The Town of Pelham
Hazard Mitigation Plan

Adopted by the Pelham Select Board on December 12, 2016

The Pelham Hazard Mitigation Committee

and

Pioneer Valley Planning Commission
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Acknowledgements

The Pelham Select Board extends special thanks to the Pelham Hazard Mitigation Planning Committee as follows:

Gary Thomann- Police Chief/Emergency Management Director
Jim Doubleday- Selectboard
Bill Pula- Board of Health
Ray Murphy- Fire Chief
Judy Eiseman- Planning Board
Lexi Dewey- Planning Board
Rick Adamcek-Highway Superintendent

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The Pioneer Valley Planning Commission

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1: PLANNING PROCESS

Introduction

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 Pelham 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, and updating a hazard mitigation plan every five years, 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.

Hazard Mitigation Committee

Updating the Town of Pelham's Hazard Mitigation plan involved a 6-member committee:

- Gary Thomann- Police Chief/Emergency Management Director
- Jim Doubleday- Selectboard
- Bill Pula- Board of Health
- Ray Murphy- Fire Chief
- Judy Eiseman- Planning Board (alternate- Lexi Dewey)
- Rick Adamcek-Highway Superintendent

The Hazard Mitigation Planning process update for the Town included the following tasks:

- Reviewing and incorporating existing plans and other information including changes in development in the last five years since the Town's first Hazard Mitigation planning process
- Updating the natural hazards that may impact the community from the previous plan
- 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 the community is currently implementing to protect against future disaster damages
- Identifying deficiencies in the current Hazard Mitigation strategies and establishing goals for updating, revising or adopting new strategies
- Adopting and implementing the final updated Hazard Mitigation Plan

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

Committee Meetings

Meetings of the Hazard Mitigation Committee, all of which took place at the Fire Training Room at the Pelham Public Safety Complex, were held on the dates listed below. Agendas for these meetings are included in Appendix B.

June 21, 2016
Work group meeting included hazard mitigation planning overview, identify and organizing of the planning team and an initial discussion of hazard identification and risk assessment.

June 29, 2016
Work group continued a discussion of hazard identification and risk, discussed existing hazard mitigation strategies, completed the FEMA capabilities assessment and prepared for the first public meeting.

July 5, 2016
Work group identified critical facilities in town, made edits to their critical facilities and past hazard map and began to consider future mitigation strategies to be included in this plan.

July 13, 2016
Work group finalized prioritized list of mitigation strategies, based on conversation at previous meeting. Work group reviewed revised vulnerability assessment, and reviewed map of location critical facilities and natural hazards.

July 20, 2016
Work group defined the implementation plan, reviewed the draft of the Hazard Mitigation Plan and prepared for the final public meeting.

Agendas and sign-in sheets for each meeting can be found in Appendix B. While not all members of the Hazard Mitigation Committee were able to attend each meeting, all members collaborated on the plan and were updated on progress by fellow Committee members after meetings occurred.

Participation by Stakeholders

A variety of stakeholders were provided with an opportunity to be involved in the update of the Pelham Hazard Mitigation Plan. The different categories of stakeholders that were involved, and the engagement activities that occurred, are described below.

Local and regional agencies involved in hazard mitigation activities and surrounding community engagement and input

The Pioneer Valley Planning Commission is a regional planning agency for 43 towns and cities in Massachusetts' Hampden and Hampshire Counties. PVPC regularly engages with the Town of Pelham as part of its regional planning efforts, which include the following:

- Developing the Pioneer Valley Regional Land Use Plan, Valley Vision 2, which advocates for sustainable land use throughout the region and consideration for the impact of flooding and other natural hazards on development.

- Developing the Pioneer Valley Climate Action and Clean Energy Plan, which assesses the impact that climate change will have on the region and recommends strategies for mitigation that can be implemented by local municipalities and businesses.

- Collaborating with state agencies, such as the Department of Conservation and Recreation, to maintain inventories of critical infrastructure throughout the region.

All of these PVPC initiatives considered the impact of natural hazards on the region and strategies for reducing their impact to people and property through hazard mitigation activities.

The facilitation of the Pelham Hazard Mitigation Plan by PVPC ensured that the information from these plans was incorporated into the Hazard Mitigation Planning process.

In addition, the Pioneer Valley Planning Commission is actively involved in the Western Region Homeland Security Advisory Council (WRHSAC). WHRSAC, which includes representatives from Western Massachusetts municipalities, Fire Departments, Public Works Departments, Police Departments, area hospitals and regional transit from throughout the four counties of western Massachusetts, is responsible for allocating emergency preparedness funding from the US Department of Homeland Security. The representatives of these disciplines who serve on the WRHSAC are charged with sharing the information discussed at meetings with their colleagues at their regular meetings. PVPC attends all WRHSAC meetings and all WRHSAC members are aware of the fact that Pelham was updating its Hazard Mitigation plan. Meetings of WRHSAC regularly involve discussion about how to improve emergency preparedness in western Massachusetts, and hazard mitigation activities are included in this discussion.

For the update of this Hazard Mitigation Plan, PVPC provided feedback from WRHSAC on regional mitigation activities and natural hazards pertaining to Pelham. This was the method through which WRHSAC was engaged in the planning process.

In addition, PVPC staff regularly present to their Executive Committee and Commission (representatives from the 43 cities and towns that comprise the Pioneer Valley, when new projects are launched and when funding opportunities are available). As result, all the communities in the region were informed of Pelham's Hazard Mitigation Plan update process and encouraged to comment.

PVPC staff included a summary article on the status of Hazard Mitigation planning in the region in the quarterly Regional Reporter that is mailed to area Chambers of Commerce, all member municipalities, area colleges and universities and other key stakeholders in the region. In this way, businesses, educational institutions and other key stakeholders were educated about and informed of Pelham's hazard mitigation planning work.

Agencies that have the authority to regulate development

The Pelham Planning Board is the primary Town agency responsible for regulating development in town. Feedback to the Planning Board was ensured through the participation of a planning board member on the Hazard Mitigation Committee. In addition, the Pioneer Valley Planning Commission, as a regional planning authority, works with all agencies that regulate development in Pelham, including the municipal entities listed above and state agencies, such as Department of Conservation and Recreation and MassDOT. This regular involvement ensured that during the development of the Pelham Hazard Mitigation Plan, the operational policies and any mitigation strategies or identified hazards from these entities were incorporated into the Hazard Mitigation Plan.

Participation by the Public, Businesses, and Neighboring Communities

Two public planning sessions were held as part of the update of the Pelham plan – on June 29, 2016 and July 20, 2016. Both meetings occurred after the Hazard Mitigation Committee had

provided input on hazards and mitigation strategies relevant to the community. Notice of both public meetings was posted at Pelham Town Hall in compliance with the Commonwealth of Massachusetts' open meeting law. Public meeting notices can be found in Appendix B.

On June 22, 2016, the Pioneer Valley Planning Commission sent a press release to relevant media outlets to announce that there would be a first public outreach meeting about the plan on June 29, 2016. This release was sent to those media identified by the Hazard Mitigation Committee as most relevant to the development of the plan. These media organizations can be found in Appendix B.

On July 13, 2016 PVPC sent out a press release indicating that a second public outreach meeting would take place on July 20, 2016, and also to inform the public that a draft of the Pelham Hazard Mitigation Plan had been placed on PVPC's website. A list of media organizations that were sent the second press release is included in Appendix B. The screen capture of PVPC's website showing the link to the press release can be found in Appendix B. The release also indicated that all residents, businesses and other concerned parties of Pelham were encouraged to comment on the plan by e-mailing or calling staff contacts at PVPC or the Town. In addition to the media release, information about the second public meeting was sent out to an active listserv in Pelham called Neighbors to Neighbors. The listserv is comprised of town residents and is used as a means of communication amongst them for discussing relevant events in town and for the pooling of resources to meet needs. The committee identified this as a good strategy for expanding potential engagement.

The Hazard Mitigation Committee determined that the most effective outreach strategy for engaging with the public, businesses and neighboring communities was through the media, and so this was the outreach strategy employed for reaching out to all three groups of stakeholders. The press release indicated that residents of Pelham were invited to attend the event, which was also intended to include representatives of businesses in Pelham and residents of neighboring communities.

Businesses and neighboring communities were also provided with an opportunity to provide feedback through the Pioneer Valley Planning Commission. PVPC is regularly involved in land use, transportation, and environmental planning initiatives in Pelham and surrounding communities. Regular feedback received from these other initiatives were incorporated into the hazard mitigation planning process. Neighboring communities that were provided with an opportunity to comment included municipalities that directly border Pelham, which are: Amherst, Belchertown, Shutesbury and New Salem.

Additional outreach to surrounding communities occurred through the regular quarterly newsletter that PVPC sends out to its member communities about its recent activities. In these articles, adjacent municipalities were encouraged to reach out to PVPC about hazard mitigation plans by e-mailing or calling staff contacts at PVPC. These notices are included in Appendix B.

Feedback was received from members of the public during the second public meeting. In general, attendees were really glad to see that the town was undertaking this planning process and agreed with how the hazards were ranked in the risk assessment. There were questions

about why hazardous material disasters, particularly oil train and truck spills/fires, were not considered in this plan. Participants were pleased with the strategies that the committee has chosen to pursue in this plan. Of greatest interest was the establishment of a shelter plan and a town-wide notification system. The group brainstormed a list of town groups and networks that could be used to disseminate information through and use as a means of getting people signed up for the notification system. These include the Neighbors to Neighbors Listserv, Friends of the Library, the Lions club, through the schools and at the monthly recycling event. This information was noted by the Emergency Management Director and will be used when the notification system is established and when information is ready to be distributed. Lastly, a community member suggested establishing a Citizen Emergency Response Team, which could be deployed during a disaster if town staff that live further away cannot make it to town. The EMD will explore the feasibility of this during the creation of the shelter plan.

Any future input received from the public, as well as any other stakeholders, will be incorporated into the plan during future regular updates. Public participation will be a critical component of the Hazard Mitigation Plan maintenance process. The Hazard Mitigation Committee will hold all future meetings in accordance with Massachusetts open meeting laws. In addition, the public will be invited to provide comments through e-mail. The comments will be reviewed by the Hazard Mitigation Committee and incorporated as appropriate.

Select Board Meeting

In 2016, the Select Board agreed to begin the process of developing a Hazard Mitigation Plan. Once the plan was provisionally approved by FEMA, the Select Board held a public hearing on the plan and then adopted it.

2: LOCAL PROFILE

Community Setting

Pelham is a small, pleasant town perched on the ridge that divides the Connecticut River's Pioneer Valley from Quabbin Reservoir and central Massachusetts. The eastern one-third of the town is state owned land, part of the Reservoir watershed. Almost one-third of Pelham's original land area is now part of the Quabbin Reservoir, which was constructed in the 1930's. Daniel Shays Highway, now part of Route 202, was built as part of the reservoir project.

The Pelham School System is the Town's largest employer.. Most employed persons work out of town at businesses, nearby colleges and the University of Massachusetts. Pelham is home to many retired people who enjoy the environment and cultural opportunities of the region.

Settled in 1739 by Scottish Immigrants, Pelham was incorporated as a town in 1743. Its most famous citizen was Capt. Daniel Shays, who led a year-long rebellion against the courts and state officials who were seizing farms for payment of debts of families made poor after the Revolution. Planned in the local meeting place, Conkey's Tavern, this rebellion of 1786 is credited with bringing about the Constitutional Convention held in Philadelphia in 1787. Pelham's Old Meeting House, built in 1743, is the oldest town hall in continuous use in the nation and is still the site of the Fall Town Meeting.

Pelham once had extensive fields and farms. Water powered grist and wooden turning mills dotted the streams. West Pelham served as a terminus of a regional electric trolley system, and was the site of the Orient Springs health resort and the first factory to produce bamboo fishing rods in the United States. Building stone was quarried from several locations in Town and shipped throughout the region. Old Chapel at the University of Massachusetts and Johnson Chapel at Amherst College are faced in Pelham stone.

Today most of Pelham is forestland laced with residences along 46 miles of roads. Large forest tracts in Pelham are owned by the Town of Amherst for drinking water supply, and by the University of Massachusetts and Amherst College for research and recreation. The Town has acquired several key tracts for conservation and passive recreation.

A tradition of pride and independence are exemplified even today. The Town Library currently houses 9,000 volumes and features a display on historic Pelham. The community has a volunteer fire department and its own police force.

Geography

Pelham is located in northeastern Hampshire County and is approximately 25 square miles in area. It is bordered by Amherst to the west, Belchertown to the east, New Salem to the west and Shutesbury to the north. Pelham lies 15 miles east of Northampton, the county seat of Hampshire County, and 91 miles west of Boston.

Population Characteristics

According to the U.S. Census, there are 1,350 residents (a 3.7% decrease since 2000) and a total of 597 housing units (a 7.3% increase since 2000). (American Community Survey 2009-14).

Climate

Pelham is located in northeastern Hampshire County, where annual rainfall averages 44 inches and is distributed throughout the year. In addition to rain, snowfall averages 40 inches per season. Prevailing winds from the south (and from the north/northwest to a lesser extent) reach their highest average speed during the month of April. In the past few decades, New England has seen an increase in the number of extreme rainfall events, defined as large amounts of rain in a short period of time. In Massachusetts, the increase since 1948 has been 81 percent (Environment America Research & Policy Center, 2012).

Development

Zoning

The Town of Pelham has one zoning district, Residential, and one overlay district, a Water Supply Protection Overlay district. The Water Supply Protection Overlay district affects all land within the town. The intent of the overall district was" to include all lands within the watersheds of surface water supplies and lands lying with the recharge areas of groundwater aquifers, including lands which recharge public and private wells.

The Planning Board is currently working with the Pioneer Valley Planning Commission on Village Center Zoning District, which could increase development and density in the center of Pelham. It could also allow for the development of commercial uses that currently do not exist in the town.

Current Development Trends

Historically, Pelham has been slow to develop because it was somewhat off the beaten track. As it is zoned entirely for residential development, the town has no businesses to offset property taxes—a situation that is causing angst among some residents at this time. Pelham remains as described in the 1971 Natural Resources Program of the Town of Pelham: "virtually devoid of industry or commerce, by-passed by major highways, long since abandoned for commercial agriculture, occupied largely by watershed lands, the town of Pelham is basically and essentially a forest. Roads are relatively few and the population . . . is largely concentrated along Amherst Road and in the West Pelham section."

However, the growth of the University of Massachusetts in the early 1970s resulted in development and change in Pelham. Throughout the 1980s Pelham attracted many new residents "wanting to live in a traditional, scenic New England community yet have access to jobs in the economically thriving Pioneer Valley" (Draft Growth Management Plan for the Town of Pelham 1988). Noting the years that houses in Pelham were built is useful to indicate the relatively peak periods of development in Pelham. Pelham's housing stock grew rapidly for a

brief period in the 1980s and some in the 1990s putting development pressure on its open space. However, growth has slowed and the concern now is how to protect additional open space when the cost of maintaining basic town services is increasingly difficult.

Between 2000 and 2014, Pelham saw its population decline by 3.7% to 1,350 people and its housing stock increase by 7.3% to 597 units.

National Flood Insurance Program Status

Pelham is not a participating member of the National Flood Insurance Program.

Infrastructure

Roads and Highways

Pelham has just over forty-five miles of roads which has meant that much of its backland open space has been protected from development due to inaccessibility and the cost of complying with town environmental and safety regulations. Despite the surge of growth in the 1980s, there have been no new subdivisions in over twenty-five years. Although Route 202 runs through the town, along much of its length development is precluded by the Quabbin Reservation on the eastern side of the road and many wetland areas on the western side.

Rail

There is no active rail service within Pelham. The closest rail facility is located in Northampton and provides Amtrak service through the Vermonter line.

Public Transportation

There is a PVTA bus line on Route 9, which crosses into the southwest corner of Pelham. The MAX regional intercity express bus service stops in Pelham. This transit service connects Worcester and Northampton, allowing users to connect to regional transit service and commuter services.

Public Drinking Water Supply

In the west Pelham area 30 percent of Pelham's total population is served by the neighboring Amherst water supply system, while the remaining 70 percent of Pelham's residents depend upon individual on site wells. There are four reservoirs located in the Pelham: Hill Reservoir, Hawley Reservoir, Intake Reservoir and part of the Quabbin Reservoir. The Hill, Hawley and Intake Reservoirs serve as a back-up to water supply for the town of Amherst and the Quabbin Reservoir supplies the Boston metropolitan region with drinking water.

Sewer Service

Most of the town is served by septic systems (only a small number of homes are tied into the Amherst sewer system) and much of the undeveloped land presents limitations for adequate septic systems under the revised Title 5 Code. Some new changes in available septic systems or regulations may make currently unbuildable land available even though by present standards they are marginal due to ledge or high ground water. The entire town is designated as a Water Supply Protection District, underscoring the need to protect public and private watershed lands in Pelham and surrounding communities.

Schools

Public schools serving Pelham include Pelham Elementary School and Amherst Regional Middle and High School.

Natural Resources

Pelham lies just west of the Quabbin Reservoir and is bounded by Amherst on the west, Shutesbury and New Salem to the north, and on the south by Belchertown. The town is almost entirely forested, with a significant network of streams and associated "headwater" and other wetlands resources. Of its total area of 16,896 acres approximately 15,000 are in woodland with development scattered along the major roads. The Pioneer Valley Planning Commission's map from Valley Vision 2: the New Regional Land Use Plan for the Pioneer Valley (2007) demonstrates that Pelham is expected to play a protective role for the region’s environment.

Surface Water

By far the most important water resource is the Quabbin Reservoir. Nearly 6,000 acres in Pelham are controlled and managed by the Department of Conservation and Recreation (DCR) in conjunction with the Massachusetts Water Resources Authority (MWRA). The Quabbin watershed dominates the resource situation east of Route 202. In addition, the town of Amherst owns about 1500 acres of watershed land in Pelham including three reservoirs in the central plateau. The remainder of the town is watershed for private or public water supply in Shutesbury, Belchertown, Springfield and Pelham itself.

Streams in Pelham are also important elements of the town's water resources. The western two-thirds of the town drains to the west. Significant water courses include: Amethyst Brook and its tributaries Dunlop, Harris and Buffam Brooks, draining the large central portion of town, and Heatherstone Brook, draining land in the northwesterly corner of town into Adams Brook in Amherst. The eastern one third of the town drains from Route 202 east to the Quabbin Reservoir by way of several small streams – Briggs, Purgee, and Gulf Brooks and the larger Cadwell Creek. Jabish Brook drains a small section southward along Route 202 (Natural Resources Program 1971) in the spring. Except along the few town-protected portions of streams, public access is either poor or informal.

Ponds are few and scattered with only limited potential for outdoor recreation, and the three Amherst Reservoirs–Hill, Hawley and Intake—in the Amethyst Brook and Harris Brook systems are off limits to public uses other than hiking and hunting because of the potential for contamination resulting from more intensive activities. The public has lost the access it once had to the private impoundment on Amethyst Brook in West Pelham, leaving the town without a permitted local swimming spot.

Pelham has approximately 50 documented vernal pools and more remain undocumented. Among these vernal pools 36 are state-certified and an additional 15 pools await state certification. These are key ecological community types for a number of important common and rare species. Additionally, clusters of vernal pools are contained within the 1830 forest blocks suggesting a number of these wetlands are located within forested areas with moderate levels of agricultural disturbance and elevated levels of diversity.

Aquifers

The land in Pelham serves a vital regional and state-wide water supply function. Most of the land in Pelham is either an aquifer recharge area, or is a surface watershed draining to a water supply reservoir, or both. The remainder is a recharge area for private wells. Drinking water protection is one of the primary functions of open space in Pelham. Pelham works with surrounding towns to implement local regulations consistent with the goal of regional water supply protection

Floodways

Pelham has approximately 112 acres (.06%) of land within the 100-year floodplain and no land within the 500-year flood. Small scale flooding of residential cellars of homes built in or near wetland buffer zones has been the only type of flood problem known to have occurred in town. The following areas are more susceptible to flooding, but are located entirely or mostly within protected lands:

- Areas around the northernmost section of Amethyst Brook
- Area near Soule Swamp south of Knight's Corner
- Immediate areas around the Hill, Hawley and Intake Reservoirs
- Area along the shore of the Quabbin Reservoir.

Forests

Pelham is predominately a forested landscape. This large amount of woodland provides habitat to a great variety of wildlife. Logging operations continue to have a significant impact in town. The town's forests have many stands that originated early in the century following an era of heavy cutting; much of this is reaching or has reached merchantable size. Areas of old growth forest are few and are concentrated along stream ravines. Since a good deal of forest land is under Chapter 61 protection, requiring owners to file management plans with the Commonwealth and the Conservation Commission, a significant check exists on forestry operations. Holdings of W.D. Cowls, Inc., a forest-products company, are the largest single hold of private forest lands in the town. Other large forest blocks of interest for protection or

connection to other protected land include areas off Buffam Road, in the hills between Mt. Orient and Poverty Mountain, in the tract threaded by Amethyst and Buffam Brooks bounded by Shutesbury, Boyden, Buffam, North Valley, and Amherst Roads and between Arnold Road and Butter Hill Road. The Conservation Commission monitors cutting operations carefully to see that they are in compliance with the required plans. Additionally, cutting is overseen by service foresters at the Department of Conservation to ensure compliance with the Forest Cutting Act.

At the 2016 Town Meeting, the town voted to preserve 185 acres of forested land near the Amethyst and Buffam Brooks (bounded by Shutesbury, Boyden, Buffman, North Valley and Amherst Roads). The Community Forest Project will be used to showcase sustainable forestry practices.

Wetlands

Pelham wetlands include significant "upland" or "headwater" wetlands not protected by the state's Wetland Protection Act but which are subject to the jurisdiction of the Conservation Commission through the town's local Wetlands Bylaw.

3: HAZARD IDENTIFICATION AND ANALYSIS

The following section includes a summary of disasters that have affected or could affect Pelham. Historical research, conversations with local officials and emergency management personnel, available hazard mapping and other weather-related databases were used to develop this list.

The Hazard Mitigation Committee referred to the 2013 Massachusetts Hazard Mitigation list of hazards as a starting point for determining the relevant hazards in Pelham. The table below illustrates a comparison between the relevant hazards in the state plan and in Pelham's plan.

Comparison of Hazard identified in the 2013 Massachusetts Hazard Mitigation Plan and the Pelham Hazard Mitigation Plan	
2013 Massachusetts Hazard Mitigation Plan	**Town of Pelham Relevance**
Coastal Hazards	The Town of Pelham is not located on the coast and therefore not at risk of coastal hazards.
Dam Failure	Dam Failure is a risk to Pelham.
Drought (Severe Weather)	Drought is a risk to Pelham.
Earthquake	Earthquakes are a risk to Pelham.
Extreme Temperature (Severe Weather)	Extreme Temperature is not considered a risk to Pelham.
Flood (including Ice Jam)	Flooding is a risk to Pelham
High Wind (Severe Weather)	High Wind is a risk to Pelham and is included in the Severe Thunderstorm/Wind/Tornado/Microburst category.
Hurricane/Tropical Storm	Hurricanes are a risk to Pelham.
Ice Storm (Severe Winter Weather)	Ice Storms are a risk to Pelham and included in the category Severe Snowstorms/Ice Storms.
Landslide	Landslides are a risk to Pelham.
Major Urban Fires	Major Urban Fires are not considered a risk to Pelham. However, wildfires and brush fires are considered a risk.
Nor'easter	Nor'easters are a risk to Pelham and included in the category Severe Snowstorms/Ice Storms.
Snow & Blizzard (Severe Winter Weather)	Snow & Blizzards are a risk to Pelham and included in the category Severe Snowstorms/Ice Storms.
Thunderstorm (Severe Weather)	Thunderstorms are a risk to Pelham and included in the category Severe Thunderstorms/Wind/Tornadoes/ Microbursts.
Tornado (Severe Weather)	Tornadoes are a risk to Pelham and included in the category Severe Thunderstorms/Wind/Tornadoes/ Microburst.
Tsunami	The Town of Pelham is not located on the coast or near the coast for tsunami to be a risk.
Wildland Fire	Wildland Fire is considered a risk to the Town of Pelham.

Natural Hazard Analysis Methodology

This chapter examines the hazards in the Massachusetts State Hazard Mitigation Plan which are identified as likely to affect Pelham. The analysis is organized into the following sections: Hazard Description, Location, Extent, Previous Occurrences, Probability of Future Events, Impact, and Vulnerability. A description of each of these analysis categories is provided below.

Hazard Description

The natural hazards identified for Pelham are: floods, severe snowstorms/ice storms, hurricanes, severe thunderstorms / wind / tornadoes, wildfire/brushfire, earthquakes, dam failure / levee breech, and drought. Many of these hazards result in similar impacts to a community. For example, hurricanes, tornadoes and severe snowstorms may cause wind-related damage.

Location

Location refers to the geographic areas within the planning area that are affected by the hazard. Some hazards affect the entire planning area universally, while others apply to a specific portion, such as a floodplain or area that is susceptible to wild fires. Classifications are based on the area that would potentially be affected by the hazard, on the following scale:

Percentage of Town Impacted by Natural Hazard	
Land Area Affected by Occurrence	**Percentage of Town Impacted**
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

Extent describes the strength or magnitude of a hazard. Where appropriate, extent is described using an established scientific scale or measurement system. Other descriptions of extent include water depth, wind speed, and duration.

Previous Occurrences

Previous hazard events that have occurred are described. Depending on the nature of the hazard, events listed may have occurred on a local, state-wide, or regional level.

Probability of Future Events

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

Frequency of Occurrence and Annual Probability of Given Natural Hazard	
Frequency of Occurrence	**Probability of Future Events**
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

Impact

Impact refers to the effect that a hazard may have on the people and property in the community, based on the assessment of extent described above. Impacts are classified according to the following scale:

Impacts, Magnitude of Multiple Impacts of Given Natural Hazard	
Impacts	**Magnitude of Multiple Impacts**
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.
Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.

Vulnerability

Based on the above metrics, a hazard index rating was determined for each hazard. The hazard index ratings are based on a scale of 1 through 5 as follows:

1 – Very high risk
2 – High risk
3 – Medium risk
4 – Low risk
5 – Very low 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.

Hazard Identification and Risk Analysis				
Type of Hazard	**Location of Occurrence**	**Probability of Future Events**	**Impact**	**Hazard Risk Index Rating**
Flooding	Medium	High	Limited	2-High
Severe Snowstorms/Ice Storms	Large	Very High	Critical	2-High
Severe Thunderstorms/ Winds/Tornadoes/ Microbursts	Severe Thunderstorms/ Winds: Large Tornadoes/ Microbursts: Medium	Severe Thunderstorms/ Winds: High Tornadoes/ Microbursts: Low	Limited	Severe Thunderstorms/ Winds: 3-Medium Tornadoes: 5-Very Low Microbursts: 4-Low
Hurricanes	Large	Moderate	Critical	2-High
Wildfire / Brushfire	Large	Low	Minor	4-Low
Earthquakes	Large	Very Low	Limited	5- Very Low
Dam Failures	Small	Very Low	Minor	5- Very Low
Drought	Large	Low	Minor	5- Very Low
Landslides	Small	Moderate	Minor	3- Medium

Flooding

Hazard Description

There are three major types of storms that can generate flooding in Pelham:

- *Continental storms* are typically low-pressure systems that can be either slow or fast moving. These storms originate from the west and occur throughout the year.
- *Coastal storms,* also known as nor'easters, usually occur in late summer or early fall and originate from the south. The most severe coastal storms, hurricanes, occasionally reach Massachusetts and generate very large amounts of rainfall.
- *Thunderstorms* form on warm, humid summer days and cause locally significant rainfall, usually over the course of several hours. These storms can form quickly and are more difficult to predict than continental and coastal storms.

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.

Location

Pelham has approximately 112 acres (.06%) of land within the 100-year floodplain and no land within the 500-year flood. The following areas are most susceptible to flooding in the town:

- Areas around the northernmost section of Amethyst Brook
- Area near Soule Swamp south of Knight's Corner
- Immediate areas around the Hill, Hawley and Intake Reservoirs
- Area along the shore of the Quabbin Reservoir.
- Soule Swap near Packardville Road

Undersized or blocked culverts also create localized flooding in the following areas:

- Meetinghouse Road
- Quarry Road
- North Valley Road
- Harkness Road

Based on these locations, flooding has a "medium" location of occurrence, with 10 to 50% percent of the land area affected.

Extent

Floods can be classified as one of two types: flash floods and general floods.

Flash floods are the product of heavy, localized precipitation in a short time period over a given location. 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).

General floods may last for several days or weeks and are caused by precipitation over a longer time period in a particular river basin. 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).

The average annual precipitation for Pelham and surrounding areas in western Massachusetts is 46 inches.

Previous Occurrences

Hurricane Irene and Super storm Sandy both caused limited flooding in Pelham. The storms caused wash outs of a few of the town's dirt roads. Flooding from severe rainfall has caused roads to wash out across town. Most recently, Amherst Road washed out and required re-construction. As part of the re-construction process, better drainage was included to prevent this from happening in the future.

Probability of Future Events

Based on previous occurrences, the probability of flooding in Pelham is "low," with a 1 to 10 percent probability in any given year. Flooding frequencies for the various floodplains in Pelham are defined by FEMA as the following:

- 10-year floodplain – 10 percent chance of flooding in any given year
- 25-year floodplain – 2.5 percent chance of flooding in any given year
- 100-year floodplain – 1 percent chance of flooding in any given year
- 500-year floodplain – 0.2 percent chance of flooding in any given year

Climate scientists predict that in the next few decades, climate change will increase the frequency and intensity of all storms that can cause flooding. Currently, floods are the most costly natural hazard in the United States, and climate change will only increase this damage. More information about the effect of Climate Change can be found in the Pioneer Valley

Planning Commission's Climate Action Plan, available at www.sustainableknowledgecorridor.org.

The Massachusetts State Climate Change Adaptation Report has additional information about the impact of climate change and can be accessed at www.mass.gov/eea/air-water-climate-change/climate-change/climate-change-adaptation-report.html.

Impact

The impact of a flood event would be limited in Pelham .This equates to approximately 10 percent or more of property in affected area damaged.

To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $172, 092,900, is used. An estimated 10 percent of damage would occur to 20 percent of structures, resulting in a total of $3,441,858 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above analysis, Pelham faces a vulnerability of "2- High" from flooding.

Most of Pelham's land in the floodplain is undeveloped, and therefore minimal properties are vulnerable to flooding. Localized flooding caused by undersized culverts washes out local roads annually. This can make travel through town difficult and can be costly to repair. None of the town's critical facilities are located in areas that are prone to flooding. Most evacuation routes would not be vulnerable to flooding, except for route 202 near the Jabish Brook.

Severe Snowstorms / Ice Storms

Hazard Description

Snow is characterized as frozen precipitation in the form of six-sided ice crystal. In order for snow to occur, temperatures in the atmosphere (from ground level to cloud level) must be at or below freezing. The strongest form of a severe snow storm is a blizzard. Blizzards are characterized by frequent wind gusts above 35 miles per hour, limited to no visibility due to falling snow and extreme cold that lasts longer than three hours.

Ice storms are liquid rain that falls and freezes upon contact with cold objects. There must be an ice build-up of greater than ¼ inch for it to be considered an ice storm. When more than a ½ inch of ice build-up is forecasted a winter storm warning can be triggered.

Severe winter storms can pose a significant risk to property and human life. The rain, freezing rain, ice, snow, cold temperatures and wind associated with these storms can cause the following hazards:

- Disrupted power and phone service
- Unsafe roadways and increased traffic accidents
- Infrastructure and other property are also at risk from severe winter storms and the associated flooding that can occur following heavy snow melt
- Tree damage and fallen branches that cause utility line damage and roadway blockages
- Damage to telecommunications structures
- Reduced ability of emergency officials to respond promptly to medical emergencies or fires
- Elderly are affected by extreme weather

Location

The entire town of Pelham is susceptible to severe snowstorms and ice storms. Because these storms occur regionally, they impact the entire town. As a result, the location of occurrence is “large,” with over 50 percent of land area affected.

Because Pelham is highly forested, there are not many places where snow drifts are a major issue. Amherst Road and Shutesbury Road have experienced some drifting that occasionally limits travel to one lane. There are also no site specific issues with ice build up on roads.

Extent

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 are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. The aerial distribution of snowfall and population information are combined in an equation that calculates a NESIS score which 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.

Northeast Snowfall Impact Scale Categories		
Category	**NESIS Value**	**Description**
1	1—2.499	Notable
2	2.5—3.99	Significant
3	4—5.99	Major
4	6—9.99	Crippling
5	10.0+	Extreme

Source: http://www.ncdc.noaa.gov/snow-and-ice/rsi/nesis

Previous Occurrences

New England generally experiences at least one or two severe winter storms each year with varying degrees of severity. Severe winter storms typically occur during January and February; however, they can occur from late September through late April.

The Hazard Mitigation Committee identified the following as storms that have impacted Pelham in recent history:

- October 2011- Heavy snowfall before trees had lost their leaves cause major power outages across Western Massachusetts. Parts of Pelham were without power for close to five days.
- Winter 2009- A severe ice storm caused widespread power outages in the town. Route 202 was also damaged.
- Winter of 1978 and 1996- Heavy snow storms caused power outages and made clearing the roads of snow challenging.

Based on data available from the National Oceanic and Atmospheric Administration, there are 47 winter storms since 1958 that have registered on the NESIS scale. Of these, approximately 26 storms resulted in snow falls in the Pioneer Valley of at least 10 inches. These storms are listed in the table on the next page, in order of their NESIS severity.

Winter Storms Producing Over 10 inches of Snow in the Pioneer Valley, 1958-2013			
Date	NESIS Value	NASIS Category	NESIS Classification
3/12/1993	13.2	5	Extreme
3/2/1960	8.77	4	Crippling
2/15/2003	7.5	4	Crippling
2/2/1961	7.06	4	Crippling
1/21/2005	6.8	4	Crippling
1/19/1978	6.53	4	Crippling
12/25/1969	6.29	4	Crippling
2/10/1983	6.25	4	Crippling
2/14/1958	6.25	4	Crippling
2/5/1978	5.78	3	Major
2/23/2010	5.46	3	Major
2/8/1994	5.39	3	Major
1/9/2011	5.31	3	Major
2/18/1972	4.77	3	Major
12/11/1960	4.53	3	Major
2/7/2013	4.35	3	Major
2/22/1969	4.29	3	Major
1/18/1961	4.04	3	Major
2/8/1969	3.51	2	Significant
2/5/1967	3.5	2	Significant
4/6/1982	3.35	2	Significant
3/4/2013	3.05	2	Significant
3/15/2007	2.54	2	Significant
3/31/1997	2.29	1	Notable
2/2/1995	1.43	1	Notable
1/25/1987	1.19	1	Notable

Source: http://www.ncdc.noaa.gov/snow-and-ice/rsi/nesis

Probability of Future Events

Based upon the availability of records for Hampshire County, the likelihood that a severe snow storm will hit Pelham in any given year is “Very High," or a 70 to 100 percent probability in any given year.

Research on climate change indicates that there is great potential for stronger, more frequent storms as the global temperature increases. More information about the effect of Climate

Change can be found in the Pioneer Valley Planning Commission's Climate Action Plan, available at www.sustainableknowledgecorridor.org.

The Massachusetts State Climate Change Adaptation Report has additional information about the impact of climate change and can be accessed at www.mass.gov/eea/air-water-climate-change/climate-change/climate-change-adaptation-report.html.

Impact

The impact of an event would be "critical," with more than 25 percent of property in the affected area damaged. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all residential property in town, $172,092,900, is used.

An estimated 25 percent of damage would occur to 10 percent of structures, resulting in a total of $4,302,322 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above assessment, Pelham faces a "2-High" vulnerability from severe snow storms and ice storms. Based on local knowledge and expertise on the local Hazard Mitigation Committee, ice storms are expected to cause greater damage than severe snow.

The entire town is vulnerable to the impacts of severe snow and ice. The critical facility structures in town have been designed with pitched roofs, negating the risk of roof collapse from heavy snow loads. The town's energy and communication infrastructure could be vulnerable to heavy snow or ice, which has been known to cause power outages across the region. Ice buildup on roadways has made winter travel challenging in the past, but as the town reconstructs roads they have been implementing road designs that minimize that build up.

Hurricanes / Tropical Storms

Hazard Description

Hurricanes are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. The primary damaging forces associated with these storms are high-level sustained winds and heavy precipitation. Hurricanes are violent rainstorms with strong winds that can reach speeds of up to 200 miles per hour and which generate 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.

Location

Because of the hazard's regional nature, all of Pelham is at risk from hurricanes and tropical storms, meaning the location of occurrence is "large," with over 50 percent of land area affected. Ridge tops are more susceptible to wind damage.

Extent

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Hurricane Wind Scale, which rates hurricane wind intensity on a scale of 1 to 5, with 5 being the most intense.

Saffir-Simpson Scale	
Category	**Maximum Sustained Wind Speed (MPH)**
1	74–95
2	96–110
3	111–129
4	130–156
5	157 +

Source: National Hurricane Center, 2012

Previous Occurrences

Hurricanes that have affected Pelham are shown in the following table.

Major Hurricanes and Tropical Storms Affecting Pelham		
Hurricane/Storm Name	**Year**	**Saffir/Simpson Category (when reached MA)**
Great Hurricane of 1938	1938	3
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
Irene	2011	Tropical Storm
Sandy	2012	Super Storm

Source: National Hurricane Center, 2012

While Hurricane Brenda tracked directly through Pelham, it and these other hurricanes and tropical storms did not cause any significant damage to Pelham. Most recently Hurricane Irene and Super Storm Sandy caused localized flooding and road washouts in Pelham.

Probability of Future Events

Pelham'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. Based upon past occurrences, it is reasonable to say that there is a "moderate" probability of hurricanes or tropical storms, or a 10 to 40 percent probability in any given year.

Impact

A description of the damages that could occur due to a hurricane is described by the Saffir-Simpson scale, as shown below.

Hurricane Damage Classifications			
Storm Category	**Damage Level**	**Description of Damages**	**Wind Speed (MPH)**
1	MINIMAL Very dangerous winds will produce some damage	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage. An example of a Category 1 hurricane is Hurricane Dolly (2008).	74-95
2	MODERATE Extremely dangerous winds will cause extensive damage	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings. An example of a Category 2 hurricane is Hurricane Francis in 2004.	96-110
3	EXTENSIVE Devastating damage will occur	Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland. An example of a Category 3 hurricane is Hurricane Ivan (2004).	111-129
4	EXTREME Catastrophic damage will occur	More extensive curtain wall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland. An example of a Category 4 hurricane is Hurricane Charley (2004).	130-156
5	CATASTROPHIC Catastrophic damage will occur	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required. An example of a Category 5 hurricane is Hurricane Andrew (1992).	157+

The Town of Pelham faces a “Critical” impact from hurricanes, with more than 25% percent of property in the affected area damaged.

To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $172,092,900 is used. Wind damage of 5 percent with 10 percent of structures damaged would result in an estimated $860,464 of damage. Estimated flood damage to 10 percent of the structures with 20 percent damage to each structure would result in $3,441,858 of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above analysis, Pelham faces a "2-High" vulnerability from hurricanes and tropical storms.

The entire town would be vulnerable to the impact of a hurricane. Areas prone to flooding are particularly vulnerable. Additionally high winds could impact the town’s communication and energy infrastructure. The local Hazard Mitigation Committee is also unsure about whether the town’s older buildings including the Department of Public Works, Town Hall and historic buildings will withstand strong winds that can accompany hurricanes, due to their age and corresponding design standards.

Severe Thunderstorms / Wind / Tornadoes/Microbursts

Hazard Description

A thunderstorm is a storm with lightning and thunder produced by a cumulonimbus cloud, usually producing gusty winds, heavy rain, and sometimes hail. Effective January 5, 2010, the NWS modified the hail size criterion to classify a thunderstorm as 'severe' when it produces damaging wind gusts in excess of 58 mph (50 knots), hail that is 1 inch in diameter or larger (quarter size), or a tornado (NWS, 2013).

Wind is air in motion relative to surface of the earth. For non-tropical events over land, the NWS issues a Wind Advisory (sustained winds of 31 to 39 mph for at least 1 hour or any gusts 46 to 57 mph) or a High Wind Warning (sustained winds 40+ mph or any gusts 58+ mph). For non-tropical events over water, the NWS issues a small craft advisory (sustained winds 25-33 knots), a gale warning (sustained winds 34-47 knots), a storm warning (sustained winds 48 to 63 knots), or a hurricane force wind warning (sustained winds 64+ knots). For tropical systems, the NWS issues a tropical storm warning for any areas (inland or coastal) that are expecting sustained winds from 39 to 73 mph. A hurricane warning is issued for any areas (inland or coastal) that are expecting sustained winds of 74 mph. Effects from high winds can include downed trees and/or power lines and damage to roofs, windows, etc. High winds can cause scattered power outages. High winds are also a hazard for the boating, shipping, and aviation industry sectors.

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 eastern Hampshire County. High wind speeds, hail, and debris generated by tornadoes can result in loss of life, downed trees and power lines, and damage to structures and other personal property.

Microbursts are sudden down bursts of air that that funnel air directly down until it hits the ground and disperses outwards. Microbursts most commonly occur during strong thunderstorms. The scale and suddenness of microbursts make them difficult to predict with certainty, but it is possible to forecast the conditions that make microbursts much more likely. The high winds associated with microbursts can knock over full grown trees, damage buildings and are especially problematic for aircrafts.

Location

As per the Massachusetts Hazard Mitigation Plan, the entire Town is at risk of high winds, severe thunderstorms, and tornadoes. However, the actual area that would be affected by these hazards is "medium," or 10 to 50 percent of total land area.

Extent

An average thunderstorm is 15 miles across and lasts 30 minutes; severe thunderstorms can be much larger and longer. Southern New England typically experiences 10 to 15 days per year with severe thunderstorms. Thunderstorms can cause hail, wind, and flooding.

Microbursts are typically less than three miles across. They can last anywhere from a few seconds to several minutes. Microbursts cause damaging winds up to 170 miles per hour in strength and can be accompanied by precipitation.

Tornadoes are measured using the enhanced F-Scale, shown with the following categories and corresponding descriptions of damage:

Enhanced Fujita Scale Levels and Descriptions of Damage			
EF-Scale Number	**Intensity Phrase**	**3-Second Gust (MPH)**	**Type of Damage Done**
EF0	Gale	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	Moderate	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	Significant	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	Severe	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	Devastating	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.

Rainfall records for a 24-hour period and per month are listed below:

Rainfall Records for Pelham, MA		
Month	**24-Hour Record**	**Monthly Record**
January	2.8"	8.9"
February	3.23"	7.68"
March	2.8"	7.72"
April	3.55"	8.75"
May	3.62"	11.54"
June	3.74"	10.4"
July	4.33"	9.73"
August	7.56"	18.68"
September	7.68"	3.23"
October	3.39"	9.06"
November	2.44"	7.56"
December	2.99"	7.25"

Source: http://www.myforecast.com/bin/climate.m?city=571506&metric=false

The extent of hail that can be present in severe thunderstorms can be found in the table below.

Hail Extent	
Hail Size	**Object Analog**
.50	Marble, moth ball
.75	Penny
.88	Nickel
1.00	Quarter
1.25	Half dollar
1.50	Walnut, ping pong
1.75	Golf ball
2.00	Hen egg
2.50	Tennis ball
2.75	Baseball
3.00	Tea cup
4.00	Grapefruit
4.50	Softball

Source: http://www.spc.noaa.gov/misc/tables/hailsize.htm

Previous Occurrences

Because thunderstorms and wind affect the town regularly on an annual basis, there are not significant records available for these events. As per the Massachusetts Hazard Mitigation Plan, there are approximately 10 to 30 days of thunderstorm activity in the state each year. Most occur in the late afternoon and evening hours, when the heating is the greatest. The most common months are June, July, and August, but the Great Barrington, MA tornado (1995) occurred in May and the Windsor Locks, CT tornado (1979) occurred in October.

Within Massachusetts, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester. In 2011, a tornado ranked F3 (Severe Damage) on the Fujita Scale of Tornado Intensity, blew through the towns of West Springfield, Westfield, Springfield, Monson, Wilbraham, Brimfield, Sturbridge, and Southbridge. The tornado and related storm killed 3 people and resulted in hundreds of injuries across the state. Nine incidents of tornado activity (F3 or less) have occurred in Hampshire County since 1954 and no known tornadoes have touched down in Pelham.

On average, since 1993, there have been between 5-6 severe thunderstorms per year (defined as with winds over 50 miles per hour) in the region around Pelham.

The Hazard Mitigation Committee was aware of two microbursts in the last 20 years. One occurred along Amherst Road and the other along Harkness Road. Neither microburst resulted in damage to structures, but trees and power lines were impacted.

Probability of Future Events

One measure of tornado activity is the tornado index value. It is calculated based on historical tornado events data using USA.com algorithms. It is an indicator of the tornado level in a region. A higher tornado index value means a higher chance of tornado events. Data was used for Hampshire County to determine the Tornado Index Value as shown in the table below.

Tornado Index for Hampshire County	
Hampshire County	125.73
Massachusetts	87.60
United States	136.45

Source: USA.com, http://www.usa.com/hampshire-county-ma-natural-disasters-extremes.htm

Based upon the available historical record, the estimated probability of a tornado or microburst in Pelham is "low," or between 1 and 10 percent in any given year. As per the Massachusetts Hazard Mitigation Plan, there are approximately 10 to 30 days of thunderstorm activity in the state each year. Thus, there is a “high” probability (40 percent to 70 percent change in any given year) of a severe thunderstorm or winds affecting the town.

Impact

Overall, the Town of Pelham faces a “limited” impact from severe thunderstorms, winds, or tornadoes, with 10 percent or more of the town affected. The potential for locally catastrophic damage is a factor in any severe weather event. In Pelham, a tornado that hit residential areas would leave much more damage than a tornado with a travel path that ran along the town’s forested areas, where little settlement has occurred. Most buildings in town have not been built

to Zone 1, Design Wind Speed Codes, because most of the town's housing was built before the first edition of the Massachusetts State Building Code went into effect on January 1, 1975.

To approximate the potential impact to property and people that could be affected by severe weather, tornado, or wind, the total value of all residential property in town, $172,092,900 is used. An estimated 100 percent of damage would occur to 1 percent of structures, resulting in a total of $1,720,929 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above assessment, Pelham has a vulnerability of "3-medium" from severe thunderstorms, a "5-Very Low" vulnerability from tornadoes and severe winds and a "4-low" vulnerability from microbursts.

The entire town would be vulnerable to the destruction caused by severe thunderstorms, wind and tornadoes. The vulnerabilities associated with flooding could be present if substantial rain accompanies severe thunderstorms. Additionally high winds could impact the town's communication and energy infrastructure and old buildings. Critical facilities that are most vulnerable include the Town Hall and DPW building, which were designed to withstand lower wind standards.

Wildfire / Brushfire

Hazard Description

Wildfires are typically larger fires, involving full-sized trees as well as meadows and scrublands. Brushfires are uncontrolled fires that occur in meadows and scrublands, but do not involve full-sized trees. Both wildfires and brushfires can consume homes, other buildings and/or agricultural resources. Typical causes of brushfires and wildfires are lightning strikes, human carelessness, and arson.

FEMA has classifications for 3 different classes of wildfires:

- *Surface fires* are the most common type of wildfire, with the surface burning slowly along the floor of a forest, killing or damaging trees.
- *Ground fires* burn on or below the forest floor and are usually started by lightening
- *Crown fires* move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions.

Location

Approximately 15,000 of Pelham's 16,896 acres (89 percent) is forested and therefore at risk of wildfire. The location of occurrence is "large," with more than 50 percent of land area affected.

Extent

Wildfires can cause widespread damage to the areas that they affect. They can spread very rapidly, depending on local wind speeds and be very difficult to get under control. Fires can last for several hours up to several days.

In Pelham, 89 percent of the land is forested (23.4 square miles), and is therefore at risk of fire. A large wildfire could damage almost all of the town's land mass in a short period of time. However, Massachusetts receives more than 40 inches of rain per year and much of the landscape is fragmented, and together these two traits make wildfires uncommon in Massachusetts. Nevertheless, in drought conditions, a brushfire or wildfire would be a matter of concern. A large wildfire could damage a large swath of Pelham's landscape, including vital watershed lands, in a short period of time.

Based on major wildfires that have occurred in western Massachusetts, it is estimated that such a fire would likely destroy around 50 to 500 acres of forested area.

Previous Occurrences

During the past 100 years, there have not been many wildfires occurring in the Pioneer Valley. However, several have occurred during the past 20 years, as shown in the list below:

- 1995 – Russell, 500 acres burned on Mt. Tekoa

- 2000 – South Hadley, 310 acres burned over 14 days in the Litihia Springs Watershed
- 2001 – Ware, 400 acres burned
- 2010 – Russell, 320 acres burned on Mt. Tekoa
- 2012 – Eastern Hampden County, dry conditions and wind gusts created a brush fire in Brimfield, and burned 50 acres
- 2016 –Montgomery, 60 acres burned on Mt. Tekoa

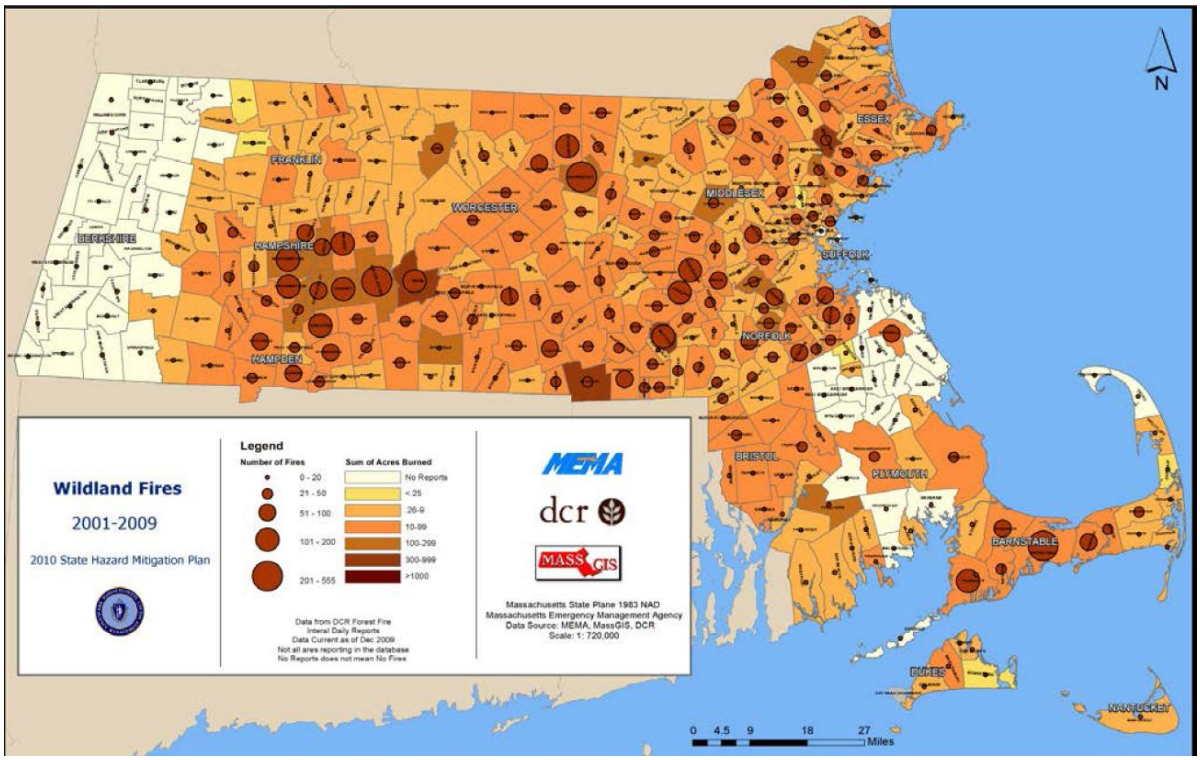
The following fire incidents have been reported in Pelham in the past. This data includes structural fires, brush fires, car fires, etc.

Total Fire Incidents in Pelham	
2009	1
2010	3
2011	1
2012	1
2013	3

Source: Massachusetts Fire Incidence Reporting System, County Profiles, 2012 Fire Data Analysis

In recent history, there have been no wildfires in Pelham. Annually, the fire department responds to one to three brush fires that are usually due to human error. For context, the fire department has issued between 65 and 95 open air burning permits annually in the last five years.

Wildland Fires in Massachusetts, 2001-2009



Source: Massachusetts Hazard Mitigation Plan

Probability of Future Events

In accordance with the Massachusetts Hazard Mitigation Plan, the Hazard Mitigation Committee found it is difficult to predict the likelihood of wildfires in a probabilistic manner because the number of variables involved. However, given the history of previous wildfires, and their proximity to the Town, the likelihood of a future wildfire is determined to be "low," or between less than a 10 percent probability in any given year.

Climate scenarios project summer temperature increases between 2ºC and 5ºC and precipitation decreases of up to 15 percent. Such conditions would exacerbate summer drought and further promote high-elevation wildfires, releasing stores of carbon and further contributing to the buildup of greenhouse gases. Forest response to increased atmospheric carbon dioxide—the so-called "fertilization effect"—could also contribute to more tree growth and thus more fuel for fires, but the effects of carbon dioxide on mature forests are still largely unknown.

Impact

Pelham faces a "minor" impact from wildfires, with minimal damage anticipated in such an event. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $172,092,900 is used.

An estimated 100 percent of damage would occur to 1 percent of structures, resulting in a total of $1,720,929 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on the above assessment, Pelham faces a ”4-low" vulnerability from wildfire and brushfires.

Given that 89% of Pelham is forested, the entire town is vulnerable to wildfires. Depending on where the burn were to happen different critical facilities or evacuation routes, as well as residents, could be impacted.

Earthquakes

Hazard Description

An earthquake is a sudden, rapid shaking of the ground that is caused by the breaking and shifting of rock beneath the Earth's surface. Earthquakes can occur suddenly, without warning, at any time of the year. New England experiences an average of 30 to 40 earthquakes each year although most are not noticed by people.[1] 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.[2]

Location

Because of the regional nature of the hazard, the entire town is susceptible to earthquakes, and the location of occurrence is "large," with over 50 percent of land affected.

Extent

The magnitude of an earthquake is measured using the Richter Scale, which measures the energy of an earthquake by determining the size of the greatest vibrations recorded on the seismogram. On this scale, one step up in magnitude (from 5.0 to 6.0, for example) increases the energy more than 30 times. The intensity of an earthquake is measured using the Modified Mercalli Scale. This scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures on a scale of I through XII, with I denoting a weak earthquake and XII denoting a earthquake that causes almost complete destruction.

[1] Northeast States Emergency Consortium Web site: *www.nesec.org/hazards/earthquakes.cfm.*
[2] Federal Emergency Management Agency Web site: *www.fema.gov/hazards/earthquakes/quake.shtm.*

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

Modified Mercalli Intensity Scale for and Effects			
Scale	**Intensity**	**Description Of Effects**	**Corresponding Richter Scale Magnitude**
I	Instrumental	Detected only on seismographs.	
II	Feeble	Some people feel it.	< 4.2
III	Slight	Felt by people resting; like a truck rumbling by.	
IV	Moderate	Felt by people walking.	
V	Slightly Strong	Sleepers awake; church bells ring.	< 4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves.	< 5.4
VII	Very Strong	Mild alarm; walls crack; plaster falls.	< 6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged.	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open.	< 6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread.	< 7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards.	< 8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves.	> 8.1

Source: US Federal Emergency Management Agency

Previous Occurrences

The most recent earthquakes in the region that could have affected the Town of Pelham are shown in the table below. There is no record of any damage to the Town of Pelham as a result of these earthquakes.

Largest Earthquakes in region 1924 – 2014		
Location	**Date**	**Magnitude**
Ossipee, NH	December 20, 1940	5.5
Ossipee, NH	December 24, 1940	5.5
Dover-Foxcroft, ME	December 28, 1947	4.5
Kingston, RI	June 10, 1951	4.6
Portland, ME	April 26, 1957	4.7
Middlebury, VT	April 10, 1962	4.2
Near NH Quebec Border, NH	June 15, 1973	4.8
West of Laconia, NH	Jan. 19, 1982	4.5
Plattsburg, NY	April 20, 2002	5.1
Bar Harbor, NH	October 3, 2006	4.2
Hollis Center, ME	October 16, 2012	4.6

Source: Northeast States Emergency Consortium website, www.nesec.org/hazards/earthquakes.cfm

New England States Record of Historic Earthquakes		
State	**Years of Record**	**Number Of Earthquakes**
Connecticut	1668 - 2007	137
Maine	1766 - 2007	544
Massachusetts	1668 - 2007	355
New Hampshire	1638 - 2007	360
Rhode Island	1776 - 2007	38
Vermont	1843 - 2007	73
New York	1840 - 2007	755
Total Number of Earthquakes within the New England states between 1638 and 1989 is 2262.		

Source: Northeast States Emergency Consortium website, *www.nesec.org/hazards/earthquakes.cfm*

Probability of Future Events

One measure of earthquake activity is the Earthquake Index Value. It is calculated based on historical earthquake events data using USA.com algorithms. It is an indicator of the earthquake activity level in a region. A higher earthquake index value means a higher chance of earthquake events. Data was used for Hampshire County to determine the Earthquake Index Value as shown in the table below.

Earthquake Index for Hampshire County	
Hampshire County	0.17
Massachusetts	0.70
United States	1.81

Based upon existing records, there is a “very low” frequency of earthquakes in Pelham, with less than a 1 percent chance of an earthquake in any given year.

Impact

Massachusetts introduced earthquake design requirements into their building code in 1975 and improved building code for seismic reasons in the 1980s. 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 the 1980s 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. Liquefaction of the land near water could also lead to extensive destruction.

Pelham faces a “limited” impact from earthquakes, with less than 10% of property expected to be damaged. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $172,092,900 is used. An estimated 10 percent of damage would occur to 25 percent of structures, resulting in a total of $4,302,322 worth of damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

Vulnerability

Based on this analysis, Pelham maintains a "5- Very Low" vulnerability from earthquakes.

Older buildings are particularly vulnerable to earthquakes because their construction pre-dates building codes that included strong seismic consideration. In Pelham, the Town Hall and DPW building are likely to be the most vulnerable critical facilities and the town’s historic buildings, including the old town hall, church and community meeting house would also be vulnerable. A loss of these historic buildings could represent a loss of Pelham history and culture. The town’s identified evacuation routes do not contain bridges, and are therefore likely to still function if an earthquake were to hit

Dam Failure

Hazard Description

Dams and levees and their associated impoundments provide many benefits to a community, such as water supply, recreation, hydroelectric power generation, and flood control. However, they also pose a potential risk to lives and property. Dam or levee failure is not a common occurrence, but dams do represent a potentially disastrous hazard. When a dam or levee fails, the potential energy of the stored water behind the dam is released rapidly. Most dam or levee failures occur when floodwaters above overtop and erode the material components of the dam. Often dam or levee breeches lead to catastrophic consequences as the water rushes in a torrent downstream flooding an area engineers refer to as an "inundation area." The number of casualties and the amount of property damage will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Many dams in Massachusetts were built during the 19th Century without the benefit of modern engineering design and construction oversight. Dams of this age can fail because of structural problems due to age and/or lack of proper maintenance, as well as from structural damage caused by an earthquake or flooding.

The Massachusetts Department of Conservation and Recreation Office of Dam Safety is the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00). To be regulated, these dams are in excess of 6 feet in height (regardless of storage capacity) and have more than 15 acre feet of storage capacity (regardless of height). Dam safety regulations enacted in 2005 transferred significant responsibilities for dams from the State of Massachusetts to dam owners, including the responsibility to conduct dam inspections.

Location

There are four dams located within Pelham's boundaries. The location of occurrence for a dam failure has been determined to be "small," with less than 10 percent of land area affected.

Dams and Dykes in Pelham		
Dam	**Hazard Level**	**Condition**
Hawley Reservoir Dam	Significant Hazard	Satisfactory
Hill Reservoir Dam	Significant Hazard	Fair
Intake Reservoir Dam	Low Hazard	Fair
Jabish Brook Dam	Non-Jurisdictional	--

Extent

Often dam or levee 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.

Dams in Massachusetts are assessed according to their risk to life and property. The state has three 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.

Previous Occurrences

To date, there have been no dam or levee failures in Pelham.

Probability of Future Events

As Pelham's dams age, and if maintenance is deferred, the likelihood of a dam failure will increase, but, currently the frequency of dam failures is "Very Low" with a less than 1 percent chance of a dam failing in any given year.

As described in the Massachusetts Hazard Mitigation Plan, dams are designed partly based on assumptions about a river's flow behavior, expressed as hydrographs. Changes in weather patterns can have significant effects on the hydrograph used for the design of a dam. If the hygrograph changes, it is conceivable that the dam can lose some or all of its designed margin of safety, also known as freeboard. If freeboard is reduced, dam operators may be forced to release increased volumes earlier in a storm cycle in order to maintain the required margins of safety. Such early releases of increased volumes can increase flood potential downstream. Throughout the west, communities downstream of dams are already seeing increases in stream flows from earlier releases from dams. Dams are constructed with safety features known as "spillways." Spillways are put in place on dams as a safety measure in the event of the reservoir filling too quickly. Spillway overflow events often referred to as "design failures," result in increased discharges downstream and increased flooding potential. Although climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures.

Impact

An impact from a dam failure event could range from "limited" to "catastrophic," with approximately 20 percent of property in the affected area damaged or destroyed. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, $172,092,900 is used. An estimated 100 percent of damage would occur to 10 percent of structures, resulting in a total of $1,720,929 worth of

damage. The cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included in this estimate.

A dam failure in Pelham is likely to impact the town of Amherst, which is located directly downstream, in a much more significant manner.

Vulnerability

Based on this analysis, Pelham has a "5- Very Low" vulnerability from dam or levee failure.

The Hazard Mitigation Committee did not feel that many areas of Pelham or the town's critical facilities were vulnerable to damage from dam failures. The areas downstream from these dams are sparsely populated or have deep channels that are likely to funnel the water away from property. If the dam at the Hawley Reservoir were to fail Amherst road, which is a designated evacuation route, could be damaged. Similarly, if the dam at the Hill Reservoir were to fail Meetinghouse road—a designated evacuation route—could be damaged.

Drought

Hazard Description

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.

Location

Because of this hazard's regional nature, a drought would impact the entire town, resulting in a "large" location of occurrence, or more than 50 percent of total land area affected.

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. Approximately 30% of the Pelham residents receive water through the Town of Amherst. The remaining residents depend on private wells for water. Massachusetts' wells are permitted according to their ability to meet demand for 180 days at maximum capacity with no recharge; if these conditions extended beyond the thresholds that determine supply capacity the damage from a drought could be widespread due to depleted groundwater supplies. The U.S. Drought Monitor also records information on historical drought occurrence. Unfortunately, data could only be found at the state level. The U.S. Drought Monitor categorizes drought on a D0-D4 scale as shown below.

U.S. Drought Monitor		
Classification	**Category**	**Description**
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

Previous Occurrences

In Massachusetts, six major droughts have occurred statewide since 1930.[3] They range in severity and length, from three to eight years. In many of these droughts, water-supply systems were found to be inadequate. Water was piped in to urban areas, and water-supply systems were modified to permit withdrawals at lower water levels. The following table indicates previous occurrences of drought since 2000, based on the US Drought Monitor:

Annual Drought Status	
Year	**Maximum Severity**
2000	No drought
2001	D2 conditions in 21% of the state
2002	D2 conditions in 99% of the state
2003	No drought
2004	D0 conditions in 44% of the state
2005	D1 conditions in 7% of the state
2006	D0 conditions in 98% of the state
2007	D1 conditions in 71% of the state
2008	D0 conditions in 57% of the state
2009	D0 conditions in 44% of the state
2010	D1 conditions in 27% of the state
2011	D0 conditions in 0.01% of the state
2012	D2 conditions in 51% of the state
2013	D1 conditions in 60% of the state
2014	D1 conditions in 54% of the state
2015	D1 conditions in 100% of the state

Source: US Drought Monitor

To date, Pelham has not been significantly impacted by any previous droughts in the state. The Hazard Mitigation Committee could not think of any times in recent history when a resident's private well had gone dry. In the event that this does happen, however, the Fire Department can fill the private well to ensure that the resident has water.

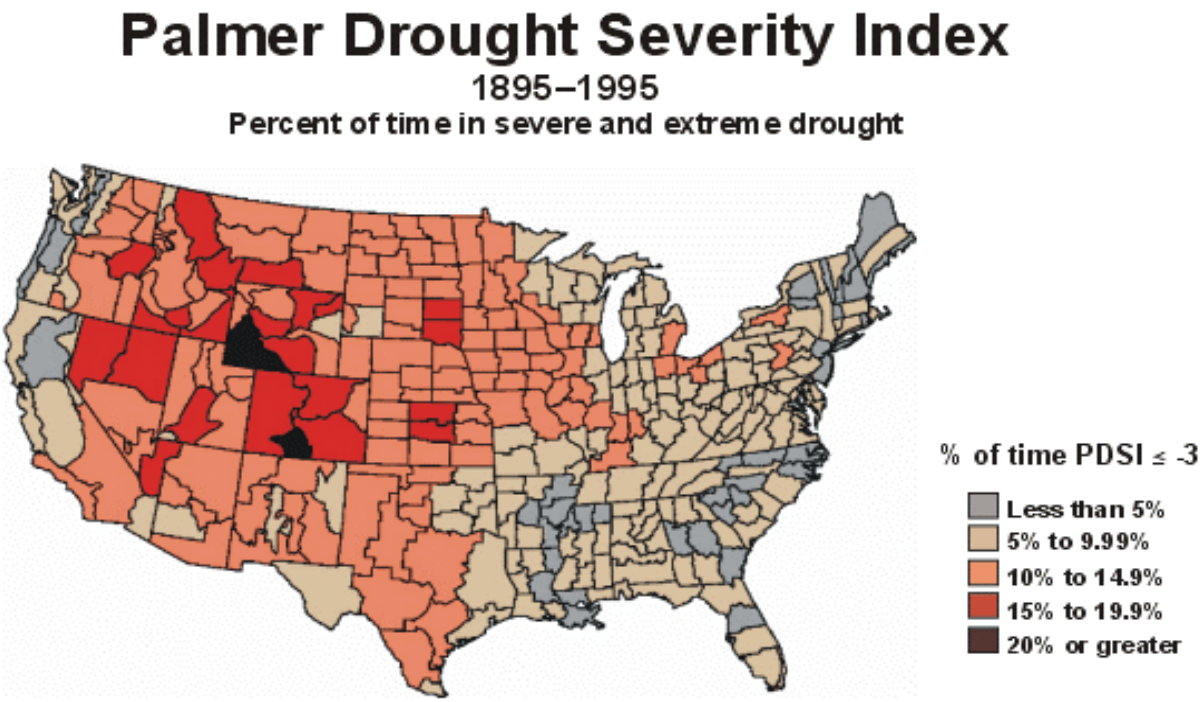
Probability of Future Events

In Pelham, as in the rest of the state, drought has a "low" probability of future occurrence, or between 1 and 10 percent in any given year.

Based on past events and current criteria outlined in the Massachusetts Drought Management Plan, it appears that western Massachusetts may be more vulnerable than eastern Massachusetts to severe drought conditions. However, many factors, such as water supply sources, population, economic factors (i.e., agriculture based economy), and infrastructure, may affect the severity and length of a drought event. When evaluating the region's risk for drought

[3] US Geological Survey Water-Supply Paper 2375. "National Water Summary 1989 – Floods and Droughts: Massachusetts." Prepared by S. William Wandle, Jr., US Geological Survey.

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.[4]



Impact

Due to the water richness of western Massachusetts, Pelham is unlikely to be adversely affected by anything other than a major, extended drought. The impacts of drought are categorized by the U.S. Drought Monitor to include:

- Slowing or loss of crops and pastures
- Water shortages of restrictions
- Low water levels in streams, reservoirs, and wells

As a result, the impact of a drought would be “minor” with only minimal property damage or disruption on quality of life.

Vulnerability

Based on the above assessment, Pelham has a vulnerability of "5-Very Low” from drought. While such a drought would require water saving measures to be implemented, there would be no foreseeable damage to structures or loss of life resulting from the hazard.

[4] National Drought Mitigation Center – http://drought.unl.edu

Landslides

Hazard Description

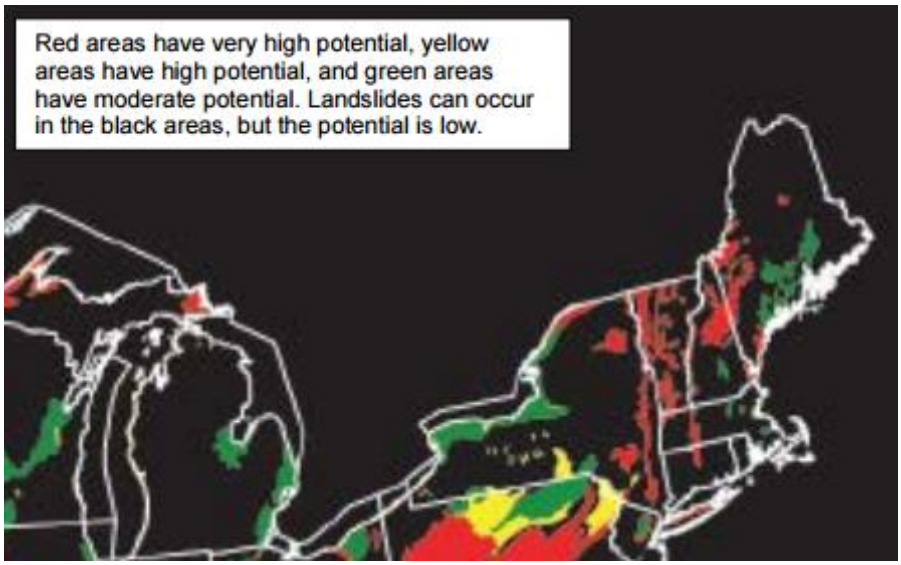
The following description of landslides is excerpted from the Massachusetts Hazard Mitigation Plan, p. 12-1:

> The term "landslide" includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other contributing factors (USGS, 2013). According to the Massachusetts state geologist, Steve Mabee, slope saturation by water is a primary cause of landslides in the Commonwealth. This effect can be in the form of intense rainfall, snowmelt, changes in groundwater level, and water level changes along coastlines, earth dams, and the banks of lakes, rivers, and reservoirs. Water added to a slope can not only add weight to the slope, which increases the driving force, but can increase the pore pressure in fractures and soil pores, which decreases the internal strength of the earth materials needed to resist the driving forces.
>
> Landslides in Massachusetts can be divided into four general groups: 1) construction related, 2) over steepened slopes caused by undercutting due to flooding or wave action, 3) adverse geologic conditions, and 4) slope saturation. Construction related failures occur predominantly in road cuts excavated into glacial till where topsoil has been placed on top of the till. This juxtaposition of materials with different permeability often causes a failure plane to develop along the interface between the two materials resulting in sliding following heavy rains. […] Other construction related failures occur in utility trenches excavated in materials that have very low cohesive strength and associated high water table (usually within a few feet of the surface). The clays often formed in the deepest parts of many of the glacial lakes that existed in Massachusetts following the last glaciation. Some of the major glacial lakes are Bascom, Hitchcock [which encompassed the area of present-day Hadley], Nashua, Sudbury, Concord, and Merrimack. (Mabee, 2010).

Location

The entire U.S. experiences landslides, with 36 states having moderate to highly severe landslide hazards. Expansion of urban and recreational developments into hillside areas leads to more people being threatened by landslides each year. The figure below shows landslide potential mapped by the USGS for the eastern U.S. Landslides are common throughout the Appalachian region and New England. The greatest eastern hazard is from sliding of clay-rich soils. Based on the U.S. data set for landslides, it appears that areas along the Connecticut River in western Massachusetts, and the greater Boston area have the highest risk to landslide. The figure below, excerpted from the Massachusetts Hazard Mitigation Plan, illustrates the landslide incidence and susceptibility zones in Massachusetts. Note a band of red, indicating "high" risk, along the Connecticut River Valley through Western Massachusetts.

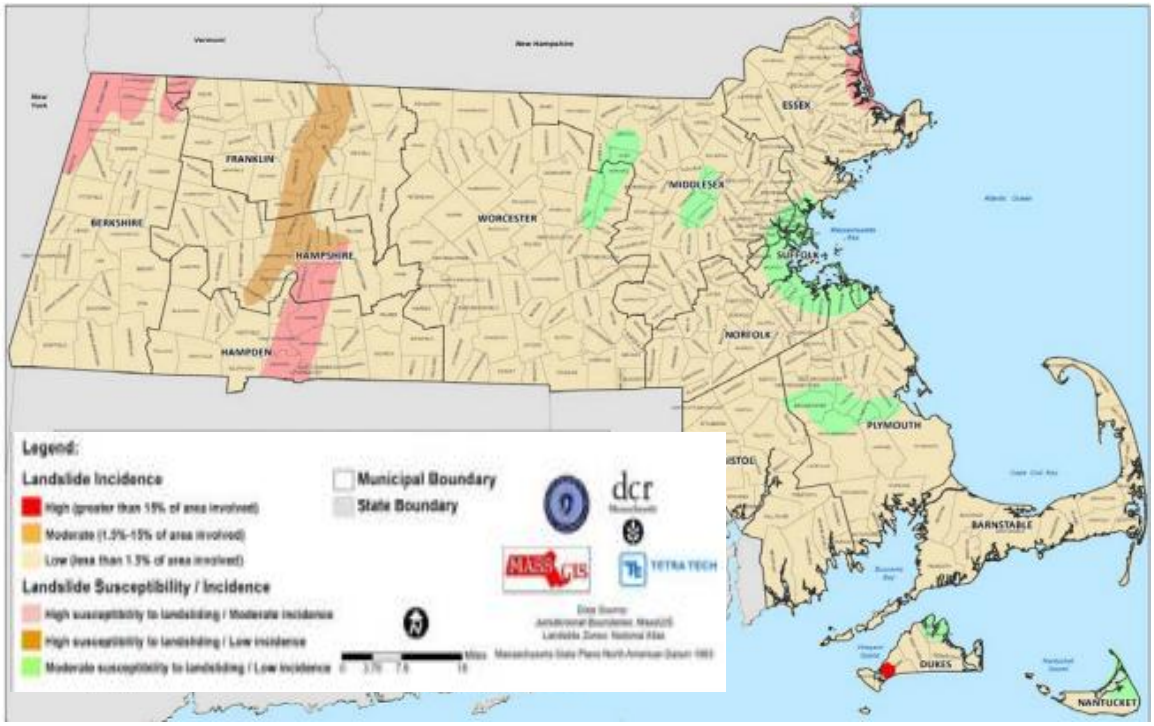
Landslide Incidence and Susceptibility Map U.S. Northeast



Source: http://geology.com/usgs/landslides/

The figure below illustrates the landslide incidence and susceptibility zones in Massachusetts. Note that parts of Pelham are located within the brown band of "moderate" landslide incidence and susceptibility that passes through the region.

Landslide Incidence and Susceptibility Zones 2013 Massachusetts



Source: Massachusetts Department of Conservation Resources

Extent

To determine the extent of a landslide hazard, the affected areas need to be identified and the probability of the landslide occurring within some time period needs to be assessed. Natural variables that contribute to the overall extent of potential landslide activity in any particular area include soil properties, topographic position and slope, and historical incidence. Predicting a landslide is difficult, even under ideal conditions. As a result, the landslide hazard is often represented by landslide incidence and/or susceptibility, defined below:

> Landslide incidence is the number of landslides that have occurred in a given geographic area. High incidence means greater than 15% of a given area has been involved in landslides; medium incidence means that 1.5% to 15% of an area has been involved; and low incidence means that less than 1.5% of an area has been involved.

Landslide susceptibility is defined as the probable degree of response of geologic formations to natural or artificial cutting, to loading of slopes, or to unusually high precipitation. It can be assumed that unusually high precipitation or changes in existing conditions can initiate landslide movement in areas where rocks and soils have experienced numerous landslides in the past. Landslide susceptibility depends on slope angle and the geologic material underlying the slope. Landslide susceptibility only identifies areas potentially affected and does not imply a time frame when a landslide might occur. “High,” “Medium,” and “Low” susceptibility are delimited by the same percentages used for classifying the incidence of landslides. Landslides destroy property and infrastructure and can take the lives of people. Slope failures in the United States result in an average of 25 lives lost per year and an annual cost to society of about $1.5 billion.

Previous Occurrences

The following areas of Pelham have experienced minor landslides, most commonly leading to washed out roads:

- North Valley Road
- Arnold Road
- Meetinghouse Road
- Amherst Road at Bray Court

Pelham’s location on a mountain side, make these small slides likely. The Hazard Mitigation Committee noted that ongoing logging and lack of zoning measures prohibiting housing development on slopes could increase these occurrences.

Probability of Future Events

Increasing short-term heavy precipitation events will increase the risk of landslides in Pelham. There is a “moderate” probability or a 10 to 40% chance of a landslide happening in the next year.

Impact

Homes located on lots with significant slopes (i.e., 10% or greater) are at greater risk of impacts from landslides. The impact of a landslide in Pelham would be “minor” with minimal damage to structures in town. Roadways are likely to be the most impacted by landslides.

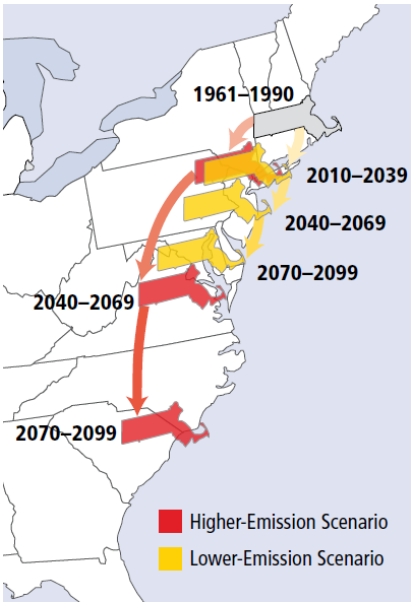
Vulnerability

Based on the above assessment, Pelham has a hazard index rating of **“3 –moderate”** from landslides.

Areas most vulnerable small landslides include North Valley Road, Meetinghouse Road and Amherst Road at Bray Court. Structures and roads in these areas are at risk of damage. The hazard mitigation committee predicts that this vulnerability could increase if lands continue to be forested.

Impacts of Climate Change

Greater variation and extremes in local atmospheric temperatures due to global changes in climate are now among the natural hazards that this plan anticipates. Pelham is likely to experience more instances of extreme and sustained heat and cold. And, because warmer air holds more moisture, higher temperatures will also bring wetter winters, more severe storms, and more frequent flooding. Locally, there will also be more single-day records highs, and more total days with highs above 90 degrees, and more heat waves with 3 or more days above 90 degrees. More extreme temperatures throughout Western Massachusetts and New England mean that there will be more floods, droughts, and tornados. There will also be more Atlantic hurricanes and nor-easters. Anticipated increases in extreme local temperatures is directly related to many of the previously described vulnerabilities, as well as increasing the risk of heat-related disease and injury, especially among senior citizens and residents unable to afford air conditioning.



At current rates of greenhouse gas accumulation and temperature increases, the climate of Massachusetts will become similar to those of present-day New Jersey or Virginia by 2040-2069, depending on future GHG emissions. *Source: NECIA 2006*

Anticipated Climatic Variation

In Western Massachusetts, annual precipitation is expected to increase by 14% by the end of the 21st century. However, most of this precipitation increase will come during the winter months – as much as 30% more than today – while summertime precipitation will actually decrease slightly. Also, most of the added winter precipitation is expected to be in the form of rain, rather than snow. This will mean a continuation of the current regional trend of a decreasing snowfall totals, as well as the number of days with snow cover on the ground, but more precipitation overall. The increased amount of strong precipitation events and overall increase in rainfall, combined with the aging stormwater infrastructure in the region, will likely result in more flooding in the region.

Anticipated Climatic Variations for Massachusetts Due to Climate Change

Category	Current (1961-1990 avg.)	Predicted Change 2040-2069	Predicted Change 2070-2099
Average Annual Temperature (°F)	46°	50°to 51°	51° to 56°
Average Winter Temperature (°F)	23°	25.5° to 27°	31° to 35°
Average Summer Temperature (°F)	68°	69.5° to 71.5°	74° to 82°
Days over 90 °F	5 to 20 days	-	30 to 60 days
Days over 100 °F	0 to 2 days	-	3 to 28 days
Annual Precipitation	41 inches	43 to 44 inches	44 to 47 inches
Winter Precipitation	8 inches	8.5 to 9 inches	9 to 10.4 inches
Summer Precipitation	11 inches	10.9 to 10.7 inches	10.9 to 11 inches

Sources: Massachusetts Climate Adaptation Report 2011, NECIA

Increased temperatures will likely have the following projected impacts to people, property, and the local economy:

- There will be greater stress on special populations, such as senior citizens and economically disadvantaged people, without access to air conditioning during heat waves.
- Increased temperatures and changes in growing seasons for various crops will put stress on current food production and require farming operations to adjust by planting new varieties of crops. There is one farm in Pelham that will likely be affected.
- Livestock will be at greater risk from extreme and extended heat.
- Increased energy usage in order to cool buildings in the summer and long-term electrical needs will increase.

Other Hazards

In addition to the hazards identified above, the Hazard Mitigation Team reviewed the full list of hazards listed in the Massachusetts Hazard Mitigation Plan. Due to the location and context of the Town, coastal erosion, landslides, ice jams, and tsunamis, were determined to not be a threat.

Extreme temperatures, while identified in the state Hazard Mitigation Plan, was determined by the Pelham Hazard Mitigation Committee to not currently be a primary hazard to people, property, or critical infrastructure in Pelham. While extreme temperatures can result in increased risk of wildfire, this effect is addressed as part of the "Wildfire/Brushfire" hazard assessment. As described in the hazard assessment of climate change, extreme temperatures are likely to have a larger effect on the Town in the future. The Hazard Mitigation Committee will continue to assess the impact of extreme temperature and update the Hazard Mitigation Plan accordingly.

4: CRITICAL FACILITIES

Facility Classification

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 community residents and property
- Would create a secondary disaster if a hazard were to impact it

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

- Facilities needed for emergency response in the event of a hazard event.
- Facilities or institutions that include special populations which would need additional attention in the event of a hazard event.
- Facilities that have potential supplies and resources needed for response.

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

Category 1 – Emergency Response Services

The Town has identified the emergency response facilities as the highest priority in regards to protection from natural hazards:

Emergency Operations Center

Primary: Fire and Police Complex- 2 South Valley Road
Alternate: Town Hall (Rhodes Building) - 352 Amherst Road
Alternate: Pelham Highway Department- 353 Amherst Road

Fire Station

Pelham Fire Department – 2 South Valley Road

Police Station

Pelham Police Department – 2 South Valley Road

Highway Garage

Pelham Highway Department – 353 Amherst Road

Water Department

Town of Amherst Water Department- Amherst, MA (Provides 20% of town water and hydrants)
Amherst Water Treatment Plant and Pumping Station-86 Amherst Road

Emergency Fuel Stations

Diesel: Pelham Highway Department- 353 Amherst Road
Gasoline: None. Use gas stations in neighboring towns.

Emergency Electrical Power Facility

One portable generator- Pelham Highway Department- 353 Amherst Road
Multiple small generators located at Pelham Highway Department

Emergency Shelters

Pelham has no designated shelters that are stocked with supplies. The following can be used as heating and cooling facilities:

- Pelham Elementary School- 45 Amherst Road
- Pelham Department of Public Works-353 Amherst Road
- Town Hall- 351 Amherst Road
- Fire and Police Complex- 2 South Valley Road

The town has an agreement in place with the University of Massachusetts at Amherst to act as a shelter if needed. Residents have also gone to shelters in Belchertown in the past.

Dry Hydrants, Fire Ponds, and Water Sources

Hawley Reservoir- Dry Hydrant and Fire Pond

Water

Pumping Stations
2 South Valley Road
Harkness Road (Sewage)

Helicopter Landing Sites

Primary: Intersection of Route 202 and Amherst Road
Alternate: Knight's Corner Field- 180 Daniel Shay's Highway

Communications

Route 202- Mont Lincoln Area has 3 towers. (2 Public Safety and 1 commercial)
Old Pratt Corner Road- 1 commercial tower
Public Safety Complex- 2 South Valley Road (Radio Communications)

Primary Evacuation Routes

Route 202
Amherst Road
Harkness Road
Enfield Road

North Valley Road to Buffam Road

Bridges Located on Evacuation Routes

No bridges on Evacuation Routes

Category 2 – Facilities/Populations to Protect

The following populations and facilities may require special attention during a hazard event.

Special Needs Population

Group Homes

Harkness Road

Packardville Road (Currently closed, but may be reopening)

Elderly Housing/Assisted Living

None

Recreation Areas

Community Garden- Meetinghouse Road

Pelham Library- 2 South Valley Road

Schools

Pelham Elementary School- 45 Amherst Rd.

Places of Worship

None

Historic Buildings/Sites

Pelham Community Hall- 36 Amherst Road

Pelham Historical Complex (Old Town Hall and Church)- near 351 Amherst Road

Apartment Complexes

None

Employment Centers

None

Camps

None

Mobile Home Parks

8 Mobile Homes- 34 Amherst Road

Category 3 – Potential Resources

Contains facilities that provide potential resources for services and supplies.

Food

Pelham Elementary School- 45 Amherst Road
Pelham Community Hall- 36 Amherst Road (Full kitchen that could be used for cooking.)

Hospital/Medical Supplies (nearest)

Cooley-Dickinson Hospital- Northampton
Urgent Care- University Drive, Amherst

Gas

Commercial Gas Station- College Street, Amherst

Building Material Suppliers

Leaders Lumber- Amherst
Cowls- Amherst
Amherst Farm Supplies- Amherst

Heavy Materials Suppliers

Warner Brothers-Sunderland

Critical Facilities and Evacuation Routes Potentially Affected by Hazard Areas			
Hazard Type	**Hazard Area**	**Critical Facilities Affected**	**Evacuation Routes Affected**
Flooding	Along rivers, streams and wetlands.	None	Route 202 near Jabish Brook
Severe Snowstorms/Ice Storms	Whole town	None	North section of Route 202
Severe Thunderstorms which cause wind damage	Whole town	Older buildings including the DPW, Town Hall and historic buildings were not designed/built to withstand strong winds.	Route 202 near Jabish Brook (if flooding)
Hurricanes	Whole town	Older buildings including the DPW, Town Hall and historic buildings were not designed/built to withstand strong winds.	Route 202 near Jabish Brook (if flooding)
Tornadoes/Microburst	Whole town	Depends where it hits	Depends where it hits
Wildfire/Brushfire	Whole Town	None	None
Earthquakes	Whole Town	Older buildings not constructed to earthquake standards.	None
Dam Failures	Areas downstream of the Hawley, Hill and Intake Reservoir	None	Hawley Reservoir- Amherst Road Hill Reservoir- Meetinghouse Road
Drought	Whole Town	None	None
Landslides	North Valley Road, Arnold Road, Meetinghouse Road, Amherst Road at Bray Court	None	Amherst Road at Bray Court and North Valley Road

5: MITIGATION CAPABILITIES & STRATEGIES

Capability Assessment Summary: Existing Authorities Policies, Programs, & Resources and Ability to Expand on & Improve Existing Policies & Programs

One of the steps of this Hazard Mitigation Plan update process is to evaluate all of the Town's existing policies and practices related to natural hazards and identify potential gaps in protection. Pelham's local Hazard Mitigation Committee worked with PVPC to complete the FEMA Capability Assessment worksheet, included in Appendix E.

Pelham has most of the no cost or low cost hazard mitigation capabilities in place. Land use zoning, subdivision regulations and an array of specific policies and regulations that include hazard mitigation best practices, such as limitations on development in floodplains and wetlands, stormwater management, tree maintenance, etc. Pelham also has appropriate staff dedicated to hazard mitigation-related work for a community its size, including a Town Administrator, a professionally run Department of Public Works, a Building Inspector and a Tree Warden. Pelham also has some of the recommended plans in place, including an Open Space and Recreation Plan and a Capitol Improvements Plan. Not only does Pelham have these capabilities in place, but they are also deployed for hazard mitigation as appropriate. The Town also has very committed and dedicated volunteers who serve on Boards and Committees and in Volunteer positions. The Town collaborates closely with surrounding communities and is party to Mutual Aid agreements through the MEMA. Pelham is also an active member community of the Pioneer Valley Planning Commission (PVPC) and can take advantage of no cost local technical assistance as needed provided by the professional planning staff at the PVPC.

Pelham's most obvious hazard mitigation need is for federal funds to implement prioritized actions. While Pelham is a well-managed fiscally sound Town, it is not a wealthy community and with state constraints on municipalities raising their own funds, Pelham has very limited financial resources to invest in costly hazard mitigation measures. Pelham is, however, committed to locally matching all HMGP grants received.

After reviewing existing policies and the hazard identification and assessment, the Town Hazard Mitigation Committee developed a set of hazard mitigation strategies it would like to implement.

The Town of Pelham has developed the following goal to serve as a framework for mitigation of the hazards identified in this plan.

Goal Statement

To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to the following hazards: flooding, severe snowstorms/ice storms, severe thunderstorms, hurricanes, tornadoes, microbursts, wildfires/brushfires, earthquakes, dam failures, drought and landslides.

Overview of Mitigation Strategies by Hazard

An overview of the general concepts underlying mitigation strategies for each of the hazards identified in this plan is as follows:

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. 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 general bylaws, zoning bylaw, and subdivision regulations. Representatives from the planning board suggested that the regulating committees could reevaluate their actions to ensure that these regulations are being properly enforced as new development comes into town. Infrastructure like dams and culverts are in place to manage the flow of water.

Severe Snowstorms / Ice Storms

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.

The Town's current mitigation tools and strategies focus on preparedness, with many regulations and standards established based on safety during storm events. To the extent that some of the damages from a winter storm can be caused by flooding, flood protection mitigation measures also assist with severe snowstorms and ice storms. The Town has adopted the State Building Code, which ensures minimum snow load requirements for roofs on new buildings. Additionally, as roads are reconstructed in town, road designs that minimize ice buildup are being implemented.

Hurricanes

Hurricanes provide the most lead warning time of all identified hazards, 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 cause 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. Flood protection measures can thus also be considered hurricane mitigation measures. The high winds that often accompany hurricanes can also damage buildings and infrastructure, similar to tornadoes and other strong wind events.

Severe Thunderstorms / Winds / Tornadoes

Most damage from tornadoes and severe thunderstorms come 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, making strict adherence to building codes a primary mitigation strategy. In addition, current land development regulations, such as restrictions on the height of telecommunications towers, can also help prevent wind damages.

Wildfires / Brushfires

Wildfire and brushfire mitigation strategies involve educating people about how to prevent fires from starting, as well as controlling burns within the town.

Earthquakes

Although there are five mapped seismological faults in Massachusetts, there is no discernible 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 for which to plan. 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.

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 nowhere to flow. 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.

Drought

Although Massachusetts does not face extreme droughts like many other places in the country, it is susceptible to dry spells and drought. The primary mitigation strategy currently in place is to require subdivisions to provide an environmental review that assesses the impact that the development will have on groundwater.

Existing Mitigation Capabilities

The Town of Pelham had numerous policies, plans, practices, programs and regulations in place, prior to the creation of this plan, that were serving to mitigate the impact of natural hazards in the Town of Pelham. These various initiatives are summarized, described and assessed on the following pages and have been evaluated in the "Effectiveness" column.

Existing Mitigation Capabilities				
Strategy	**Action Type**	**Description**	**Hazards Mitigated**	**Effectiveness / Improvements**
Water Supply Protection District	Zoning bylaw	Overlay district to protect groundwater resources by regulating certain uses, drainage, and special permit procedures.	Flooding	Effective. No changes.
Wetlands Regulations	Zoning bylaw	Proposed developments located near wetlands must meet requirements.	Flooding	Effective. No changes.
Height Restrictions	Zoning bylaw	The Town restricts height of development based on use and location.	Flooding Severe Thunderstorms/ Winds Tornadoes Hurricanes	Effective. No Changes.
Wetlands Regulations	Subdivision Regulation	Proposed developments located near wetlands must meet requirements.	Flooding	Effective. No Changes.
Roadway Slope Standard	Subdivision Regulation	Slopes on new roads are limited to 6-8%	Landslides	Effective. No Changes.

Existing Mitigation Capabilities				
Strategy	**Action Type**	**Description**	**Hazards Mitigated**	**Effectiveness / Improvements**
Drainage System Requirements	Subdivision Regulation	Drainage systems in subdivisions must be designed to accommodate a 10-year flood and bridges, culverts, and detention ponds must be designed to handle 100-year flood.	Flooding.	Effective. No Changes.
Burn Permits	Regulation	Residents must obtain burn permits, and staffs provide information on safe burning practices.	Wildfire/Brushfire	Effective. No Changes
Pelham Open Space and Recreation Plan	Planning Document	Plan inventories natural resources and promotes their preservation.	All Hazards	Work to implement the goals and policies in plan. Plan has expired and should be updated to include recent information.
Flood Control Structures	Capital Construction	There are four dams in Pelham.	Flooding	Effective. No changes
State Building Code	State Regulation	The town has adopted the State Building Code, which promotes the construction of buildings that can withstand a certain degree of hazards.	Severe Snow/Ice Storms Tornadoes/Microburst Severe Thunderstorms/ Wind	Effective. No changes.
Dam Inspections	State Regulation	DCR has an inspection schedule that is based on the hazard rating of the dam (low, medium or high hazard).	Dam Failure	Effective. (ensures that dams are adequately designed) No changes
Shelters	Operational Strategy	There are five shelters identified.	All Hazards	Effective. Currently only equipped to operate as warming and cooling stations. Could be expanded to serve as extended-stay shelter.

Existing Mitigation Capabilities				
Strategy	**Action Type**	**Description**	**Hazards Mitigated**	**Effectiveness / Improvements**
Public Education and Outreach	Operational Strategy	The Fire Department has an ongoing education program in the schools regarding fire safety and a program aimed at senior citizens	Wildfire/Brushfire	Effective. Consider mailing of information to expand populations reached.
New Dam Construction Permits	Operational Strategy	State law requires a permit for the construction of any dam.	Dam Failure	Not Effective. (The responsibility of this is no on dam owners, who may not have sufficient funding to comply.)
Tree Management	Operational Strategy	Town works with Eversource to ensure that power lines are not at risk of danger from trees.	Severe Snow/Ice Storm Hurricanes Severe Thunderstorms/ Winds	Effective. No Changes.
Backup Power	Operation Strategy	The Town has a mobile generator that can be used in case of power outage.	Severe Snow/Ice Storm Hurricanes	Effective. No Changes.

Prioritized Implementation Plan

After reviewing existing mitigation strategies in place, the Hazard Mitigation Committee identified they planned to pursue in the implementation of this plan. The risks and vulnerabilities identified in Chapter 3 were compared to existing mitigation strategies to understand where gaps exist. Selected strategies were then prioritized using the following methodology.

Prioritization Methodology

The Pelham Hazard Mitigation Planning Committee reviewed and prioritized a list of previously identified and new mitigation strategies using the following criteria:

- **Application to multiple hazards** – Strategies are given a higher priority if they assist in the mitigation of several natural hazards.

- **Time required for completion** – Projects that are faster to implement, either due to the nature of the permitting process or other regulatory procedures, or because of the time it takes to secure funding, are given higher priority.

- **Estimated benefit** – Strategies which would provide the highest degree of reduction in loss of property and life are given a higher priority. This estimate is based on the Hazard Identification and Analysis Chapter, particularly with regard to how much of each hazard's impact would be mitigated.

- **Cost effectiveness** – in order to maximize the effect of mitigation efforts using limited funds, priority is given to low-cost strategies. For example, regular tree maintenance is a relatively low-cost operational strategy that can significantly reduce the length of time of power outages during a winter storm. Strategies that have identified potential funding streams, such as the Hazard Mitigation Grant Program, are also given higher priority.

- **Eligibility Under Hazard Mitigation Grant Program –** The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Funding is made available through FEMA by the Massachusetts Emergency Management Agency. Municipalities apply for grants to fund specific mitigation projects under MEMA requirements

The following categories are used to define the priority of each mitigation strategy:

- **Low** – Strategies that would not have a significant benefit to property or people, address only one or two hazards, or would require funding and time resources that are impractical

- **Medium** – Strategies that would have some benefit to people and property and are somewhat cost effective at reducing damage to property and people

- **High** – Strategies that provide mitigation of several hazards and have a large benefit that warrants their cost and time to complete

- **Very High** – extremely beneficial projects that will greatly contribute to mitigation of multiple hazards and the protection of people and property. These projects are also given a numeric ranking within the category.

Cost Estimates

Each of the following implementation strategies is provided with a cost estimate. Projects that already have secured funding are noted as such. Where precise financial estimates are not currently available, categories were used with the following assigned dollar ranges:

- **Low** – cost less than $50,000
- **Medium** – cost between $50,000 – $100,000
- **High** – cost over $100,000

Cost estimates take into account the following resources:

- Town staff time for grant application and administration (at a rate of $25 per hour)
- Consultant design and construction cost (based on estimates for projects obtained from town and general knowledge of previous work in town)
- Town staff time for construction, maintenance, and operation activities (at a rate of $25 per hour)

Project Timeline

The following chart is a completed list of projects recommended by the Committee. The following action plan identifies Responsibility, Funding and a Time Frame for the mitigation projects recommended. The actions will begin as soon as the plan is approved and the community is eligible for funding, unless otherwise stated, and will be completed as noted in the implementation date column in the table below (called "Timeframe" in table).

Mitigation Strategies to be Implemented								
Action Name	**Action Type**	**Description**	**Hazards Addressed**	**Responsibility/ Oversight**	**Priority**	**Estimated Cost**	**Funding Source**	**Time Frame**
Notification System	Operational Strategy	Explore feasibility of town-wide notification system.	All	EMD/Selectboard	Very High	Medium	CIP/ Town Funding	2017
Create Shelter Plan	Operational Strategy	Identify and stock a primary shelter to operate as more than just a warming/cooling station. Develop a list of list of volunteers and resources that can be called upon if shelter is activated.	All	EMD	High #1	Medium	Staff Time/EMD Grant Money	2017
Identify Problem Culverts	Operational Strategy	Create a prioritized list of problem culverts.	Flooding	DPW	High #2	Low	Staff Time	2017
Emergency Preparedness Information	Community Awareness	Periodically update and disseminate information on emergency preparedness. (Including what to include in a 'home survival kit,' evacuation routes, etc.)	All	EMD/ Fire Chief/ Selectboard	High #3	Low	Staff Time/ Town Funding	Within six months of the creation of the shelter plan
Integrate Hazard Mitigation efforts into planning processes	Planning Strategy	With new planning projects including a Village Center Zoning District and a Soil/Housing Study, work to make sure that outcomes include recommendations to address topics with relevance to mitigation, including slopes and flood control.	All	Planning Board/ Selectboard/ Community Preservation Act Committee	High #4	Low	Volunteer staff boards	2016-2017 (as plans mentioned are created)
Road designs that take snow and ice build-up into account	Capital Construction	As roads are upgraded, use designs that lessen ice buildup and make snow removal easier.	Severe Snow/ Ice Storms	DPW/ Selectboard	High #5	High	Staff Time/ Chapter 90/ TIP and STRAPP funding	Ongoing

Mitigation Strategies to be Implemented								
Action Name	**Action Type**	**Description**	**Hazards Addressed**	**Responsibility/ Oversight**	**Priority**	**Estimated Cost**	**Funding Source**	**Time Frame**
Boards internally evaluate their administration of regulations to ensure effectiveness.	Regulation	Planning Board, Zoning Board and Conservation Commission should review regulations to ensure that they are strictly administering them.	All	Planning Board/ Zoning Board/ Conservation Commission	High #6	Low	Volunteer Time	2017-2018 and ongoing as board members change
Include projects that will have a positive impact on hazard mitigation efforts in the next Capital Improvements Plan.	Planning Strategy	Integrate Mitigation Strategies into the next Capital Improvement Plan. In the past, the CIP has not included DPW projects.	All.	EMD/ Selectboard/ Fire Chief/ DPW/ Finance Comittee	Medium-High #1	Low	Staff Time	Start of 2017 and ongoing
Pave dirt roads that are prone to wash-outs	Capital Construction	Explore feasibility of paving dirt roads that constantly wash out.	Flooding	DPW	Medium-High #2	High	Chapter 90 Funds/HMGP	6 months to 2 years from funding
Fix Problem Culverts	Capital Construction	Secure funding to fix high priority problem culverts.	Flooding	DPW/Selectboard	Medium	High	Town Funding/HGMP grants/ DEP grants	6 months to 2 years from funding
Slope Development Regulations	Regulation	Adopt regulations that limit slope development and tree removal	Landslides	Planning Board	Low-Medium	Low	Volunteer Time	2018
Implement Open Space and Recreation Plan	Planning Strategy	Implement goals and strategies in the town's Open Space and Recreation Plan.	All	Planning Board/ Board of Selectmen/ Conservation Commission	Low #1	Medium-High	Volunteer Time/ Town Funding	Ongoing
Acquire Incident Response Technology	Operational Strategy	Purchase software for emergency management (Incident Response Technology) to aid in response.	All	EMD	Low #2	Low	Capital Expenditure	2018-2019

6: PLAN REVIEW, EVALUATION, IMPLEMENTATION, AND ADOPTION

Upon completion of the draft Hazard Mitigation Plan, a public meeting was held by the Town staff and the Pioneer Valley Planning Commission on July 20, 2016 to present and request comments from town officials and residents. The Hazard Mitigation Plan was then submitted to the Massachusetts Emergency Management Agency (MEMA) and the Federal Emergency Management Agency for their review. Upon receiving conditional approval of the plan by FEMA, the plan was presented to the Town's Select Board and adopted.

Plan Implementation

The implementation of this plan began upon its formal adoption by the Town Select Board and approval by MEMA and FEMA. Those Town departments and boards responsible for ensuring the development of policies, bylaw revisions, and programs as described in this plan will be notified of their responsibilities immediately following approval. The Town's Hazard Mitigation Committee will oversee the implementation of the plan.

Incorporation with Other Planning Documents

Existing plans, studies, reports and municipal documents were incorporated throughout the planning process. This included a review and incorporation of significant information from the following key documents:

- ***Pelham Comprehensive Emergency Management Plan*** (particularly the Critical Infrastructure Section) – the Critical Infrastructure section was used to identify those infrastructure components in Pelham that have been identified as crucial to the function of the Pelham; also, this resource was used to identify special needs populations as well as potential emergency shortcomings.

- ***Pelham Open Space, Recreation Plan*** this Plan was used to identify the natural context within which the Pelham mitigation planning would take place. This proved useful insofar as it identified water bodies, rivers, streams, infrastructure components (i.e. water and sewer, or the lack thereof), as well as population trends. This was incorporated to ensure that the City's mitigation efforts would be sensitive to the surrounding environment.

- ***Pelham Zoning Ordinance and Rules and Regulations Governing the Subdivision of Land in Pelham, MA–*** Pelham's Zoning and subdivision by-laws were used to gather identify those actions that the town is already taking that are reducing the potential impacts of a natural hazard (i.e. floodplain regulations) to avoid duplicating existing successful efforts.

- ***Massachusetts' State Hazard Mitigation Plan*** - This plan was used to insure that the town's HMP was consistent with the State's Plan.

After this plan has been approved by both FEMA and the local government, links to the plan will be emailed to all Town staff, boards, and committees, with a reminder to review the plan periodically and work to incorporate its contents, especially the action plan, into other planning processes and documents. In addition, during annual monitoring meetings for the Hazard Mitigation Plan implementation process, the Hazard Mitigation Committee will review whether any of these plans are in the process of being updated. If so, the Hazard Mitigation Committee will remind people working on these plans, policies etc of the Hazard Mitigation plan, and urge them to incorporate the Hazard Mitigation plan into their efforts. The Hazard Mitigation Committee will also review current Town programs and policies to ensure that they are consistent with the mitigation strategies described in this plan. The Hazard Mitigation Plan will also be incorporated into updates of the Town's Comprehensive Emergency Management Plan. The Hazard Mitigation Committee will keep track of how these strategies were incorporated into other planning processes.

Plan Monitoring and Evaluation

The Town's Emergency Management Director will call meetings of all responsible parties to review plan progress as needed, based on occurrence of hazard events. The public will be notified of these meetings in advance through a posting of the agenda at Town Hall. Responsible parties identified for specific mitigation actions will be asked to submit their reports in advance of the meeting.

Meetings will involve evaluation and assessment of the plan, regarding its effectiveness at achieving the plan's goals and stated purpose. The following questions will serve as the criteria that is used to evaluate the plan:

Plan Mission and Goal

- Is the Plan's stated goal and mission still accurate and up to date, reflecting any changes to local hazard mitigation activities?
- Are there any changes or improvements that can be made to the goal and mission?

Hazard Identification and Risk Assessment

- Have there been any new occurrences of hazard events since the plan was last reviewed? If so, these hazards should be incorporated into the Hazard Identification and Risk Assessment.
- Have any new occurrences of hazards varied from previous occurrences in terms of their extent or impact? If so, the stated impact, extent, probability of future occurrence, or overall assessment of risk and vulnerability should be edited to reflect these changes.
- Is there any new data available from local, state, or Federal sources about the impact of previous hazard events, or any new data for the probability of future occurrences? If so, this information should be incorporated into the plan.

Existing Mitigation Strategies

- Are the current strategies effectively mitigating the effect of any recent hazard events?
- Has there been any damage to property since the plan was last reviewed?

- How could the existing mitigation strategies be improved upon to reduce the impact from recent occurrences of hazards? If there are improvements, these should be incorporated into the plan.

Proposed Mitigation Strategies

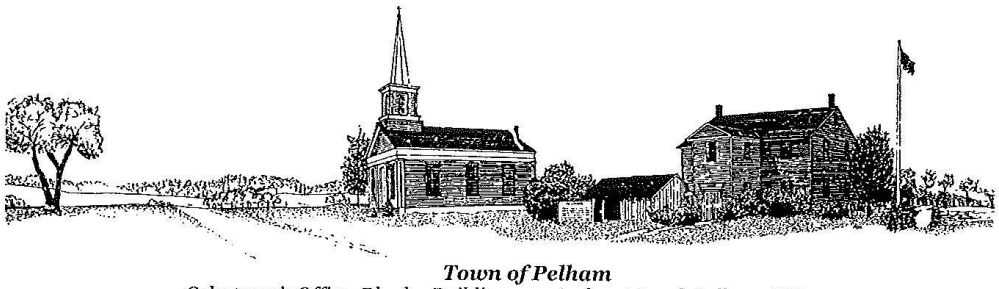
- What progress has been accomplished for each of the previously identified proposed mitigation strategies?
- How have any recently completed mitigation strategies affected the Town's vulnerability and impact from hazards that have occurred since the strategy was completed?
- Should the criteria for prioritizing the proposed mitigation strategies be altered in any way?
- Should the priority given to individual mitigation strategies be changed, based on any recent changes to financial and staffing resources, or recent hazard events?

Review of the Plan and Integration with Other Planning Documents

- Is the current process for reviewing the Hazard Mitigation Plan effective? Could it be improved?
- Are there any Town plans in the process of being updated that should have the content of this Hazard Mitigation Plan incorporated into them?
- How can the current Hazard Mitigation Plan be better integrated with other Town planning tools and operational procedures, including the zoning bylaw, the Comprehensive Emergency Management Plan, and the Capital Improvement 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. The committee will review and update the Hazard Mitigation Plan every five years.

Public participation will be a critical component of the Hazard Mitigation Plan maintenance process. The Hazard Mitigation Committee will hold all meetings in accordance with Massachusetts open meeting laws and the public is invited to attend. The public will be notified of any changes to the Plan via the meeting notices board at Town Hall, and copies of the revised Plan will be made available to the public at Town Hall.



Town of Pelham
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CERTIFICATE OF ADOPTION

Town of Pelham, MASSACHUSETTS

BOARD OF SELECTMEN

A RESOLUTION ADOPTING THE TOWN OF PELHAM HAZARD MITIGATION PLAN

WHEREAS, the Town of Pelham established a Committee to update the Town's Hazard Mitigation Plan; and

WHEREAS, the Town of Pelham participated in the update of the Town of Pelham's Hazard Mitigation Plan;

and WHEREAS, the Town of Pelham Hazard Mitigation Plan contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Pelham, and

WHEREAS, a duly-noticed public meeting was held by the Board of Selectmen on December 12, 2016 for the public and municipality to review prior to consideration of this resolution; and

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

NOW, THEREFORE BE IT RESOLVED that the Town of Pelham Board of Selectmen formally approves and adopts the Town of Pelham Hazard Mitigation Plan, in accordance with M.G.L. c. 40.

ADOPTED AND SIGNED this December 12, 2016

William Martell

William Martell, Acting-Chairman

Alisa Pearson, Clerk

ATTEST

ATTEST

7: 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 (SRPED).....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) – 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…….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) ……..MA Emergency Management Agency
406 Public Assistance and Hazard Mitigation .....MA 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) ……MA Emergency Management Agency
Emergency Generators Program by NESEC‡ .....MA Emergency Management Agency
Emergency Watershed Protection (EWP) Program.....USDA, Natural Resources Conservation Service Flood Mitigation Assistance Program (FMAP)……...MA Emergency Management Agency
Flood Plain Management Services (FPMS).....US Army Corps of Engineers
Mitigation Assistance Planning (MAP).....MA Emergency Management Agency
Mutual Aid for Public Work.....Western Massachusetts Regional Homeland Security Advisory Council
National Flood Insurance Program (NFIP) † ……..MA Emergency Management Agency
Power of Prevention Grant by NESEC‡ .....MA 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	http://www.colorado.edu/litbase/hazards/	Searchable database of references and links to many disaster-related websites.
Atlantic Hurricane Tracking Data by Year	http://wxp.eas.purdue.edu/hurricane	Hurricane track maps for each year, 1886 – 1996
National Emergency Management Association	http://nemaweb.org	Association of state emergency management directors; list of mitigation projects.
NASA – Goddard Space Flight Center "Disaster Finder:	http://www.gsfc.nasa.gov/ndrd/dis aster/	Searchable database of sites that encompass a wide range of natural disasters.
NASA Natural Disaster Reference Database	http://ltpwww.gsfc.nasa.gov/ndrd/main/html	Searchable database of worldwide natural disasters.
U.S. State & Local Gateway	http://www.statelocal.gov/	General information through the federal-state partnership.
National Weather Service	http://nws.noaa.gov/	Central page for National Weather Warnings, updated every 60 seconds.
USGS Real Time Hydrologic Data	http://h20.usgs.gov/public/realtime.html	Provisional hydrological data
Dartmouth Flood Observatory	http://www.dartmouth.edu/artsci/g eog/floods/	Observations of flooding situations.
FEMA, National Flood Insurance Program, Community Status Book	http://www.fema.gov/fema/csb.html	Searchable site for access of Community Status Books
Florida State University Atlantic Hurricane Site	http://www.met.fsu.edu/explores/tropical.html	Tracking and NWS warnings for Atlantic Hurricanes and other links
The Tornado Project Online	http://www.tornadoroject.com/	Information on tornadoes, including details of recent impacts.
National Severe Storms Laboratory	http://www.nssl.uoknor.edu/	Information about and tracking of severe storms.
Independent Insurance Agents of America IIAA Natural Disaster Risk Map	http://www.iiaa.iix.com/ndcmap.html	A multi-disaster risk map.
Earth Satellite Corporation	http://www.earthsat.com/	Flood risk maps searchable by state.
USDA Forest Service Web	http://www.fs.fed.us/land	Information on forest fires and land management.

Appendix B – Documentation of the Planning Process

Pelham Hazard Mitigation Committee
Meeting #1 Agenda

Pelham Community Hall
June 21, 2016- 9:30am-11:30am

1. Introductions/Administrative
    a. affirm local Hazard Committee membership

2. Overview of Hazard Mitigation Planning Process

    a. Background on Hazard Mitigation Planning

    b. Planning process and requirements
        i. 3-5 committee meetings
        ii. 2 public outreach meetings
        iii. MEMA / FEMA review and conditional approval
        iv. Select Board adoption
        v. FEMA final approval

    c. Schedule for committee and public outreach meetings

3. Begin Review of Base Plan

4. Homework:
    a. for Chapter 4--Critical Facilities: come prepared to fill in chapter

Pelham Hazard Mitigation Committee Meeting #1- Sign In

Pelham Community Hall
June 21, 2016- 9:30-11:30 am

Name	Position	Email
RAY MURPHY	FIRE CHIEF	murphy[illegible]@AOL.com
Gary [illegible]	Police chief/(EMD)	Pelhampolice[illegible]@yahoo.com
Rick Adamcek	DPW Supt.	Pelhamsuper@Yahoo.com
Bill Pula	BoH	William.Pula@state.MA.us
Judy Eiseman	Planning Bd.	judyeiseman@comcast.net
Lexy Dewey	" alt.	
Jim Doubleday	Selectman	jim.doubleday@gmail.com
Ashley Eaton	PVPC	
Catherine Ratte	PVPC	

Pelham Hazard Mitigation Committee
Meeting #2 Agenda

Pelham Fire Training Room
July 29, 2016 1:00-3:00pm

1. Capability Assessment--using FEMA worksheet

2. Review and provide any missing information Chapter 3: Hazard Identification and Risk Assessment

3. If Time: Review Critical Facilities Map and Chapter 4 in Base plan
    a. mark up map with corrections as needed

Planning process and requirements

1. 3-5 committee meetings
2. 2 public outreach meetings
3. MEMA / FEMA review and conditional approval
4. Select Board adoption
5. FEMA final approval

Pelham Hazard Mitigation Committee Meeting #2- Sign In

Pelham Fire Training Room
June 29, 2016- 1:00-3:00 pm

Name	Position
GARY MURPHY	POLICE CHIEF / EMD
RAY MURPHY	FIRE CHIEF
JIM DOUBLEDAY	Selectman
[illegible]	[illegible]
Rick Adamcek	DPW
Ashley Eaton	PVPC

Pelham Hazard Mitigation Committee
Meeting #3 Agenda

Pelham Fire Safety Training Room
July 5, 2016 1:00-3:00 p.m.

1. Finalize Capability Assessment as needed

2. Identification of Critical Infrastructure (Chapter 4)
    a. Review and Edit Map

3. Start process of identifying mitigation strategies time permitting

Planning process and requirements
    a. 3-5 committee meetings
    b. 2 public outreach meetings
    c. MEMA / FEMA review and conditional approval
    d. Select Board adoption
    e. FEMA final approval

Pelham Hazard Mitigation Committee Meeting #3- Sign In

Pelham Fire Training Room
July 5, 2016- 1:00-3:00 pm

Name	Position
JIM DOUBLEDAY	SELECTMAN
Gary Thomann	Police chief / EMD
[illegible]	Pelham Planning Board
RAY MURPHY	FIRE CHIEF
Penny Eaton	PVPC

Pelham Hazard Mitigation Committee
Meeting #4 Agenda

Fire Safety Training Room
July 13, 2016 1:00-3:00pm

1. Continue work on Mitigation Strategies Action Plan

2. Review and Edit Chapter 6

3. Edits to updated draft?

Planning process and requirements

I. 3-5 committee meetings
II. 2 public outreach meetings
III. MEMA / FEMA review and conditional approval
IV. Select Board adoption
V. FEMA final approval

Pelham Hazard Mitigation Committee Meeting #4- Sign In

Pelham Fire Training Room
July 13, 2016- 1:00-3:00 pm

Name	Position
JIM DOUBLEDAY	SELECTMAN
RAY MURPHY	FIRE CHIEF
[illegible]	[illegible]
[illegible]	POLICE / EMD
Rick Adamcek	DPW
Ashley Eaton	PVPC

Pelham Hazard Mitigation Committee
Meeting #5 Agenda

Fire Safety Training Room
July 20, 2016 2:00-3:00pm

1. Finalize Prioritized Action Plan

2. Any Remaining edits

3. Public Meeting Prep/Prepare plan for submission

Planning process and requirements

I. 3-5 committee meetings
II. 2 public outreach meetings
III. MEMA / FEMA review and conditional approval
IV. Select Board adoption
V. FEMA final approval

Pelham Hazard Mitigation Committee Meeting #5- Sign In

Pelham Fire Training Room
July 20, 2016- 2:00-3:00 pm

Name	Position
RAY MURPHY	FIRE CHIEF
Gary Thomasian	Police / EMD
Rick Adamcek	DPW
JIM DOUBLEDAY	SELECTMAN
Ashley Eaton	PVPC

Catalyst for Regional Progress
PVPC
Timothy W. Brennan, Executive Director

MEDIA RELEASE

CONTACT: Ashley Eaton, PVPC Planner, (413) 781-6045 or aeaton@pvpc.org

FOR IMMEDIATE RELEASE
June 22, 2016

Town of Pelham Schedules Public Engagement Event
For Hazard Mitigation Plan

Pelham residents, business owners, stakeholders and representatives from surrounding communities are invited to provide comments on the development of the Town of Pelham's Hazard Mitigation Plan on Wednesday, June 29th at 5:00 p.m. at the Rhodes Building, 351 Amherst Road. All members of the public are welcome to attend the event. Local businesses, residents of neighboring communities, and municipal officials of neighboring communities are also encouraged to attend and provide their feedback.

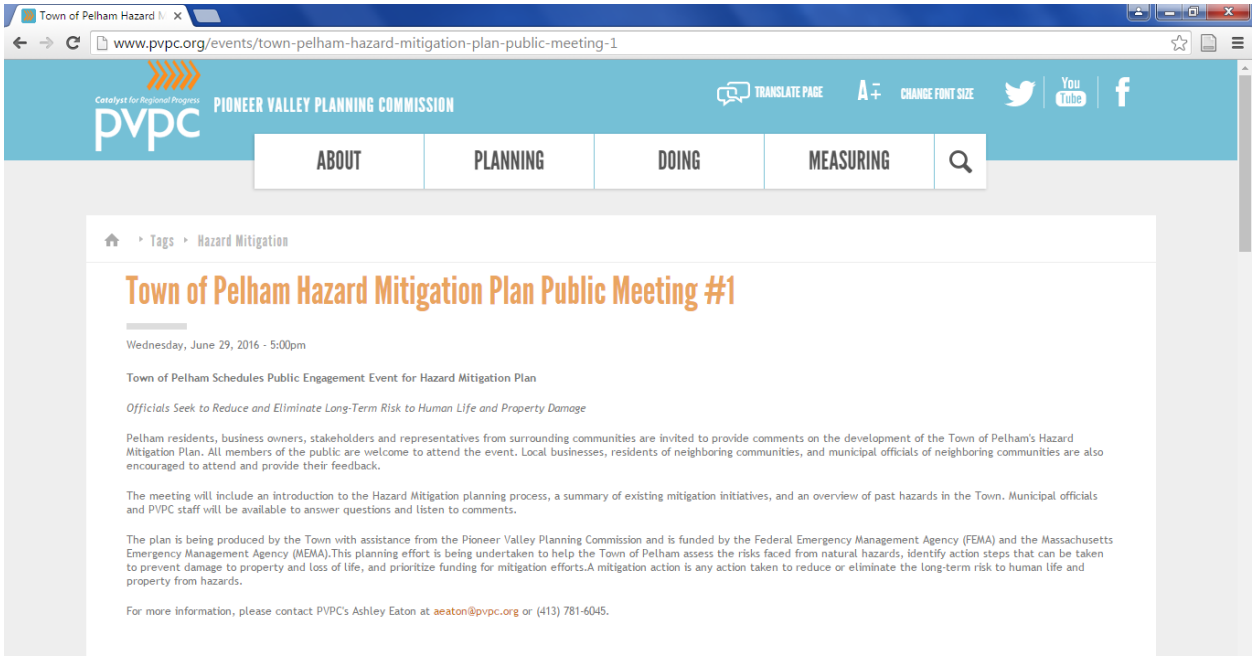
The meeting will include an introduction to the Hazard Mitigation planning process, a summary of existing mitigation initiatives, and an overview of past hazards in the Town. Municipal officials and PVPC staff will be available to answer questions and listen to comments.

The plan is being produced by the Town with assistance from the Pioneer Valley Planning Commission and is funded by the Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA). This planning effort is being undertaken to help the Town of Pelham assess the risks faced 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.

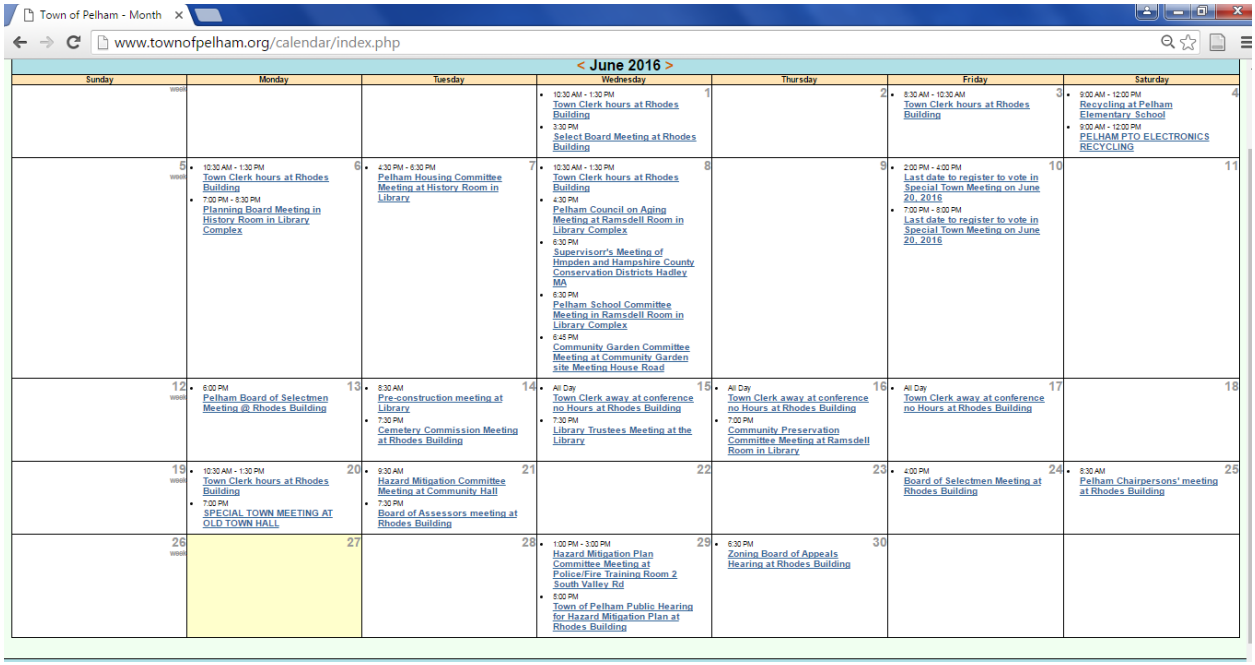
For more information, please contact PVPC's Ashley Eaton at aeaton@pvpc.org or (413) 781-6045.

Public Meeting #1 Postings

PVPC Website:



Town Calendar:



Catalyst for Regional Progress
PVPC
Timothy W. Brennan, Executive Director

MEDIA RELEASE

CONTACT: Ashley Eaton, PVPC Planner, (413) 781-6045 or aeaton@pvpc.org or
Gary Thomann, Pelham Emergency Management Director, (413) 253-0484
pelhampolicema@yahoo.com

FOR IMMEDIATE RELEASE
July 8, 2016

Town of Pelham to Hold Second Public Engagement Event for Hazard Mitigation Plan

Pelham residents, businesses, and surrounding community residents and representatives are invited to provide comments on the Town of Pelham Hazard Mitigation Plan on Wednesday, July 20, 2016, at 5:30pm in the Fire Training Room at the Pelham Public Safety Complex on 2 South Valley Road.

The purpose of the 2016 Hazard Mitigation Plan is to identify and assess Pelham's natural hazard risks and determine how to best minimize and manage them. A mitigation action is any action taken to reduce or eliminate the long-term risk to human life and property from hazards. Public participation and input is essential!

The meeting will include a discussion of existing mitigation initiatives addressing natural hazards in Pelham, and the strategies as currently proposed by the committee. Municipal staff and PVPC staff will be available to answer questions and listen to comments on the draft plan. The meeting provides an opportunity for you to share your opinions and participate in the mitigation planning process. A draft of the plan is available for review on the PVPC website.

The plan is being updated by the Town with assistance from the Pioneer Valley Planning Commission and is funded by the Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA).

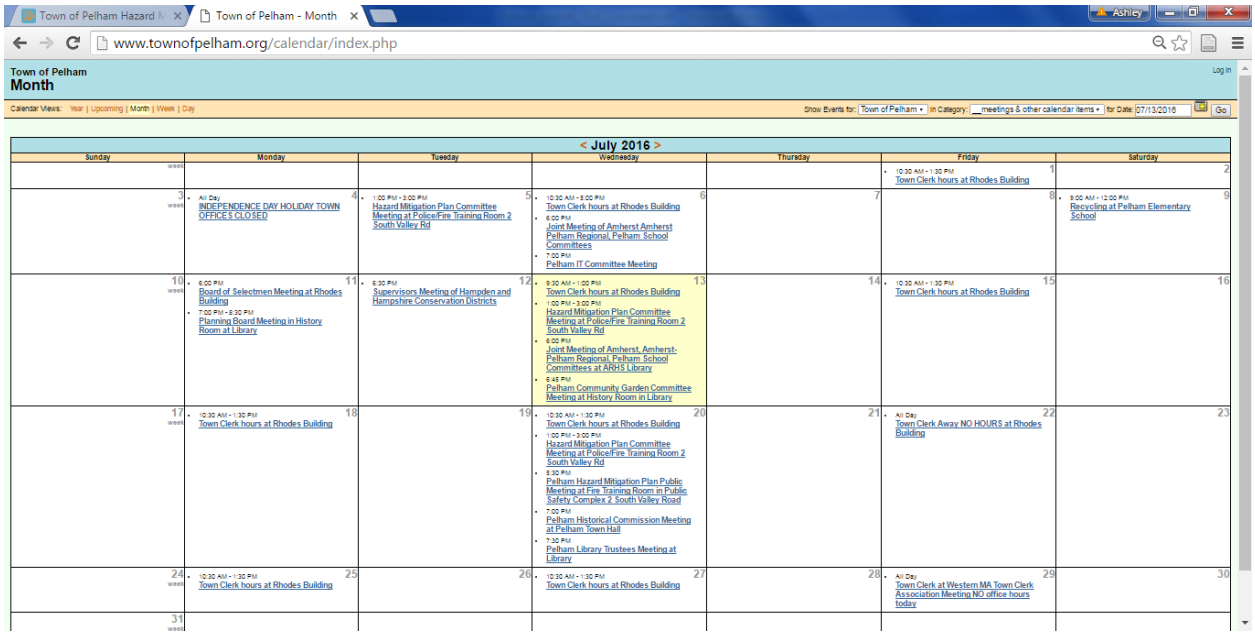
Upon completion, the plan will be presented to the Town of Pelham Selectboard for adoption and submitted to Massachusetts Emergency Management Agency (MEMA) and Federal Emergency Management Agency (FEMA) for review and approval. A FEMA approved plan makes the community eligible for federal and state mitigation grant funding.

For more information, please contact PVPC's Ashley Eaton at aeaton@pvpc.org or (413) 781-6045.

Public Meeting #1 Postings

PVPC Website:

Town Website:



Media Organizations Sent Press Releases

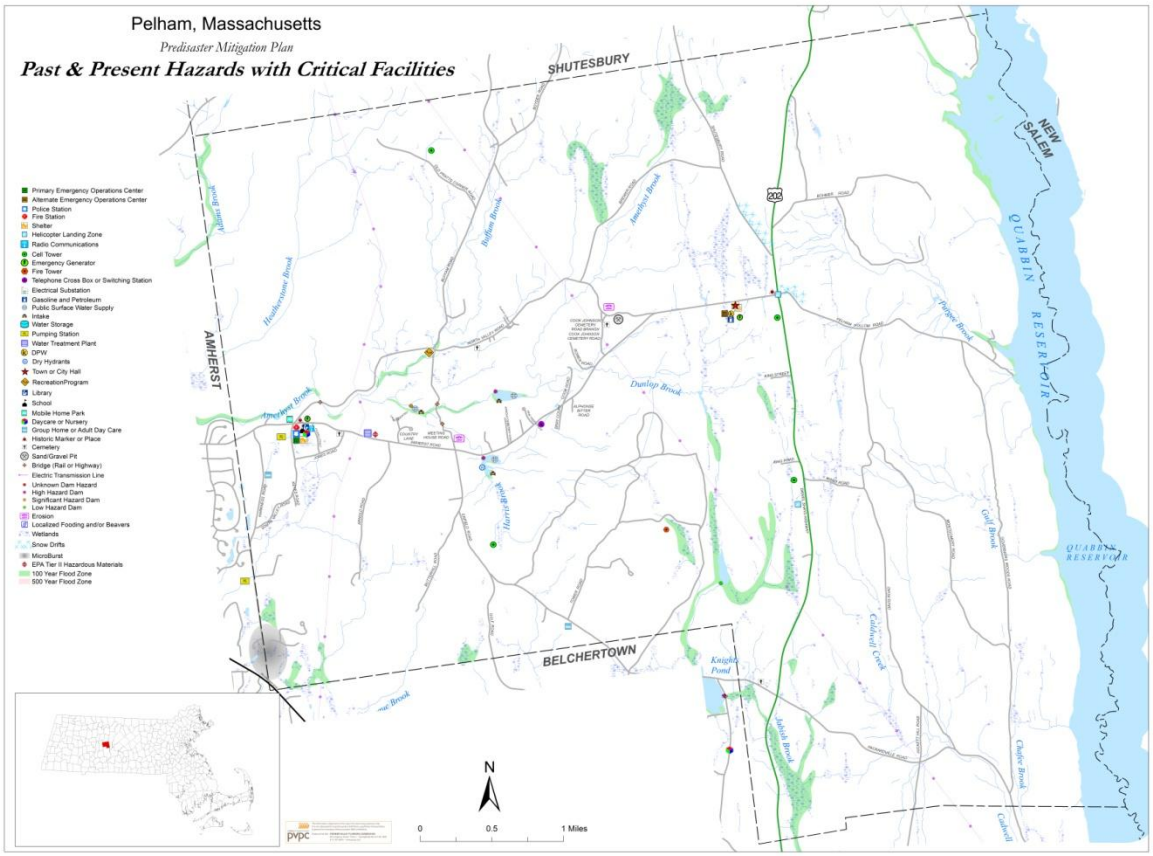
Media Organization	Address	Town	State	Zip Code
African American Point of View	688 Boston Road	Springfield	MA	01119
Agawam Advertiser News	23 Southwick Street	Feeding Hills	MA	01030
Amherst Bulletin	115 Conz Street	Pelham	MA	01060
Belchertown Sentinel	1 Main Street	Belchertown	MA	01007
Berkshire Eagle	75 South Church Street	Pittsfield	MA	01202
Brattleboro Reformer	62 Black Mountain Rd.	Brattleboro	VT	05301
CBS 3 Springfield	One Monarch Place	Springfield	MA	01144
Chicopee Register	380 Union Street	West Springfield	MA	01089
CommonWealth Magazine	18 Tremont Street	Boston	MA	02108
Country Journal	5 Main Street	Huntington	MA	01050
Daily Hampshire Gazette	115 Conz Street	Pelham	MA	01060
El Sol Latino	P.O. Box 572	Amherst	MA	01004
Going Green	PO Box 1367	Greenfield	MA	01302
Hilltown Families	P.O. Box 98	West Chesterfield	MA	01084
Holyoke Sun	138 College Street	South Hadley	MA	01075
Journal Register	24 Water Street	Palmer	MA	01069
La Voz Hispana	133 Maple Street #201	Springfield	MA	01105
Ludlow Register	24 Water Street	Palmer	MA	01069
Massachusetts Municipal Association	One Winthrop Street	Boston	MA	02110
Quaboag Current	80 Main Street	Pelham	MA	01082
Recorder	14 Hope Street	Greenfield	MA	01302
Reminder	280 N. Main Street	East Longmeadow	MA	01028
Southwick Suffield News	23 Southwick Street	Feeding Hills	MA	01030
State House News Service	State House	Boston	MA	02133
Tantasqua Town Common	80 Main Street	Pelham	MA	01082
The Longmeadow News	62 School Street	Westfield	MA	01085
The Republican	1860 Main Street	Springfield	MA	01102
The Westfield News	62 School Street	Westfield	MA	01085
Town Reminder	138 College Street	South Hadley	MA	01075
Urban Compass	83 Girard Avenue	Hartford	CT	06105
Valley Advocate	115 Conz Street	Pelham	MA	01061
Vocero Hispano	335 Chandler Street	Worcester	MA	01602
WAMC Northeast Public Radio	1215 Wilbraham Road	Springfield	MA	01119
Pelham River News	80 Main Street	Pelham	MA	01082
West Springfield Record	P.O. Box 357	West Springfield	MA	01098
WFCR-Public Radio	131 County Circle	Amherst	MA	01003
WGBY-Public TV	44 Hampden Street	Springfield	MA	01103
WGGB ABC40/FOX 6 News	1300 Liberty Street	Springfield	MA	01104

WHMP-FM	15 Hampton Avenue	Pelham	MA	01060
Wilbraham-Hampden Times	2341 Boston Road	Wilbraham	MA	01095
Worcester Telegram & Gazette	20 Franklin Street	Worcester	MA	01615
WRNX/WHYN/WPKR Radio	1331 Main Street	Springfield	MA	01103
WWLP-TV 22	PO Box 2210	Springfield	MA	01102

Appendix C – List of Acronyms

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	Board of Selectmen
DPW	Department of Public Works
LEPC	Local Emergency Planning Committee
EMD	Emergency Management Director
Con Com	Conservation Commission
Ag Com	Agricultural Commission
EOC	Emergency Operations Center
CEM Plan	Comprehensive Emergency Management Plan
EMA	Emergency Management Agency
RACES	Radio Amateur Civil Emergency Service
WMECO	Western Massachusetts Electric Company
HAZMAT	Hazardous Materials

Appendix D – Past and Potential Hazards/Critical Facilities Map



Appendix E - Capability Assessment Worksheet

Worksheet 4.1 Capability Assessment Worksheet

Jurisdiction Pelham, MA

Local mitigation capabilities are existing authorities, policies, programs, and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible. Complete one worksheet for each jurisdiction.

Planning and Regulatory

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. Please indicate which of the following your jurisdiction has in place.

Plans	**Yes/No Yr**	**Does the plan address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?**
Comprehensive/Master Plan	No	Have a draft master plan that was created approximately 40 years ago and never adopted at town meeting
Capital Improvements Plan	Yes	Plan does not address hazard. Most information is regarding road maintenance. HM strategies could be implemented into it. For example, purchasing generators included in the plan in the past.
Economic Development Plan	No	Forthcoming Village Center overlay district could touch upon economic development
Local Emergency Operations Plan	Yes	Yes addresses hazards. Unsure how effective it is, as they have yet to need to use it.
Continuity of Operations Plan	Yes	Addresses hazards. Unsure how effective it is, as they have yet to need to use it.
Transportation Plan	No	Transportation component in the Emergency Management Plan. (outlines evacuation routes)
Stormwater Management Plan	No	Pelham received a waiver from EPA for the MS4 permit Stormwater is address in zoning code
Community Wildfire Protection Plan	-	Adhere to state plans
Other special plans (e.g. brownfields, redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Yes	Open Space and Recreation Plan (plan is expired and needs to be updated) Forthcoming: Soil and Wetlands Study/Housing Plan

Building Code, Permitting, and Inspections	Y/N	Are codes adequately enforced?
Building Code	Y	Version/Year: State Building Code and adopted "stretch code" in 2013
Building Code Effectiveness Grading Schedule (BCEGS) Score	--	Score:
Fire Department ISO Rating	N	Rating:
Site plan review requirements	Y	

Land Use Planning & Ordinances	Y/N	Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?
Zoning Ordinance	Y	Restrictions on building on steep grades and earth removal
Subdivision ordinance	Y	
Floodplain ordinance	N	Small acreage of 100-year floodplain within the town is near the Quabbin Reservoir and under a conservation restriction
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	Some information tucked into zoning code.
Flood insurance rate maps	N	
Acquisition of land use for open space and public recreation uses	Y	Have acquired land in the past for a community garden and community forest through CPA funds
Other		

How can these capabilities be expanded and improved to reduce risk?
Zoning could be expanded to include uplands zoning restrictions and development near streams and wetlands. Capital Improvement Plan could be updated to include the identification of problem culverts and other hazard mitigation strategies that fall under the purview of capital improvements.

Administrative & Technical

Identify whether your community has the following administrative and technical capabilities. These include staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level of government that provide technical assistance, indicate so in your comments.

Administration	**Y/N**	**Describe capability** **Is coordination effective?**
Planning Board	Yes	Coordination is effective most of the time.
Mitigation Planning Committee	Yes	Ad hoc. Pulled together to create this plan and will meet annually to maintain it.
Maintenance programs to reduce risk (e.g. tree trimming, clearing drainage systems)	Yes	Catch basins and drainage system cleaned on an annual basis. Tree trimming done as needed working with EverSource.
Mutual aid agreements	Yes	Police, Fire and Highway Department in surrounding communities.

Staff	**Y/N** **FT/PT**	**Is staffing adequate to enforce regulations?** **Is staff trained on hazards and mitigation?** **Is coordination between agencies and staff effective?**
Chief Building Official	Yes (PT)	Building Inspector is effective
Floodplain Administrator	No	
Emergency Manager	Yes (FT)	Emergency Manager is also the Police Chief.
Community Planner	No	Planning Board works with HCOG and PVPC
Civil Engineer	No	
GIS Coordinator	No	Technical assistance through PVPC and Town of Amherst
Other		Health Board has an employee through the Quabbin District that works with four towns.

Technical	**Y/N**	**Describe capability** **Has capability been used to assess/mitigate risk in the past?**
Warning systems/services (Reverse 911, outdoor warning signals)	No	Multiple groups in the town are starting to express interest in an information notification system though.
Hazard data and information	Yes	Through police, fire, EMD and Highway Superintendent
Grant writing	No	Volunteers on boards do write grants with the possibility for support through HCOG and PVPC
Hazus analysis	No	
Other		

How can these capabilities be expanded and improved to reduce risk?
Collaboration across town boards and position could help to strengthen existing work being done. Implementation of an information notification system would be useful.

Financial

Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.

Funding Resource	Access Eligibility Y/N	Has the funding resource been used in the past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital Improvements Project funding	Yes	$200,000 a year. Any Capital improvement over $10,000 is eligible. In past have bought police and fire equipment, generator, and building repairs.
Authority to levy taxes for specific purposes	Yes	Must be voted on through town meeting. Town has a history of levying taxes on themselves if there is a good connection to what the money will provide.
Fees for water, sewer, gas or electric services	No	
Impact fees for new development	No	
Storm water utility fee	No	
Incur debt through general obligation bonds and/or special tax bonds	Yes	Town Finance Committee has an aversion to these because of interest
Community development block grants		
Other federal funding programs	Yes	FEMA funds
State funding programs	Yes	MEMA grant monies Chapter 90 Road money CPA matching money
Other		

How can these capabilities be expanded and improved to reduce risk?
Restructure or clarifying what types of "projects" capital improvements project funding can be used on to see if mitigation projects could be added to the list. (If expanding to include some of these projects, could money be raised to increase this fund a bit?) Consider taking out bonds for major projects. The goal to save money on interest payments may be shortsighted and not in the town's best long term interest.

Education & Outreach

Identify education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information.

Program/Organization	Y/N	Describe program/organization and how it relates to disaster resilience and mitigation
Local citizens groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	Anti-fracking group Kestrel Land Trust Mothers Out Front (Environmental Protection with an emphasis on children) Neighbor to Neighbor listserv (Community members sharing information and items)
Ongoing public education or information program (e.g. responsible water use, fire safety, household preparedness, environmental education)	Yes	Senior SAFE Program (Partnership with Amherst, Shutesbury and Leverett) Annual open house at police and fire
Natural disaster or safety related school programs	Yes	SAFE program for fourth grade students
StormReady certification	No	
Firewise Communities certification	No	
Public-private partnership initiatives addressing disaster-related issues		
Other		

How can these capabilities be expanded and improved to reduce risk?
Getting information about preparedness via mailings or online could be useful to capture the population that does not make it to annual open house that police and fire hold.