevation receive drier snow.

Severe winter weather occurs regionally and therefore would impact the entire town, although several specific locations are more susceptible to damage. These problem areas have been described and assessed for vulnerability.

Any severe winter weather incident can cause critical snow and ice hazards throughout the Town.

### **Extent**

New England generally experiences at least one or two severe winter storms each year with varying degrees of severity. The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service ([Kocin and Uccellini, 2004](#)) characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10 inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS gives an indication of a storm's societal impacts.

NESIS scores factor in the area affected by the snowstorm, the snow, and the number of people living in the path of the storm. The NESIS score varies from around one for smaller storms to over ten for extreme storms. The raw score is then converted into one of the five NESIS categories. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers.

### **Previous Occurrences**

Amherst's recent history has not recorded any loss of life due to the extreme winter weather, but there are usually several incidents of property damage or personal injury each winter. In addition, during heavy snow years, accumulations can reach several feet deep. Amherst's historic road network often creates some steep grades, dangerous intersections, or narrow throughways, sometimes making plowing difficult and causing snow and ice hazards.

- Amherst has been subject to 22 winter storms categorized as major to extreme according to the NESIS scale since 1960. Additional historically significant winter storms to affect Amherst include the Great Snow of 1717 and the Blizzard of 1888
- Moderate risk town wide due to snow, ice and extreme cold.
- Elderly are affected by extreme weather.

### **Probability of Future Events**

Based on the NESIS scale, Amherst is at risk of a major to extreme winter storm in any given year is slightly less than 50 percent.

## Hurricanes/Severe Wind – Medium Risk

Hurricanes are violent rainstorms with strong winds that can reach speeds of up to 200 miles per hour, and large amounts of precipitation. Hurricanes generally occur between June and November and can result in flooding and wind damage to structures and above-ground utilities. Severe wind can also occur in the absence of a hurricane, especially impacting mountain tops. Global warming will increase the threat of hurricanes and severe winds as oceans and the atmosphere warms. Climate change research indicates that storms like hurricanes will become more intense and more frequent in the future.

### **Location**

All of Amherst is at risk from hurricanes with ridgetops more susceptible to wind damage and the flood-prone portions of town to flooding from the heavy rains.

### **Extent**

Amherst's location in Western Massachusetts reduces the risk of extremely high winds that are associated with hurricanes, although it can experience some high wind events. During hurricanes or severe wind events, the Town has experienced small blocks of downed timber and uprooting of trees onto structures.

- Estimated wind damage: 5% of the structures with 10% damage, \$12,327,213;
- Estimated flood damage: 10% of the structures with 20% damage, \$49,308,851;
- Vulnerability assessment for a hurricane event (both wind and flood damages): \$61,636,064;
- Cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included.

### **Previous Occurrences**

In Massachusetts, sixteen major hurricanes have had landfall since 1851, two of which impacted Western Massachusetts. These include: Hurricane Carol in 1954 and Hurricane Gloria in 1985. Hurricanes are usually ranked category 1-5, using the Saffir-Simpson Scale, with category 5 hurricanes being the most severe. Both Hurricane Carol and Gloria were category 1-2 storms, meaning winds ranged from 74-110 mph with the potential for some roofing or window damage to buildings, damage to unanchored mobile homes, trees, or poor construction, and/or some minor flooding.

- Connecticut River corridor at risk.
- 1938 hurricane was a major event - wind damage and flooding statewide.
- Power and phone lines - disruptions of services.
- Flooding/washing of evacuation routes.

**Table 3-2 Major Non-Winter Storms to Affect Amherst Area**

Hurricane/Storm Name	Year	Saffir/Simpson Category
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		(when reached MA)
Great Hurricane of 1938	1938	Unclear, 3 or 4
Great Atlantic Hurricane	1944	1
Carol	1954	3
Edna	1954	1
Diane	1955	Tropical Storm
Donna	1960	Unclear, 1 or 2
Groundhog Day Gale	1976	Not Applicable
Gloria	1985	1
Bob	1991	2
Floyd	1999	Tropical Storm

### **Probability of Future Events**

Based upon the past events, it is reasonable to say that there is a low frequency of major hurricanes in Amherst (once every fifty years is less than a one percent chance of any such storm occurring in a given year) while the possibility of a less severe hurricane or tropical storm affecting Amherst in any given year is approximately 10 percent.

### **Tornadoes/Microbursts – Medium Risk**

Tornadoes 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, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester, including towns in Hampshire County.

Of additional concern are microbursts, which often do tornado-like damage and can be mistaken for tornadoes. In contrast to the upward rush of air in a tornado, air blasts rapidly downward from thunderstorms to create microbursts. Microbursts and tornadoes are expected to become more frequent and more violent as the earth's atmosphere warms, due to predictions of climate change from global warming.

### **Location**

The occurrence of severe thunderstorms and microbursts is frequent during the summer months. Amherst has experienced damage in all areas of town. Downed trees, damage to power lines and trees

The hazard area for tornadoes in Amherst varies according to the intensity and size of the tornado. There have not been enough tornadoes in Amherst to accurately predict sections of town that are more likely to experience a tornado.

### **Extent**



Risk of tornadoes is considered to be medium in Hampshire County. Tornadoes rarely occur in this part of the country; therefore, assessing damages is difficult. River corridors and hill tops are most prone to damage from these events, but as described in Hurricanes/ Severe Winds section, above, there are few high hills in Amherst.

Because tornadoes and microbursts rarely occur in this part of the country, assessing damages is difficult. Furthermore, buildings have not been built to Zone 2, Design Wind Speed Codes. The entire Town of Amherst is vulnerable.

- Tornadoes/microburst hazard estimates 20% damage to 10% of structures in Town;
- Vulnerability assessment estimates \$49,308,851 in damages;
- Estimated cost does not include building contents, land values or damages to utilities.

### **Previous Occurrences**

No known tornados have ever touched down in Amherst, and there have been several high-wind storms and hail events. In Western Massachusetts, the majority of sighted tornadoes have occurred in a swath directly over Amherst, known as “tornado alley.” Thirteen incidents of tornado activity (all F2<sup>1</sup> or less) occurred in Hampshire County between 1959 and 2005.

### **Probability of Future Events**

Based upon the past events, it is reasonable to say that there is a low frequency of tornadoes in Amherst.

### **Wildfires/Brushfire – Medium Risk**

According to FEMA, there are three different classes of wildland fires: surface fires, ground fires and crown fires. 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 wildfires or brushfires have not been a significant problem in Amherst, 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. Global climate changes may also influence precipitation patterns, making the region more susceptible to drought and therefore, wildfires.

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<sup>1</sup> F2 refers to the commonly used Fujita Tornado Damage Scale which ranks tornados F0-F5 depending on estimated wind speeds and damages, with F5 the most severe.

Hampshire County has approximately 252,000 acres of forested land, which accounts for 72% of total land area. Forest fires are therefore a potentially significant issue. In Amherst, approximately 43% of the town's total land area is in forest, or about 7,951 acres, and is therefore at risk of fire.

### **Location**

Amherst has experienced fires in all sections of town. The largest and most difficult fires have occurred in the area of North East Street and the open land to the east, in the Lawrence Swamp, the Flat Hills Road area, south of Bay Road and woodlands in the north part of town. There is open land throughout town in which a large wildland fire could develop.

South Hadley and Hadley had a large, approximately 500 acres, wildfire in the Holyoke range six years ago. If the fire had crossed Route 116 it would have threatened Amherst and Granby.

### **Extent**

Significant risk exists for potential wildfire incidents, especially near some of the town's forested, agricultural, and recreational lands. Forested and agricultural areas with high fuel content have more potential to burn. In addition, it is often very difficult to access some of the locations to extinguish the brushfire.

- Up to 4 structures could be impacted by a wildfire in one of the Town's agricultural areas;
- Assuming 100% damage to 100% of the structures, not including costs repairing or replacing any power lines, telephone lines, and contents of structures;
- Vulnerability assessment estimates approximately \$1,214,000 in damages for a wildfire.

### **Previous Occurrences**

Fires originating from illegal and unattended open burning are somewhat common in Amherst. The majority are small and quickly contained. According to the Amherst Fire Department, there are approximately 15 unauthorized burns (or brushfires) per year, on average. As a point of comparison, approximately 1,000 burn permits are issued annually.

### **Probability of Future Events**

Based upon the past events, it is reasonable to say that there is a low frequency of wildfires in Amherst.

## **Earthquakes – Low Risk**

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. 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. 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.

### **Location**

In the event of an earthquake, all of Amherst would be affected with some portions more impacted than others, depending on the magnitude of the earthquake and the underlying population density.

### **Extent**

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. The seismic standards have also been upgraded with the 1997 revision of the State Building Code.

- Moderate potential for serious damage in downtown Amherst;
- Structures are mostly wood frame construction, so loss estimates predict 20% of town assessed value, not including costs of repairing or replacing roads, bridges, power lines, telephone lines, or the contents of the structures;
- Vulnerability assessment estimates approximately \$493,088,512.

### **Previous Occurrences**

Nineteen earthquakes, intensity V (Modified Mercalli scale) or greater, have centered in Massachusetts since it was colonized by Europeans. A shock in 1755 reached intensity VIII at Boston and was felt across the State. In addition, Massachusetts was affected by some of the more severe Canadian shocks plus the earthquake of 1929 that centered on Grand Banks of Newfoundland.

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

Tables 3.3 & 3.4 contain information regarding most of the earthquakes, including all of affecting New England, the significant ones. None have been noted to cause any damage in Amherst or the surrounding area.

<b>Table 3.3: New England Earthquakes (1924-2002)<sup>2</sup> magnitude 4.2 or higher</b>		
<b>Location</b>	<b>Date</b>	<b>Magnitude</b>
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

<b>Table 3.4: New England States Record of Earthquakes<sup>2</sup></b>		
<b>State</b>	<b>Years of Record</b>	<b>Number of Earthquakes</b>
Connecticut	1568 - 1989	137
Maine	1766 - 1989	391
Massachusetts	1627 - 1989	316
New Hampshire	1728 - 1989	270
Rhode Island	1766 - 1989	32
Vermont	1843 - 1989	69
New York	1737 - 1985	24
Total Earthquakes in New England (1568-1989)		1,239

### **Probability of Future Events**

Based upon the past events, it is reasonable to say that there is a low frequency of major earthquakes in Amherst (there have been no earthquakes over 4.2 on the Richter scale in nearly 100 years) while the possibility of a less severe earthquake or tropical storm affecting Amherst in any given year is slightly less than 1 percent but these are unlikely to cause any significant damage.

<sup>2</sup> Northeast States Emergency Consortium Web site: [www.nesec.org/hazards/earthquakes.cfm](http://www.nesec.org/hazards/earthquakes.cfm)

## **Dam Failure – Very Low Risk**

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 released. Often dam breaches lead to catastrophic consequences as the water ultimately 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. Most earthen dam failures occur when floodwaters above overtop and erode the material components of the dam.

The Massachusetts Department of Conservation and Recreation (MA DCR) was the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00). Until 2002, DCR was also responsible for conducting dam inspections but then state law was changed to place the responsibility and cost for inspections on the owners of the dams. This means that individual dam owners are now responsible for conducting inspections.

The state has four hazard classifications for dams:

- High Hazard: 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: 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: Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected.
- Non-jurisdictional: The storage capacity of the impoundment and height of dam are such that they need not be regulated.

The inspection schedule for dams is as follows:

- Low Hazard dams – 10 years
- Significant Hazard dams – 5 years
- High Hazard 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. All other dams are subject to the regulations unless exempted in writing by DCR.

**Location**

- According to DCR and MEMA sources, as well as local knowledge, there are currently eight (8) dams<sup>3</sup> in Amherst. The follow table identifies the dams within the town as well as whether they are classified as low, significant, non-jurisdictional or high hazard.
- Several dams in surrounding communities are listed as a failure will have a significant impact on Amherst

<b>Table 3-5: Dams in Amherst</b>					
<b>Dam name/ date built</b>	<b>ID</b>	<b>Owner</b>	<b>Purpose</b>	<b>Condition/last inspected</b>	<b>Hazard Risk</b>
Factory Hollow Dam	MA00063	Town of Amherst- DPW	Recreation	Fair/ 8-22-06	High
Factory Hollow Dike	MA00597		Recreation	Satisfactory/ 8-22-06	Significant
Ice Pond Dam	MA01665	Amherst Field Association	drainage	Unknown/ Unknown	Significant
Epstein Pond Dam	MA00483	Balderwood Realty Trust	Recreation	Unknown/ Unknown	Low
Owens Farm Pond Dam	MA01667	C.G. Equity Ventures	drainage	Unknown/ Unknown	Low
Echo Hill Association Pond Dam	MA01666	Echo Hill Association	Drainage	Unknown/ Unknown	Non-Jurisdictional
University Pond Dam	MA01668	Commonwealth of MA-UMass/Amherst	drainage	Unknown/ Unknown	Non-Jurisdictional
Markert Pond Dam	MA02303	Town of Amherst- DPW	Drainage	Unknown/ Unknown	Non-Jurisdictional
Atkins Reservoir (Shutesbury)			Reservoir	Unknown	
Hills Reservoir (Pelham)			Reservoir	Unknown	
Hawley Reservoir (Pelham)			Reservoir	Unknown	

<sup>3</sup> It is difficult to track down accurate records of dams, as ownership and exact location is not clear. Furthermore, many very old dams listed in DCR records are not in existence anymore, according to local knowledge. This list is compiled from a combination of sources, and then verified by the Committee.

Bartlett (Pelham)				Unknown	
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**Extent**

A vulnerability assessment was done for the inundation area below the one high risk dam, Factory Hollow and its accompanying significant risk dike, and also for the other significant risk Ice Pond Dam.

Factory Hollow Vulnerability Assessment: The inundation area would include the Mill Hollow apartments, (estimated 40 apartments valued at \$150,000) and 11 single family homes as well as three commercial structures (including a towing company and an auto body shop) on Sunderland Road and two Town park buildings in the Mill River recreation area. Economic cost of total destruction of all properties: \$9,725,500.

Ice Pond Vulnerability Assessment: Given the current use of the Ice Pond dam and development around it, its failure would only cause minor property damage to an estimated 15 condominiums and one private residence.

In addition to dams in Amherst, the Town is also vulnerable to dam failure in the neighboring community of Shutesbury.

Atkins Reservoir Dam (located in Shutesbury) Vulnerability Assessment: On East Leverett Road approximately 45 private residences are located in the inundation zone, as is the whole area previously identified in the Factory Hollow dam vulnerability assessment. In addition three homes on Summer street are also located in the inundation zone. 15 additional residences located on Meadow street are also in the inundation zone as are portions of Russellville road including Kieras Oil, home to a 100,000 gallon oil tank. Economic cost: Same as for Factory Hollow dam failure plus \$17,041,500 (not including cost of damage to commercial properties).

Amherst has already addressed the hazard of dam failure in the neighboring community of Pelham and is working with the MA Department of Ecological Resources to breach the Bartlett/Rod Shop dam which is privately owned.

**Previous Occurrences**

Amherst has a history of no dam failures.

**Probability of Future Events**

Based upon the past events, it is reasonable to say that there is a low frequency of dam failure in Amherst.

**Drought – Very Low Risk**

Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. In the most general sense, drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector.

Reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat are a few examples of the direct impacts of drought. Of course, these impacts can have far-reaching effects throughout the region and even the country.

### **Location**

A drought would affect all of Amherst

### **Extent**

The severity of a drought would determine the scale of the event and would vary among town residents depending on whether the residents' water supply is derived from a private well or the public water system.

When evaluating the region's risk for drought on a national level, utilizing a measure called the Palmer Drought Severity Index, Massachusetts is historically in the lowest percentile for severity and risk of drought. Even so, there have been several years of drought-like conditions in Western Massachusetts: 1940-1952, 1980-1983, and 1995-2001. Furthermore, global warming and climate change may have an effect on drought risk in the region. With the projected temperature increases, some scientists think that the global hydrological cycle will also intensify. This would cause, among other effects, the potential for more severe, longer-lasting droughts. Additionally, even minor droughts will increase the risk of wildfire, especially in areas of high recreational use.

### **Previous Occurrences**

In Massachusetts, six major droughts have occurred statewide since 1930. They range in severity and length, from three to eight years. In these droughts, water-supply systems were found to be inadequate. In extreme cases, water was piped in to urban areas, and water-supply systems were modified to permit withdrawals at lower water levels.

Amherst has had limited experience with severe drought conditions. In 1980 the Town had to send approximately 25,000 students from the University of Massachusetts and Amherst College home for one week because the Town had no water.

### **Probability of Future Occurrences**

Based upon the past events, it is reasonable to say that there is a low frequency of drought in Amherst.

## **Man-Made Hazards – Hazardous Materials – Medium Risk**

Hazardous materials are chemical substances, which if released or misused can pose a threat to the environment or health. These chemicals come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products containing hazardous chemicals are used and stored in homes and businesses routinely. These products are also shipped daily on the nation's highways, railroads, waterways, and pipelines.



Amherst relies on State District Four Department of Fire Services HazMat team for responding to incidents involving hazardous materials through a mutual aid agreement. There is no history of any major accidents involving some sort of oil or chemical spill, but transportation of chemicals and bio-hazardous materials by vehicle transport on Main Street is a concern. Small areas of hazardous materials storage increase the potential for future incidents.

**Location**

The Toxics Release Inventory (TRI), a publicly available EPA database that contains information on specific toxic chemical releases and other waste management activities reported annually by certain covered industry groups as well as federal facilities. According to TRI, there are no industries currently releasing hazardous materials within Amherst's town limits. However, there are six Tier II Hazardous Materials storage facilities in Amherst, they are included on the Past & Potential Hazards/Critical Facilities Map (Appendix D).

However, varying quantities of hazardous materials are manufactured, used, or stored at an estimated 4.5 million facilities in the United States--from major industrial plants to local dry cleaning establishments or gardening supply stores. These hazardous materials are transported regularly over our highways and by rail and if released can spread quickly to any community. Incidents can occur at any time without warning. Human error is the probable cause of most transportation incidents and associated consequences involving the release of hazardous materials.

<b>Table 3-7 Tier II Hazardous Materials storage facilities in Amherst</b>	
<b>Site Name</b>	<b>Site Address</b>
Hampshire College Campus	893 West Street
Verizon Amherst Co (ma823106)	65 South Prospect Street
Verizon Amherst Co (ma823107)	20 Fearing Street
Comcast Of Massachusetts/Virginia, Inc.	160 Old Farm Road
John S. Lane & Son, Inc.	1550 West Street
University Of Massachusetts	
Amherst College	South Pleasant Street
Town Waste water Treatment Plant	Mullins Way
Town Water Treatment Plant	Markert Hill Rod
Town Water Treatment Plant	South East Street
Numerous unknown farm and industry	

**Extent**

The extent of hazardous chemical release is not predictable as it is dependent on the location including whether it is from a stationary or moving source, amount and type of chemical released, and weather conditions at the time of the release. Given the passage of trucks and trains through the community, combined with the proximity of the train tracks to the Lawrence Swamp, under which 6 water supply wells are located, a hazardous materials spill could have devastating consequences for the Town of Amherst. Beaver dams in the Lawrence swamp cause dramatic rises in the water level

which is threatening the strength and stability of berms supporting the train tracks. A train derailment in the swamp would jeopardize the Town's water supply (60% of which comes from these wells) as well as causing potential damage to a small number of nearby homes.

### **Previous Occurrences**

Available data dating from 1998-2003 shows zero releases of hazardous materials (total) from these sites per year.

### **Probability of Future Events**

Given available data it is no releases of hazardous chemicals each year is most likely, and the likelihood of a catastrophic release is low.

## 4: CRITICAL FACILITIES

A Critical Facility is defined as a building, structure, or location which:

- is vital to the hazard response effort.
- Maintains an existing level of protection from hazards for the community.
- Would create a secondary disaster if a hazard were to impact it.

### **Critical Facilities within Hazard Areas**

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Hazards identified in this plan are regional risks and, as such, all critical facilities fall into the hazard area. The exception to this is flooding. There are several critical facilities that fall within the 100-year floodplain as shown in the table at the end of this section.

The Critical Facilities List for the Town of Amherst has been identified utilizing a Critical Facilities List provided by the State Hazard Mitigation Officer. Amherst's Hazard Mitigation Committee has broken up this list of facilities into four categories:

- The first category contains facilities needed for Emergency Response in the event of a disaster.
- The second category contains Non-Emergency Response Facilities that have been identified by the Committee as non-essential. These are not required in an emergency response event, but are considered essential for the everyday operation of Amherst.
- The third category contains Facilities/Populations that the Committee wishes to protect in the event of a disaster.
- The fourth category contains Potential Resources, which can provide services or supplies in the event of a disaster.

The critical facilities and evacuation routes potentially affected by hazard areas are identified in Table 4-1, following this list. The Past and Potential Hazards/Critical Facilities Map (Appendix D) identifies these facilities.

### **Category 1 – Emergency Response Services**

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The Town has identified the Emergency Response Facilities and Services as the highest priority in regards to protection from natural and man-made hazards.

- 1) Emergency Operations Center  
Primary: Public Safety Building, 111 Main Street  
Secondary: Fire Department, 603 East Pleasant Street

- 2) Fire Station  
 Amherst Fire Department Central Station 68 N Pleasant St  
 North Station 603 East Pleasant St
- 3) Police Station  
 Amherst Police Department – 111 Main St
- 4) Highway Department  
 Highway Department – 586 S Pleasant St
- 5) Water Department  
 Water Department – 586 S Pleasant St  
 Water Treatment Plant – 33 Market Hill Rd  
 Wastewater Treatment Plant—Mullins Way
- 6) Emergency Fuel Stations  
 Fire Department, 603 East Pleasant Street  
 4000 gallons diesel; 8000 gallons gasoline  
 Highway Department – 586 S. Pleasant Street  
 2000 gallons diesel; 4000 gallons diesel  
 Police Department, 111 Main St  
 1000 gallons gasoline
- 7) Emergency Electrical Power Facility  
 Police Department & EOC  
 Fire Department, 68 North Pleasant Street  
 Fire Department, 603 East Pleasant Street
- 8) Emergency Shelters  
 Amherst Regional High School, 21 Mattoon Street—primary\*  
 Amherst Regional Middle School, 170 Chestnut Street  
 Crocker Farm elementary school, 280 West Street  
 Fort River elementary school, 70 Southeast Street  
 Wildwood Elementary school 71 Strong Street  
 \*Shelters also have generators.
- 9) Water Sources  
 Numerous locations in Amherst, any available.
- 10) Transfer Station  
 On Past & Potential Hazards/Critical Facilities Map – 740 Belchertown Rd
- 11) Helicopter Landing Sites  
 School parking lot  
 (Permitted anywhere feasible.)
- 12) Communications

# cell/radio towers throughout town – see Past & Potential Hazards/Critical Facilities Map—1 located on Pulpit Hill Rd and one on West St – the Norwottuck Fish and Game club-private property.  
 2 Verizon switching facilities on Fearing Street and S. Prospect Street

13) Primary Evacuation Routes  
 Rte 9, Rte 116,

14) Bridges/Culverts Located on Evacuation Routes

Bridges

<u>Evacuation Route</u>	<u>Crosses</u>	<u>Owner</u>	<u>Year Built</u>	<u>Year Rebuilt</u>
Route 116 West Street	Fort River	Mass Highway		NA
Route 9 Belchertown Road	Fort River	Mass Highway		NA
Route 116	Mill River	Mass Highway		NA
Route 116	Mill River			
Route 116	Eastman Brook			

## **Category 2 – Non Emergency Response Facilities**

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The town has identified these facilities as non-emergency facilities; however, they are considered essential for the everyday operation of Amherst.

- 1) Problem Culverts  
 DPW has a list which will be attached to final plan
- 2) Water Supply  
 Town reservoir

## **Category 3 – Facilities/Populations to Protect**

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The third category contains people and facilities that need to be protected in event of a disaster.

- 1) Special Needs Population  
 Nursing Home – numerous, updated regularly and available upon request
- 2) Elderly Housing/Assisted Living  
 Senior Housing – numerous, available upon request
- 3) Public Buildings/Areas  
  
 Golf Courses-Public Cherry Hill Golf Course - 325 Montague Rd  
 Jones Library Inc - 43 Amity St  
 Munson Memorial Library - 1046 S East St

Web Du Bois Library – University of Massachusetts  
North Amherst Library - 8 Montague Rd  
Amherst History Museum Strong - 67 Amity St  
Eric Carle Museum of Picture Book Art - 125 W Bay Rd  
US Post Office - 33 Montague Rd  
US Post Office - 145 University Dr  
Amherst Leisure Svc - 70 Boltwood Walk  
Mill River Pool - 95 Montague  
War Memorial Pool - 205 Triangle St

4) Schools

Amherst Regional Middle School - 170 Chestnut St  
Amherst Regional Senior High School - 21 Mattoon St  
Ft River Elementary School - 70 S East St  
Marks Meadow Elementary School - 813 N Pleasant St  
Wildwood Elementary School - 71 Strong St  
Common School - 521 S Pleasant Street  
Crocker Farm Elementary School - 280 West St

5) Churches

Amherst Chinese Christian Church - 611 Belchertown Rd  
Church Of Jesus Christ Of LDS - 104 Sunset Ave  
First Baptist Church-Amherst - 434 N Pleasant St  
First Congregational Church - 165 Main St  
Goodwin AME Zion Church - 41 Woodside Ave  
Grace Episcopal Church - 14 Boltwood Ave  
Immanuel Lutheran Church - 867 N Pleasant St  
Kingdom Hall-Jehovah's Witness - 17 Pomeroy Ln  
Mercy House - 365 N Pleasant St  
New Life Baptist Church - 51 Pondview Dr  
Newman Center - 472 N Pleasant St  
North Congregational Church - 1199 N Pleasant St  
South Congregational Church - 1066 S East St  
St Brigid's Catholic Church - 122 N Pleasant St  
Unitarian Universalist Society - 121 N Pleasant St

Synagogues

Hillel House - 388 N Pleasant St  
Jewish Community Of Amherst - 742 Main St

Mosque

Hampshire Mosque - 1 E Pleasant St

6) Historic Buildings/Sites

Two cemeteries on Past & Potential Hazards/Critical Facilities Map.

7) Apartment Complexes

Numerous available upon request

- 8) Employment Centers  
University of Massachusetts - 300 Massachusetts Avenue  
Amherst College – 100 Boltwood Avenue  
Hampshire College – 893 West Street

### **Category 4 – Potential Resources (Numerous—please see Comprehensive Emergency Management Plan, CEMP, updated annually and available through the Town EMD)**

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Contains facilities that provide potential resources for services or supplies.

The Town of Amherst has been pro-active in establishing cooperative agreements with local businesses to assure cooperation and collaboration in the event of an emergency.

- 1) Food/Water  
Numerous grocery stores—EMD has working relationship with many
- 2) Hospitals/Medical Supplies  
Cooley Dickinson Hospital in Northampton—8 miles away  
Many local pharmacies and drug stores
- 3) Gas/Heating Oil/Propane  
Numerous—available upon request and tracked by EMD
- 4) Building Materials Suppliers  
Numerous
- 5) Heavy & Small Equipment Suppliers  
Numerous

**Table 4.1: Critical Facilities and Evacuation Routes Potentially Affected by Hazard Areas**

<b>Hazard Type</b>	<b>Hazard Area</b>	<b>Critical Facilities Affected</b>	<b>Evacuation Routes Affected</b>
Flooding (100-year)	Meadow ST., W. Pomeroy Lane	none	Rte 9 and 116
Flooding (localized)	Cottage, Triangle, W. Pomeroy, E. Hadley , State, Main, Summers, Meadow	Town Hall, Public Safety Building	Probably not
Severe Snow/Ice Storm	Varies—all over Town	Possibly, but not at all likely	possibly
Hurricane/Severe Wind	Varies—all over Town	Possibly, but not at all likely	possibly
Wildfire/Brushfire	Agriculture land	none	no
Earthquake	All over	Possibly, but not at all likely	yes
Dam Failure	Sunderland Rd, E. Leverett Rd, Russelville Rd. Summer St. Meadow St.	none	no
Drought	All over	none	no
Hazardous Materials	Lawrence Swamp, along Rtes 9 and 116	none	yes

(Past & Potential Hazards/Critical Facilities Map Located In Appendix D)





# 5: MITIGATION STRATEGIES

One of the steps of this Natural Hazard Mitigation Plan is to evaluate all of the town's existing policies and practices related to natural hazards and identify potential gaps in protection. Once these gaps in protection are identified, future mitigation strategies can be crafted and recommended. This is done by evaluating existing and future measures in comparison to the Town's goal statement for natural hazard mitigation.

### 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. To provide adequate shelter, water, food and basic first aid to displaced residents in the event of a natural disaster and to provide adequate notification and information regarding evacuation procedures, etc., to residents in the event of a natural disaster.

For the extent of this analysis, the Committee reviewed the following Town documents:

- Zoning Bylaw
- Subdivision Regulations
- Open Space and Recreation Plan (draft)
- Comprehensive Planning Study: Defining Village Boundaries & Open Space Preservation Strategies
- CEM Plan
- Other relevant Bylaws as identified (Fire Department Burn Permit Procedures, Building Code, etc.)

This section of the plan serves to identify current mitigation strategies and recommend future mitigation strategies. This is done both generally, and by hazard type.

## General Mitigation Measures

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Several of the recommended mitigation measures have multiple benefits because, if implemented, they will mitigate or prevent damages from more than one type of natural hazard. These do not fall under one hazard type, but could be put into place for facilitation of better natural hazard protection generally.

Some of these general hazard-related strategies and measures do not fall

### What's the CEM Plan?

An important existing general preparedness and response tool is Amherst's Comprehensive Emergency Management Plan (CEM Plan). Although the CEM Plan is focused on the procedural response to an emergency, it organizes information, includes supply and information inventories, and outlines detailed steps for increasing preparedness.

specifically under the category of “mitigation,” but are instead, tools for preparedness. The Hazard Mitigation Planning Committee recognizes that these are also important recommendations for the Town, is acting to implement them already.

## **Flooding**

The key factors in flooding are the water capacity of water bodies and waterways, the regulation of waterways by flood control structures, and the preservation of flood storage areas and wetlands. As more land is developed, more flood storage is demanded of the town’s water bodies and waterways.

### **Current Mitigation Measures**

The Town currently addresses this problem with a variety of mitigation tools and strategies. Flood-related regulations and strategies are included in the Town’s zoning by-law, subdivision regulations, as well as a proposed stormwater management by-law. Relevant goals are included in the adopted Open Space and Recreation Plan. Infrastructure like dams and culverts are in place to manage the flow of water. These current mitigation strategies are outlined in the following table.

**Table 5-1: Existing Flood Hazard Mitigation Measures**

<b>Existing Strategy</b>		<b>Description</b>	<b>Effectiveness</b>	<b>Potential Changes</b>
Flood Control Structures		Eight dams.	Somewhat effective.	Ensure dam owners realize their responsibility to inspect the dams.
Culvert Replacement		Priority list of necessary culvert replacements and other construction projects to effectively manage flooding.	Very effective for managing flood control needs.	Seek funding from HMGP for top-priority projects.
Zoning By-Laws	Flood Prone Conservancy District (FPC)	Areas delineated as part of the 100-year floodplain are protected by strict use regulations.	Very effective for preventing incompatible development within the flood prone areas.	
	Watershed Protection District (WP)	Overlay district to protect the subwatersheds around the public water supply.	Very effective for preventing polluting, incompatible development.	
	Aquifer Recharge Protection District (ARP)	Overlay district to protect areas delineated as recharge zones for aquifers are protected by strict use regulations.	Very effective for preventing groundwater contamination and for controlling stormwater runoff.	

	Wetlands District (WD)	Overlay district to delineate areas protected through the Mass Wetlands Protection Act	Very effective for preventing development within flood storage areas/wetlands.	
	Farmland Conservation District (FC)	Overlay district to preserve land most suitable to be developed as farmland.	Very effective for preventing impervious surfaces, residential development susceptible to flooding.	
	Use Regulations	No building within 100 feet of a pond or flood retention structure. No building in floodway unless special permit.	Very effective for preventing incompatible development.	
	Special Permit/Site Plan Approval	Proposed uses must meet requirements for drainage and preventing erosion and pollution to waterbodies.	Effective for preventing incompatible development.	
Subdivision Regulations	Required Improvements	When in a flood prone area, all transformers, switching equipment, and other vital equipment must be flood-proofed.	Effective at preventing power outages.	
	Design Standards	Streets – locations must consider access during flooding; cannot be built closer than 25 feet to waterbody	Effective at protecting residents in case of flooding	
		Protection of Natural Features – including water bodies, flood prone areas, are preserved	Effective for protecting water bodies and other features.	
Amherst Open Space and Recreation Plan	Inventories natural features and promotes natural resource preservation in the town, including areas in the floodplain; such as wetlands, groundwater recharge areas, farms and open space, rivers, streams and brooks.	Effective in identifying sensitive resource areas, including floodplains. Encourages forest, farmland protection, help conserve the town's flood storage capacity.	Continue to work to implement OSRP	
National Flood Insurance Program Participation	As of 2006, there were 20 homeowners with flood insurance policies.	Somewhat effective, provided that the town remains enrolled in the National Flood Insurance Program.	The town should evaluate whether to become a part of FEMA's Community Rating System.  Educate citizens living in floodplain about NFIP.	

### **Future Mitigation Measures**

Several potential changes to the Town's current strategies have been identified in the above table, and these, as well as recommendations for other future mitigation strategies, are compiled below:

- Replace top priorities on culvert replacement list.
- Ensure dam owners realize their responsibility to inspect the dams regularly.
- Implement the goals and strategies of the Amherst Open Space and Recreation Plan dealing with protection of floodplain, forests, and farmland.
- Evaluate whether to become a part of FEMA's Community Rating System.
- Educate citizens living in the floodplain about the NFIP.

#### **What is the NFIP's Community Rating System?**

The National Flood Insurance Program has developed suggested floodplain management activities for those communities who wish to more thoroughly manage or reduce the impact of flooding in their jurisdiction. Through use of a rating system (CRS), a community's floodplain management efforts can be evaluated for effectiveness. The rating, which indicates an above average floodplain management effort, is then factored into the premium cost for flood insurance policies sold in the community. The higher the rating achieved in that community, the greater the reduction in flood insurance premium costs for local property owners. MEMA can provide additional information regarding participation in the NFIP-CRS Program.

### **Severe Snow/Ice Storm**

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Winter storms can be especially challenging for emergency management personnel. 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. Even though the storm has usually been forecast, there is no certain way for predicting its length, size or severity. Therefore, mitigation strategies must focus on preparedness prior to a severe snow/ice storm.

#### **Current Mitigation Measures**

The Town's current mitigation tools and strategies focus on preparedness, with many regulations and standards established based on safety during storm events. These current mitigation strategies are outlined in the following table.

Note: To the extent that some of the damages from a winter storm can be caused by flooding, all of the flood protection mitigation measures described in Table 5-1 in the previous section can also be considered as mitigation measures for severe snow/ice storms.

**Table 5-2: Existing Severe Snow/Ice Storm Hazard Mitigation Measures**

Existing Strategy		Description	Effectiveness	Potential Changes
Subdivision Regulations	Required Improvements	Utilities must be placed underground	Effective for preventing power loss.	Work with WMECO to facilitate underground utilities as allowed.
	Design Standards	Standards include and intersection grade regulations (4% max).	Effective.	Include regulations for maximum street grade.
State Building Code		The Town of Amherst has adopted the Massachusetts State Building Code.	Effective.	
Backup Electric Power		Shelters have backup power, three mobile generators	Very effective in case of power loss.	
Tree Management		List of dangerous trees created annually for WMECO.	Very effective, preventative collaboration.	

**Future Mitigation Measures**

Several potential changes to the Town's current strategies have been identified in the above table, and these, as well as recommendations for other future mitigation strategies, are compiled below:

- Work with Western Mass Electric Company to facilitate the underground placement of new utility lines in general and existing utility lines in locations where repetitive outages occur (as applicable).
- Include maximum street grade standards in subdivision regulations.
- Determine if existing generators at shelters are effective, replace if not effective.
- Increase enforcement of restrictions prohibiting residents from plowing snow into the road.
- Participate in the creation of a Regional Debris Management Plan.

**What is a Regional Debris Management Plan?**

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.

## Hurricanes/Severe Wind

Of all the natural disasters that could potentially impact Amherst, hurricanes 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). Even with significant warning, hurricanes can do significant damage – both due to flooding and severe wind.

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 5-1 can also be considered hurricane mitigation measures.

The high winds that oftentimes accompany hurricanes can also damage buildings and infrastructure. But regulations can be put into place to help minimize the extent of wind damages.

The Town's current mitigation strategies to deal with severe wind are equally applicable to wind events such as tornadoes and microbursts. Therefore, the analysis of severe wind strategies is coupled with this hazard.

## Tornadoes/Microbursts

The location and extent of potential damaging impacts of a tornado are completely unpredictable. Most damage from tornadoes or microbursts comes from high winds that can fell trees and electrical wires, generate hurtling debris and, possibly, hail. According to the Institute for Business and Home Safety, the wind speeds in most tornadoes are at or below design speeds that are used in current building codes. In addition, current land development regulations can also help prevent wind damages.

The following table outlines the Town's existing mitigation strategies that help prevent wind damages, whether from hurricanes, tornadoes, microbursts, or any other event.

**Table 5-3: Existing Severe Wind Hazard Mitigation Measures  
(Including Hurricane, Tornado, Microburst Hazards)**

Existing Strategy		Description	Effectiveness	Potential Changes
Zoning By-law	Use Regulations	Trailer camps are prohibited in all districts	Somewhat effective for preventing damage to susceptible structures	
	Accessory Uses	Trailers not permitted as permanent residences (max 60 days, 12		

		months if home destroyed by fire)		
	Use Classification and Standards Table	Wireless communication towers/facilities need special permit. Standards restrict height and setbacks.	Somewhat effective for preventing damage to nearby property	
Subdiv Regs	Required Improvements	Utilities must be placed underground	Effective for preventing power loss.	Work with WMECO to facilitate underground utilities as allowed.
	State Building Code	The Town has adopted the MA State Building Code.	Effective.	
	Tree Management	List of dangerous trees created annually for WMECO.	Very effective, preventative collaboration.	

**Future Mitigation Measures**

Several potential changes to the Town's current strategies have been identified in the above table, and these, as well as recommendations for other future mitigation strategies, are compiled below:

- Work with Western Mass Electric Company to facilitate the underground placement of new utility lines in general and existing utility lines in locations where repetitive outages occur (as applicable). [How?]
- Participate in the creation of a Regional Debris Management Plan.

**Wildfire/Brushfire**

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Although somewhat common, the vast majority of brushfires in Amherst are small and quickly contained. However, as with any illegal fire or brushfire, there is always the risk that a small brushfire could grow into a larger, more dangerous wildfire, especially if conditions are right. Therefore, it is important to take steps to prevent wildfires and brushfires from turning into natural disasters.

**Current Mitigation Measures**

The following table identifies what the Town is currently doing to manage brushfires and makes some suggested potential changes and recommendations for decreasing the Town's likelihood of being heavily impacted by a wildfire or brushfire.

**Table 5-4: Existing Wildfire/Brushfire Hazard Mitigation Measures**

Existing Strategy	Description	Effectiveness	Potential Changes
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Subdivision Regulations	Required Improvements	On-site water must be provided to each lot, unless approved by Board of Health and Fire Dept.	Effective.	
	Fire Alarms	Fire alarm systems must be provided if recommended by Fire Dept.		
	Definitive Plan	Plan must be review and approved by Fire Department.		
Zoning By-law	Design Standards	Fire hydrant requirements.	Effective.	
Development Impact Statements – Fire Protection		Must include type and capacity of fuel storage facilities, location of storage areas for hazardous substances, special requirements, and distance to fire station.	Effective.	
Burn Permits		Residents must obtain burn permits, and personnel provide information on safe burn practices.	Effective.	
Public Education/ Outreach		The Fire Department has an ongoing educational program in the schools.	Effective.	None.

**Future Mitigation Measures**

None.

**Earthquake**

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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. In addition, earthquakes precipitate several potential devastating secondary effects such as building collapse, utility pipeline rupture, water contamination, and extended power outages. Therefore, many of the mitigation efforts for other natural hazards identified in this plan may be applicable during the Town’s recovery from an earthquake.

**Current Mitigation Measures**

The Town’s most relevant existing mitigation measures are described in the following table.

**Table 5-5: Existing Earthquake Hazard Mitigation Measures**

Existing Strategy	Description	Effectiveness	Potential Changes
State Building Code	The Town of Amherst has adopted the State Building Code.	Effective for new buildings only.	Evaluate older structures categorized as critical facilities to determine if they are earthquake resistant.
Debris Management Plan	A debris management plan could be developed.	Effective.	Consider participation in the creation of a Regional Debris Management Plan.

**Future Mitigation Measures**

Potential changes to the Town's current strategies have been identified in the above table, and these are compiled below:

- Evaluate critical facilities to determine if they are earthquake resistant.
- Participate in the creation of a Regional Debris Management Plan.

**Dam Failure**

Dam failure is a highly infrequent occurrence, but a severe incident could prove catastrophic. In addition, dam failure most often coincides with flooding, so its impacts can be multiplied, as the additional water has no where to flow.

**Current Mitigation Measures**

The only mitigation measures currently in place are the state regulations governing the construction, inspection, and maintenance of dams. This is managed through the Office of Dam Safety at the Department of Conservation and Recreation.

**Table 5-6: Existing Dam Failure Hazard Mitigation Measures**

Existing Strategy	Description	Effectiveness	Potential Changes
New Dam Construction Permits	State law requires a permit for the construction of any dam.	Effective. Ensures dams are adequately designed.	None.
Dam Inspections	DCR has an inspection schedule that is based on the hazard rating of the dam (low, medium, high hazard).	Low. The responsibility for this is now on dam owners, who may not have sufficient funding to comply.	Identify sources of funding for dam safety inspections. Incorporate dam safety into development review process.

**Future Mitigation Measures**

Recent changes in legislation have shifted some of the responsibility of dam safety onto dam owners. The Town recognizes the need to adjust to this change. Several potential changes to the Town's current strategies have been identified in the above table, and these, as well as recommendations for other future mitigation strategies, are compiled below:

- Identify sources of funding for dam safety inspections.

## Drought

Although Massachusetts does not face extreme droughts like many other places in the country, it is susceptible to dry spells and drought. And unlike other places, drought can most likely be effectively mitigated in regions like the Pioneer Valley if measures are put into place.

### Current Mitigation Measures

Amherst has several water protection regulations in place, as evidenced in the section on flooding. Additional regulations and mitigation options, specific to drought mitigation, are included here.

**Table 5-7: Existing Drought Hazard Mitigation Measures**

Existing Strategy		Description	Effectiveness	Potential Changes
Zoning By-law	Aquifer Recharge Protection District	Areas delineated as recharge areas for aquifers are protected by strict use regulations.	Very effective for preventing groundwater contamination and for controlling stormwater runoff, promoting groundwater recharge.	Consider revising definitions for clarification – utilize state model from DEP.
	Phased Growth	Water conservation is one of the criteria evaluated.	Somewhat effective for preserving supply.	
Amherst Open Space and Recreation Plan		Makes recommendations for protecting Amherst's water quality/supply.	Somewhat effective for raising awareness about protecting water quality, supply, and conservation.	Continue to work to implement OSRP

### Future Mitigation Measures

Potential changes to the Town's current strategies have been identified in the above table, and these, as well as recommendations for other future mitigation strategies, are compiled below:

- In regards to the Amherst Open Space and Recreation Plan, implement the goals and strategies dealing with protection of waterbodies and forestland.
- Create Water Conservation Guidelines to use as an educational tool for Town residents.

## Hazardous Materials

Hazardous materials are in existence throughout Town, and are constantly being moved on Amherst's roads and highways. However, there is no way to anticipate where and when a hazardous materials spill or explosion could take place. Therefore, it makes is somewhat difficult to determine mitigation strategies, but Amherst has some regulations currently in place to mitigate the impacts of a hazardous materials disaster.

**Table 5-8: Existing Hazardous Materials Hazard Mitigation Measures**

Existing Strategy	Description	Effectiveness	Potential Changes
Watershed Protection District	Hazardous materials storage, use, release, restricted within areas delineated as within the watershed	Effective for preventing contamination.	Consider revising definitions for clarification – utilize DEP model.
Aquifer Recharge Protection District	Areas delineated as recharge areas for groundwater aquifers are protected by strict use regulations.	Very effective for preventing groundwater contamination.	
Development Impact Statement	Proposed storage of hazardous materials must be included.	Somewhat effective for evaluating impact in advance.	

### **Future Mitigation Measures**

Potential changes to the Town's current strategies have been identified in the above table, and these are compiled below:

- Consider revising definitions for clarification – utilize DEP model.

## 6: PRIORITIZED IMPLEMENTATION SCHEDULE

### Summary of Critical Evaluation

The Amherst Hazard Mitigation Planning Committee reviewed each of the recommendation future mitigation measures identified, and used the following factors to prioritize mitigation projects:

- Ability to reduce loss of life
- Ability to reduce disaster damage
- Social acceptability
- Ability to complete or be combined w/other actions
- Technical feasibility / potential success
- Impact on the environment
- Administrative workability
- Ability to meet regulations
- Political acceptability
- Ability to save or protect historic structures
- Legal implementation
- Ability to meet other community objectives
- Economic impact
- The duration of its implementation period
- Environmental compatibility

### Project Prioritization

The Amherst Hazard Mitigation Planning Committee created the following prioritized schedule for implementation of prioritized items. The table lists items in order of priority.

*Note: As additional information becomes available regarding project leadership, timeline, funding sources, and/or cost estimates, the Plan will be reviewed and amended accordingly.*

**Table 6.1: Prioritized Implementation Schedule – Action Plan**

Priority	Mitigation Action	Responsible Department/Board	Proposed Completion Date	Funding Source/ Estimated Cost	Incorporation into Existing Plans
1	Replace top priorities on culvert replacement list.	DPW	2013 ongoing	HMGP	CIP
4	Ensure dam owners realize their responsibility to inspect the dams regularly.	DPW	2015	MEMA	OSRP, Master Plan
2	Implement the goals and strategies of the Amherst Open Space and Recreation Plan dealing with protection of floodplain, forests, and farmland.	Con Comm	2014	MA DCR	OSRP
3	Evaluate whether to become a part of FEMA's Community Rating System.	Town Manager, SelectBoard	2012	local	Master Plan
10	Educate citizens living in the floodplain about the NFIP.	Con Comm	ongoing	DCR, MEMA	OSRP, Master Plan
12	Work with Western Mass Electric Company to facilitate the underground placement of new utility lines in general and existing utility lines in locations where repetitive outages occur (as applicable).	Town Manager, SelectBoard	Ongoing and highly unlikely	WMECO	CIP
11	Include maximum street grade standards in subdivision regulations.	Planning Dept and Planning Board	2013	local	Master Plan
5	Determine if existing generators at shelters are effective, replace if not	Emergency Manager	2012	Local, MEMA, HS	CEMP

	effective.				
9	Participate in the creation of a Regional Debris Management Plan.	EM	2015	HS	W. Region HS plan
15	Evaluate critical facilities to determine if they are earthquake resistant.	DPW, Building Inspector	2015	FEMA	CIP
13	Increase enforcement of restrictions prohibiting residents from plowing snow into the road.	DPW	2015	local	CEMP
6	Identify sources of funding for dam safety inspections.	DPW, TM	2014	MEMA	Master Plan
7	In regards to the Amherst Open Space and Recreation Plan, implement the goals and strategies dealing with protection of waterbodies and forestland.	Con Comm/Dept, DPW	2014	DCR	OSRP
8	Create Water Conservation Guidelines to use as an educational tool for Town residents.	DPW, Con Comm/Dept	2015	local	Master Plan, OSRP
14	Revise Watershed Protection District definitions for clarification – utilize DEP model.	Planning Dept/Board, Cons Dept/Comm	2014	local	Master Plan, OSRP

# 7: PLAN ADOPTION & IMPLEMENTATION

## Plan Adoption

Upon completion, copies of the Draft Local Hazards Mitigation Plan for the Town of Amherst were distributed to the town boards for their review and comment. A public meeting was held by the Amherst Select Board to present the draft copy of the Amherst Local Natural Hazards Mitigation Plan to town officials and residents and to request comments from this committee and the general public. The Natural Hazards Mitigation Plan was formally approved by the Select Board and forwarded to the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency (FEMA) for their approval.

## Plan Implementation

The implementation of the Amherst Local Natural Hazards Mitigation Plan will begin following its formal adoption by the Amherst Select Board and approval by MEMA and FEMA. Specific town departments and boards will be responsible for ensuring the development of policies, bylaw revisions, and programs as described in Sections 5 and 6 of this plan. The Amherst Natural Hazards Planning Committee will oversee the implementation of the plan.

## Plan Monitoring and Evaluation

The measure of success of the Amherst Local Natural Hazards Mitigation Plan will be the number of identified mitigation strategies implemented. In order for the town to become more disaster resilient and 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.

The Amherst Natural Hazards 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. Those parties noted in Section 6 of the plan, all of whom have a representative on the Amherst Natural Hazards Planning Committee, will be responsible for seeing that the actions are implemented and will report on their progress at the annual plan review meetings. Prioritized actions will be integrated into existing and future plans as appropriate.

Outreach to the public, surrounding communities, agencies, businesses, academia, non-profits, or other interested parties outside of the town of Amherst will be done in advance of each annual meeting in order to solicit their participation in assessment of the plan. 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 2015. The meetings of the committee will be organized and facilitated by the Emergency Management Director or the Amherst Select Board. The approved Amherst Hazard Mitigation plan will be available for public review at the Town Hall and the public library as well as at the PVPC offices for ongoing public review and comment.

# DRAFT

## CERTIFICATE OF ADOPTION

TOWN OF AMHERST, MASSACHUSETTS

SELECT BOARD

A RESOLUTION ADOPTING THE AMHERST

NATURAL HAZARD MITIGATION PLAN

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

WHEREAS, several public planning meetings were held between April and March 2009-2010 regarding the development and review of the Amherst Hazard Mitigation Plan; and

WHEREAS, the Amherst Hazard Mitigation Plan contains several potential future projects to mitigate hazard damage in the Town of Amherst, and

NOW, THEREFORE BE IT RESOLVED that the Amherst Select Board adopts the Amherst Hazard Mitigation Plan.

ADOPTED AND SIGNED this \_\_\_\_\_, 2010

\_\_\_\_\_, Chair  
Amherst Select Board

\_\_\_\_\_  
Amherst Select Board

\_\_\_\_\_  
Amherst Select Board

ATTEST

# APPENDICES

## Appendix A – Technical Resources

### 1) Agencies

Massachusetts Emergency Management Agency (MEMA).....	508/820-2000
Hazard Mitigation Section .....	617/626-1356
Federal Emergency Management Agency (FEMA) .....	617/223-4175
MA Regional Planning Commissions:	
Berkshire Regional Planning Commission (BRPC).....	413/442-1521
Cape Cod Commission (CCC).....	508/362-3828
Central Massachusetts Regional Planning Commission (CMRPC).....	508/693-3453
Franklin Regional Council of Governments (FRCOG).....	413/774-3167
Martha's Vineyard Commission (MVC).....	508/693-3453
Merrimack Valley Planning Commission (MVPC).....	978/374-0519
Metropolitan Area Planning Council (MAPC).....	617/451-2770
Montachusett Regional Planning Commission (MRPC).....	978/345-7376
Nantucket Planning and Economic Development Commission (NP&EDC).....	508/228-7236
Northern Middlesex Council of Governments (NMCOG).....	978/454-8021
Old Colony Planning Council (OCPC).....	508/583-1833
Pioneer Valley Planning Commission (PVPC).....	413/781-6045
Southeastern Regional Planning and Economic Development District (SRPEDD).....	508/823-1803
MA Board of Building Regulations & Standards (BBRS).....	617/227-1754
MA Coastal Zone Management (CZM).....	617/626-1200
DCR Water Supply Protection.....	617/626-1379
DCR Waterways.....	617/626-1371
DCR Office of Dam Safety.....	508/792-7716
DFW Riverways.....	617/626-1540
MA Dept. of Housing & Community Development.....	617/573-1100
Woods Hole Oceanographic Institute.....	508/457-2180
UMass-Amherst Cooperative Extension.....	413/545-4800
National Fire Protection Association (NFPA).....	617/770-3000
New England Disaster Recovery Information X-Change (NEDRIX – an association of private companies & industries involved in disaster recovery planning).....	781/485-0279
MA Board of Library Commissioners.....	617/725-1860
MA Highway Dept, District 2.....	413/582-0599
MA Division of Marine Fisheries.....	617/626-1520
MA Division of Capital & Asset Management (DCAM).....	617/727-4050
University of Massachusetts/Amherst.....	413/545-0111
Natural Resources Conservation Services (NRCS).....	413/253-4350
MA Historical Commission.....	617/727-8470
U.S. Army Corps of Engineers.....	978/318-8502
Northeast States Emergency Consortium, Inc. (NESEC).....	781/224-9876
National Oceanic and Atmospheric Administration: National Weather Service; Tauton, MA.....	508/824-5116
US Department of the Interior: US Fish and Wildlife Service .....	413/253-8200
US Geological Survey .....	508/490-5000

### 2) Mitigation Funding Resources

404 Hazard Mitigation Grant Program (HMGP) .....	Massachusetts Emergency Management Agency
406 Public Assistance and Hazard Mitigation .....	Massachusetts Emergency Management Agency

Community Development Block Grant (CDBG).....DHCD, also refer to RPC  
 Dam Safety Program.....MA Division of Conservation and Recreation  
 Disaster Preparedness Improvement Grant (DPIG) .....Massachusetts Emergency Management Agency  
 Emergency Generators Program by NESEC† .....Massachusetts Emergency Management Agency  
 Emergency Watershed Protection (EWP) Program.....USDA, Natural Resources Conservation  
 Service Flood Mitigation Assistance Program (FMAP) .....Massachusetts Emergency Management Agency  
 Flood Plain Management Services (FPMS).....US Army Corps of Engineers  
 Mitigation Assistance Planning (MAP).....Massachusetts Emergency Management Agency  
 Mutual Aid for Public Works.....Western Massachusetts Regional Homeland Security Advisory Council  
 National Flood Insurance Program (NFIP) † .....Massachusetts Emergency Management Agency  
 Power of Prevention Grant by NESEC† .....Massachusetts Emergency Management Agency  
 Roadway Repair & Maintenance Program(s).....Massachusetts Highway Department  
 Section 14 Emergency Stream Bank Erosion & Shoreline Protection .....US Army Corps of Engineers  
 Section 103 Beach Erosion.....US Army Corps of Engineers  
 Section 205 Flood Damage Reduction.....US Army Corps of Engineers  
 Section 208 Snagging and Clearing .....US Army Corps of Engineers  
 Shoreline Protection Program.....MA Department of Conservation and Recreation  
 Various Forest and Lands Program(s).....MA Department of Environmental Protection  
 Wetlands Programs .....MA Department of Environmental Protection

†NESEC – Northeast States Emergency Consortium, Inc. is a 501 (c) (3), not-for-profit natural disaster, multi-hazard mitigation and emergency management organization located in Wakefield, Massachusetts. Please, contact NESEC for more information.

† Note regarding National Flood Insurance Program (NFIP) and Community Rating System (CRS): The National Flood Insurance Program has developed suggested floodplain management activities for those communities who wish to more thoroughly manage or reduce the impact of flooding in their jurisdiction. Through use of a rating system (CRS rating), a community’s floodplain management efforts can be evaluated for effectiveness. The rating, which indicates an above average floodplain management effort, is then factored into the premium cost for flood insurance policies sold in the community. The higher the rating achieved in that community, the greater the reduction in flood insurance premium costs for local property owners. MEMA can provide additional information regarding participation in the NFIP-CRS Program.

### 3) Internet Resources

Sponsor	Internet Address	Summary of Contents
Natural Hazards Research Center, U. of Colorado	<a href="http://www.colorado.edu/litbase/hazards/">http://www.colorado.edu/litbase/hazards/</a>	Searchable database of references and links to many disaster-related websites.
Atlantic Hurricane Tracking Data by Year	<a href="http://wxp.eas.purdue.edu/hurricane">http://wxp.eas.purdue.edu/hurricane</a>	Hurricane track maps for each year, 1886 – 1996
National Emergency Management Association	<a href="http://nemaweb.org">http://nemaweb.org</a>	Association of state emergency management directors; list of mitigation projects.
NASA – Goddard Space Flight Center “Disaster Finder:	<a href="http://www.gsfc.nasa.gov/ndrd/disaster/">http://www.gsfc.nasa.gov/ndrd/disaster/</a>	Searchable database of sites that encompass a wide

		range of natural disasters.
NASA Natural Disaster Reference Database	<a href="http://ftpwww.gsfc.nasa.gov/ndrd/main/html">http://ftpwww.gsfc.nasa.gov/ndrd/main/html</a>	Searchable database of worldwide natural disasters.
U.S. State & Local Gateway	<a href="http://www.statelocal.gov/">http://www.statelocal.gov/</a>	General information through the federal-state partnership.
National Weather Service	<a href="http://nws.noaa.gov/">http://nws.noaa.gov/</a>	Central page for National Weather Warnings, updated every 60 seconds.
USGS Real Time Hydrologic Data	<a href="http://h20.usgs.gov/public/realtime.html">http://h20.usgs.gov/public/realtime.html</a>	Provisional hydrological data
Dartmouth Flood Observatory	<a href="http://www.dartmouth.edu/artsci/geog/floods/">http://www.dartmouth.edu/artsci/geog/floods/</a>	Observations of flooding situations.
FEMA, National Flood Insurance Program, Community Status Book	<a href="http://www.fema.gov/fema/csb.html">http://www.fema.gov/fema/csb.html</a>	Searchable site for access of Community Status Books
Florida State University Atlantic Hurricane Site	<a href="http://www.met.fsu.edu/explores/tropical.html">http://www.met.fsu.edu/explores/tropical.html</a>	Tracking and NWS warnings for Atlantic Hurricanes and other links
The Tornado Project Online	<a href="http://www.tornadoject.com/">http://www.tornadoject.com/</a>	Information on tornadoes, including details of recent impacts.
National Severe Storms Laboratory	<a href="http://www.nssl.uoknor.edu/">http://www.nssl.uoknor.edu/</a>	Information about and tracking of severe storms.
Independent Insurance Agents of America IIAA Natural Disaster Risk Map	<a href="http://www.iaa.iix.com/ndcmap.html">http://www.iaa.iix.com/ndcmap.html</a>	A multi-disaster risk map.
Earth Satellite Corporation	<a href="http://www.earthsat.com/">http://www.earthsat.com/</a>	Flood risk maps searchable by state.
USDA Forest Service Web	<a href="http://www.fs.fed.us/land">http://www.fs.fed.us/land</a>	Information on forest fires and land management.

## Appendix B – List of Acronyms

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FEMA	Federal Emergency Management Agency
MEMA	Massachusetts Emergency Management Agency
PVPC	Pioneer Valley Planning Commission
EPA	Environmental Protection Agency
DEP	Massachusetts' Department of Environmental Protection
NWS	National Weather Service
HMGP	Hazard Mitigation Grant Program
FMA	Flood Mitigation Assistance Program
SFHA	Special Flood Hazard Area
CIS	Community Information System
DCR	Massachusetts Department of Conservation and Recreation
FERC	Federal Energy Regulatory Commission
TRI	Toxics Release Inventory
FIRM	Flood Insurance Rate Map
NFIP	National Flood Insurance Program
CRS	Community Rating System
BOS	Select Board
BOH	Board of Health
LEPC	Local Emergency Planning Committee
EMD	Emergency Management Director
Con Com	Conservation Commission
EOC	Emergency Operations Center
CEM Plan	Comprehensive Emergency Management Plan
WMECO	Western Massachusetts Electric Company
HAZMAT	Hazardous Materials

## Appendix C – Natural Hazard Profiling Methodology<sup>4</sup>

In order to adeptly profile each of the hazards, a Hazard Identification and Analysis Matrix was prepared to organize the information that was gathered for this project.

The matrix is organized into the following sections: Type of Hazard, Location of Occurrence, Extent of Impacts, Previous Occurrences, Probability of Future Occurrence, and Hazard Index. The Hazard Index was completed to rank the hazards according to the frequency of occurrence and the amount of potential damage likely to occur. The Hazard Index forms the basis for concentrating the future mitigation efforts outlined in this plan. A description of each of the matrix categories is provided below. The completed Matrix is shown as Table 3.1.

### **Location of Occurrence**

The classifications are based on the area of the Town of Amherst that would potentially be affected by the hazard. The following scale was used:

<b>Table C.1: Location of Occurrence, Percentage of Town Impacted of Given Natural Hazard</b>	
<b>Location of Occurrence</b>	<b>Percentage of Town Impacted</b>
Large	More than 50% of the town affected
Medium	10 to 50% of the town affected
Small	Less than 10% of the town affected

### **Extent of Impacts**

The extent of direct impacts an affected area could potentially suffer were classified according to the following scale:

<b>Table C.2: Extent of Impacts, Magnitude of Multiple Impacts of Given Natural Hazard</b>	
<b>Extent of Impacts</b>	<b>Magnitude of Multiple Impacts</b>
Catastrophic	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	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.

<sup>4</sup> Source: information adapted from Town of Holden Beach, NC Community-Based Hazard Mitigation Plan, July 15, 2003, and Hyde County, NC Multi-Hazard Mitigation Plan, Sept 2002; and the Massachusetts Emergency Management Agency (MEMA).

Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.
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**Previous Occurrences**

Whether or not previous hazard events had occurred is also included, with detailed descriptions of specific previous occurrences within the hazard identification and vulnerability assessments, if necessary.

**Probability of Future Occurrence**

The likelihood of a future event for each natural hazard was classified according to the following scale:

<b>Table C.3: Frequency of Occurrence and Annual Probability of Given Natural Hazard</b>	
<b>Frequency of Occurrence</b>	<b>Probability of Future Event</b>
Very High	70-100% probability in the next year
High	40-70% probability in the next year
Moderate	10-40% probability in the next year
Low	1-10% probability in the next year
Very Low	Less than 1% probability in the next year

**Hazard Index**

The hazard index ratings were determined after assessing the frequency, location and impact classifications for each hazard. The hazard index ratings are based on a scale of 1 (highest risk) through 5 (lowest risk). The ranking is qualitative and is based, in part, on local knowledge of past experiences with each type of hazard. The size and impacts of a natural hazard can be unpredictable however; many of the mitigation strategies currently in place and many of those proposed for implementation can be applied to the expected natural hazards, regardless of their unpredictability.

The Hazard Ratings are labeled as follows:

- 1 – High Risk
- 2 – Medium-High Risk
- 3 – Medium Risk
- 4 – Medium Low Risk
- 5 – Low Risk



**Appendix D – Past & Potential Hazards/Critical Facilities Map**

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**Appendix E – Documentation of the Planning Process**

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**Amherst Hazard Mitigation Planning Committee**  
**Meeting #1 April 30 , 2009 1:00 pm**  
**Amherst Town Offices**  
**AGENDA**

**1) Introduction & Purpose of Committee**

**2) What is Hazard Mitigation Planning?**

**3) Begin Review of Draft Plan**

**4) Identify Critical Facilities** (to be shown on Base map)

- Identify Critical Facilities on Base Map. The following list contains items that should be clearly identified on the map, as they apply to your community:

- Emergency Operations Center- Nursing Homes
- Emergency Fuel Facilities                      - Elderly Housing
- Town/City Hall                                      - Day-Care Facilities
- Police Station                                        - Correctional Facilities
- Fire Station                                         - Other Congregate Care Facilities
- Public Works Garages                            - Shelters
- Water Treatment Facilities                      - Special Needs Populations
- Sewage Treatment Plants                        - Hazardous Materials Facilities
- Water Tower/Supply Pumps                    - Access Roads to Critical Facilities
- Power Plants                                        - Evacuation Routes
- Electrical Power Substations                 - Unique or Historic Resources
- Schools    - Commercial Economic Impact Areas
- Major Highways and Roadways               - Socio-Economic Impact Areas
- Bridges    - Areas with Second Language Needs
- Dams     - Hospitals

**and Evacuation Routes Potentially Affected By Hazard Areas**

**5. Hazards Analysis Methodology**

- Identify Past Hazard Occurrences, Location and Damage Assessments
- Hazard Identification and Analysis Worksheet

**6. Analyze Development Trends**

Review local zoning districts. Identify planned and proposed subdivisions and other common developments. Is planned development at risk by natural hazards? Are there mitigation measures that can be taken to prevent loss of life, property damage, and disruption of governmental services and general business activities.

**7. Review Vulnerability Assessment Methodology and Potential Loss Estimates**

**8. Schedule and Agenda for next meeting**

**TOWN CLERK: Please Post this notice per M.G. L. Chapter 39, Section 23, A-C**

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**Amherst Hazard Mitigation Planning Committee  
Meeting #2, December 22, 2009  
Amherst Town Offices  
AGENDA**

- 1. Finalize Critical Facilities and Evacuation Routes Potentially Affected By Hazard Areas**
- 2. Review Vulnerability Assessment Methodology and Potential Loss Estimates**
- 3. Establish Mitigation Goals and Objectives**
- 4. Schedule and Agenda for next meeting**

**TOWN CLERK: Please Post this notice per M.G. L. Chapter 39, Section 23, A-C**

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**Amherst Hazard Mitigation Planning Committee Meeting #3  
January 29, 2010 Amherst Town Offices  
AGENDA**

- 1. Finalize Revised Map of Critical Facilities**
- 2. Review plan and update/finalize past experience of hazards**
- 3. Develop Action Plan of Hazard Mitigation Strategies**

**CITY CLERK: Please Post this notice per M.G. L. Chapter 39, Section 23B**

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**Amherst Hazard Mitigation Planning Committee Meeting #4  
February 04, 2010 Amherst Town Offices  
AGENDA**

- 1. Final Review of plan**
- 2. Affirm Action Plan of Hazard Mitigation Strategies**
- 3. Review Plan Adoption and Implementation procedures**

**CITY CLERK: Please Post this notice per M.G. L. Chapter 39, Section 23B**

## Appendix F – Public Outreach

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### PRESS RELEASE

CONTACT: Catherine Miller, Pioneer Valley Planning Commission, (413) 781-6045

FOR IMMEDIATE RELEASE  
December 14, 2007

#### **Pre-Disaster Mitigation Plans Under Development**

The Pioneer Valley Planning Commission is beginning the process of drafting pre-disaster mitigation plans for the Communities of **Amherst**, Belchertown, Brimfield, Chicopee, Cummington, Goshen, Granby, Huntington, Palmer, Southampton, Springfield, Westfield, West Springfield, Westhampton, Williamsburg, and Worthington.

This planning effort is being undertaken to help communities assess the risks they face from natural hazards, identify action steps that can be taken to prevent damage to property and loss of life, and prioritize funding for mitigation efforts. A mitigation action is any action taken to reduce or eliminate the long-term risk to human life and property from hazards.

Individuals interested in their community's Hazard Mitigation plan can contact PVPC to request information on their community's plan development. In 2006-2007, PVPC facilitated development of plans for 16 communities in Hampshire and Hampden counties. Following completion of this second round of 16 hazard mitigation plans, PVPC will be developing a regional Hazard Mitigation plan. Communities with approved plans will be eligible for Hazard Mitigation Grant Program funding from the Massachusetts Emergency Management Agency.

These pre-disaster mitigation plans are being developed with assistance from the Pioneer Valley Planning Commission with funding provided by the Massachusetts Emergency Management Agency. For additional information, please contact Catherine Miller at (413) 781-6045 or [cmiller@pvpc.org](mailto:cmiller@pvpc.org).

## PRESS RELEASE

CONTACT: Catherine Miller, Pioneer Valley Planning Commission, (413) 781-6045

FOR IMMEDIATE RELEASE  
June 30, 2008

### **Pre-Disaster Mitigation Plans Public Comment Period**

The Pioneer Valley Planning Commission, in conjunction with local Hazard Mitigation Planning Committees, has produced drafts of Pre-disaster Mitigation Plans for the communities of Cummington, Palmer, Southampton, Westfield and Westhampton. Residents, business owners and other concerned parties of the named municipalities as well as of adjacent communities are encouraged to comment on each and all of the plans. The plans are currently able to be viewed on the Pioneer Valley Planning Commission website (under Projects and Plans) and the websites of the municipalities, where possible. Paper copies of the plans may be obtained at the Pioneer Valley Planning Commission offices at 26 Central Street, West Springfield or at the individual City/Town Halls. The plans will be available for the next 30 days.

Over the upcoming months pre-disaster mitigation plans will be developed for **Amherst**, Belchertown, Brimfield, Chicopee, Goshen, Granby, Huntington, Springfield, West Springfield, Williamsburg, and Worthington and will also be available for public comment as they are developed.

This planning effort is being undertaken to help communities assess the risks they face from natural hazards, identify action steps that can be taken to prevent damage to property and loss of life, and prioritize funding for mitigation efforts. A mitigation action is any action taken to reduce or eliminate the long-term risk to human life and property from hazards.

In 2006-2007, PVPC facilitated development of plans for 16 communities in Hampshire and Hampden counties. Following completion of this second round of 16 hazard mitigation plans, PVPC will be developing a regional Hazard Mitigation plan. Communities with approved plans are eligible for Hazard Mitigation Grant Program funding from the Massachusetts Emergency Management Agency.

These pre-disaster mitigation plans are being developed with assistance from the Pioneer Valley Planning Commission with funding provided by the Massachusetts Emergency Management Agency. For additional information, please contact Catherine Miller at (413) 781-6045 or [cmiller@pvpc.org](mailto:cmiller@pvpc.org).



*Catalyst for Regional Progress*

**PVPC**

**Timothy W. Brennan**, Executive Director

## **PRESS RELEASE**

CONTACT: Catherine Miller, Pioneer Valley Planning Commission, (413) 781-6045

FOR IMMEDIATE RELEASE

February 5, 2009

### **Pre-Disaster Mitigation Plans Public Comment Period**

The Pioneer Valley Planning Commission, in conjunction with local hazard mitigation planning committees, has produced drafts of pre-disaster mitigation plans for the communities of Huntington, Worthington, Granby, and Goshen. Residents, business owners, and other concerned parties of these municipalities and adjacent communities are encouraged to comment on these plans, which are currently available for viewing on PVPC's website at [www.pvpc.org](http://www.pvpc.org) (under Projects and Plans) and the websites of the municipalities, where possible. Paper copies of the plans may be obtained at the Pioneer Valley Planning Commission offices at 26 Central Street, West Springfield or at the individual city and town halls. The plans will be available for the next 30 days.

Starting this month pre-disaster mitigation plans will be developed for **Amherst**, Belchertown, Brimfield, Chicopee, Springfield, West Springfield, and Williamsburg, and will also be available for public comment as they are developed.

This planning effort is being undertaken to help communities assess the risks they face from natural hazards, identify action steps that can be taken to prevent damage to property and loss of life, and prioritize funding for mitigation efforts. A mitigation action is any action taken to reduce or eliminate the long-term risk to human life and property from hazards.

PVPC has previously facilitated development of plans for 21 communities in the Hampshire and Hampden county areas. Following completion of all 32 local hazard mitigation plans, PVPC will be developing a regional hazard mitigation plan. Communities with approved plans are eligible for Hazard Mitigation Grant Program funding from the Massachusetts Emergency Management Agency.

These pre-disaster mitigation plans are being developed with assistance from the Pioneer Valley Planning Commission with funding provided by the Massachusetts Emergency Management Agency. For additional information, please contact PVPC's Catherine Miller at (413) 781-6045 or [cmiller@pvpc.org](mailto:cmiller@pvpc.org).

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## **MEDIA RELEASE**

CONTACT: Catherine Ratté, Pioneer Valley Planning Commission, (413) 781-6045

FOR IMMEDIATE RELEASE  
October 26, 2009

### **Pre-Disaster Mitigation Plans Public Comment Period**

The Pioneer Valley Planning Commission, in conjunction with local hazard mitigation planning committees, has produced drafts of pre-disaster mitigation plans for the communities of Amherst, Belchertown, Brimfield, Chicopee, Springfield, West Springfield, and Williamsburg. Residents, business owners, and other concerned parties of these municipalities and adjacent communities are encouraged to comment on these plans, which are currently available for viewing on PVPC's website at [www.pvpc.org](http://www.pvpc.org) (under Projects and Plans). Paper copies of the plans may be obtained at the Pioneer Valley Planning Commission offices at 60 Congress Street, Springfield. The plans will be available for the next 30 days.

In addition, PVPC has produced a draft regional Hazard Mitigation plan for the Pioneer Valley, a copy of which is also available for public review and comment at [www.pvpc.org](http://www.pvpc.org).

This planning effort is being undertaken to help communities assess the risks they face from natural hazards, identify action steps that can be taken to prevent damage to property and loss of life, and prioritize funding for mitigation efforts. A mitigation action is



any action taken to reduce or eliminate the long-term risk to human life and property from hazards.

PVPC has previously facilitated development of plans for 25 communities in the Hampshire and Hampden county areas. Communities with approved plans are eligible for Hazard Mitigation Grant Program funding from the Massachusetts Emergency Management Agency.

These pre-disaster mitigation plans are being developed with assistance from the Pioneer Valley Planning Commission with funding provided by the Massachusetts Emergency Management Agency. For additional information, please contact PVPC's Catherine Ratté at (413) 781-6045 or [cratte@pvpc.org](mailto:cratte@pvpc.org).

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