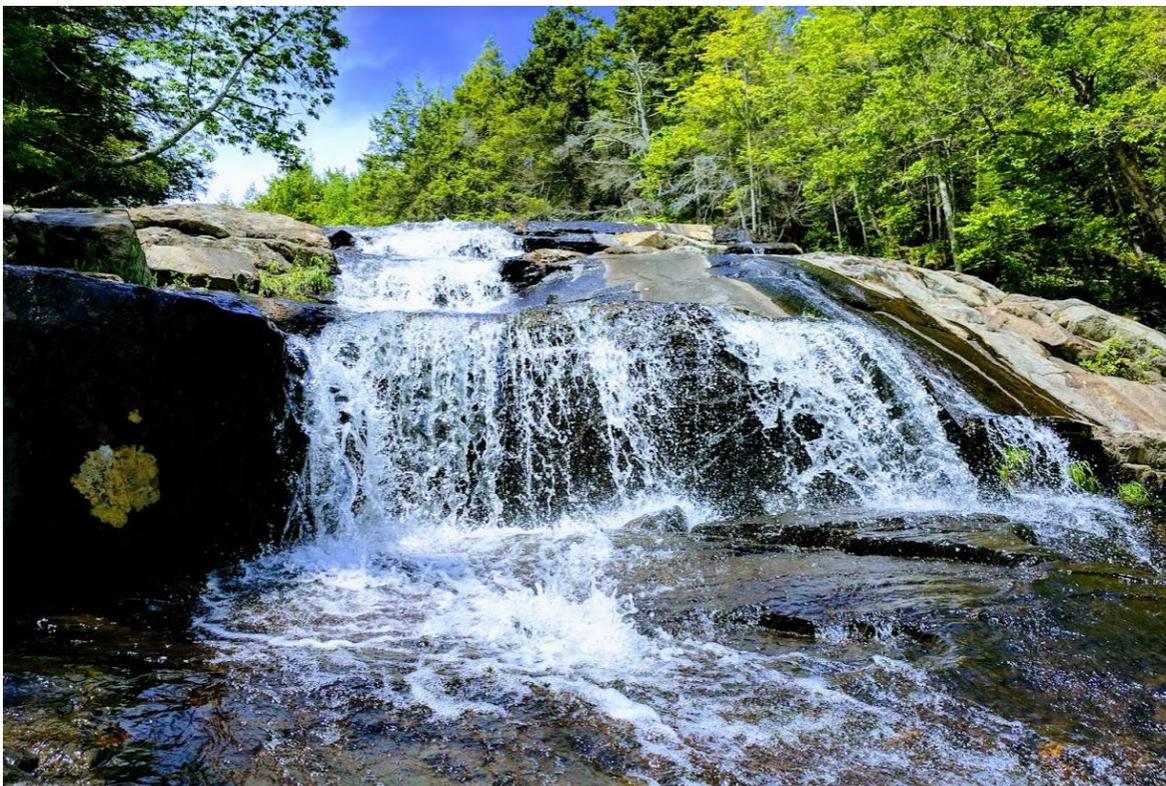


THE TOWN OF MIDDLEFIELD HAZARD MITIGATION PLAN



Adopted by the Middlefield Board of Selectmen on _____

The Middlefield Hazard Mitigation Committee

and

Pioneer Valley Planning Commission

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Acknowledgements

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

Ann Marie Visconti- Emergency Management Director

Duane Pease- Town Administrator

Judy Hoag- Board of Selectmen

Ron Radwich- Fire Chief

Joe Kearns- Finance Committee

Skip Savery- Highway Superintendent

Jackie Duda- Health Agent

Laura Lafreniere- Town Assessor

Tom Austin- Police Chief

The Middlefield Select Board offers thanks to the Massachusetts Emergency Management Agency (MEMA) for developing the Massachusetts Hazard Mitigation Plan which served as a model for this plan. In addition, special thanks are extended to the staff of the Pioneer Valley Planning Commission for professional services, process facilitation and preparation of this document.

The Pioneer Valley Planning Commission

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Cover Photo: Glendale Falls; Ashley Eaton

INSERT SIGNED ADOPTION CERTIFICATE

DRAFT

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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 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 Middlefield, 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 every five years, a hazard mitigation plan before a disaster, 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 their 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 (PDMC) are programs with this requirement.

HAZARD MITIGATION COMMITTEE

Updating the Town of Middlefield's Hazard Mitigation plan involved a 9-member committee:

- Ann Marie Visconti- Emergency Management Director
- Duane Pease- Town Administrator
- Judy Hoag- Board of Selectmen
- Ron Radwich- Fire Chief
- Joe Kearns-Finance Committee
- Skip Savery- Highway Superintendent
- Jackie Duda- Health Agent
- Laura Lafreniere- Town Assessor
- Tom Austin- Police Chief

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

- Reviewing and incorporating existing plans and other relevant information into this planning process
- Documenting natural hazards that may impact the community
- Conducting a Vulnerability/Risk Assessment to identify the infrastructure at the highest risk for being damaged by the identified natural hazards
- 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 possible mitigation strategies
- Adopting and implementing the final Hazard Mitigation Plan

The key product of this Hazard Mitigation Plan process is the development of an Action Plan with a Prioritized Implementation Schedule. This Action Plan articulates how the Town will work to reduce its vulnerabilities to natural disasters over the Plan's five year implementation period.

COMMITTEE MEETINGS

Meetings of the Hazard Mitigation Committee, all of which took place at the Middlefield Town Hall, were held on the dates listed below. Agendas for these meetings are included in Appendix B.

June 15, 2018

Work group meeting included hazard mitigation planning overview, identifying and organizing of the planning team, a discussion of the public outreach process and an initial discussion of hazards and community capabilities.

June 29, 2018

Work group refined location and previous occurrences of hazard and worked to identify and map critical facilities.

August 24, 2018

Work group review hazards and critical facilities in order to assess their vulnerability and complete their overall Risk Assessment. Committee also worked on identifying initial strategies they could pursue to mitigate risk.

September 14, 2018

Committee continued the development of the Action Plan and Implementation Schedule. The team also prepared for the 2nd 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 creation of the Middlefield 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 Middlefield as part of its regional planning efforts, which include the following:

- Developing the Pioneer Valley Regional Land Use Plan, Our Next Future, 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.
- Actively participating in the Executive Office of Energy and Environmental Affairs' Municipal Vulnerability Preparedness (MVP) program.

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 Middlefield 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). WRHSAC, 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 Middlefield 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.

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 Middlefield's Hazard Mitigation Plan process and encouraged to comment.

AGENCIES THAT HAVE THE AUTHORITY TO REGULATE DEVELOPMENT

The Middlefield Planning Board is the primary Town agency responsible for regulating development in town. Members of the Planning Board attended the Public Meetings to share their thoughts on the hazards and the potential actions that could be taken to mitigate them.

In addition, the Pioneer Valley Planning Commission, as a regional planning authority, works with all agencies that regulate development in Middlefield, 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 Middlefield 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 development of the Middlefield plan – on July 23, 2018 and September 17, 2018. 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 Middlefield Town Hall in compliance with the Commonwealth of Massachusetts' open meeting law. Public meeting agendas and notices can be found in Appendix B.

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 Middlefield were invited to attend the event, which was also intended to include representatives of businesses in Middlefield and residents of neighboring communities. The Committee also hung fliers in key locations in Town, advertised on the large announcement board in front of Town Hall and emailed their connections in Town.

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 Middlefield and surrounding communities. Regular feedback received from these other initiatives was incorporated into the hazard mitigation planning process. Neighboring communities that were provided with an opportunity to comment included municipalities

that directly border Middlefield are Peru, Worthington, Chester, Becket and Washington. These communities were invited to view the plan and attend the public meetings via a press release.

Documentation of Middlefield's public engagement process can be found in Appendix B.

Public Meeting #1 – July 23, 2018

On July 12, 2018, the Pioneer Valley Planning Commission sent a press release to relevant media outlets to announce that there would be a public outreach meeting about the planning process on July 23, 2018. This release was sent to those media identified by the Hazard Mitigation Committee as most relevant to the development of the plan. These included The Republican, The Daily Hampshire Gazette, The Berkshire Eagle, and The Country Journal. This meeting took place in the town hall auditorium immediately following a meeting of the Middlefield Planning Board. Many people from the Planning Board meeting stayed to attend the Hazard Mitigation Meeting.

General concerns that surfaced at this meeting were:

- Flooding, especially as storms come faster and drop larger quantities of water in a short amount of time
 - Cone Road is a dirt road that closes in the winter, which limits access to East River Road. If flooding does occur Cone Road is typically the first road to go.
 - Clark Wright Road has also been washed out multiple times over the years (Highway Superintendent notes that the most recent instances were in 2003 and Hurricane Irene in August of 2011. If this road washes out at the same time as Cone Road, a section of the town (East River Road) can become isolated. East River Road is home to 35-40 homes, many occupied by retirees, elderly women, and/or those with health issues. This could be especially problematic if power and telephone lines go down.
- Communication is a big issue
 - Many have cell phones, but no cell coverage
 - Concerns that Verizon is no longer maintaining land line infrastructure in the way that they used to because of the rise of cell phone adoption.
 - Town is working to bring broadband service to Town, which could ameliorate some of these challenges. This, however, could take some time.
- Some frustration around not being able to be proactive about erosion around the river due to state regulations
 - Feeling that watching erosion move closer and closer to taking out a road and not being able to do anything until the river washes away the road.
- Tree trimming- Concern that Eversource's five year trimming cycle is not enough to keep trees from encroaching on power lines.

Ideas for potential actions:

- Public radio in the sections of town that are most likely to be isolated during flooding or storm events. There are concerns that this may not be feasible, especially in the sections of town where there are no public parcels.

- The desire to have a more formalized process to get sand bags or sand from DPW when a known storm is coming
- A comprehensive drainage plan and culvert assessment to figure out what projects would need to be done to best address flooding, erosion and iced roads.

Public Meeting #2-September 17, 2018

On September 13, 2018, PVPC sent out a press release indicating that a second public outreach meeting would take place on September 17, 2018 and also to inform the public that a draft of the Middlefield Hazard Mitigation Plan had been placed on PVPC's website. The release also indicated that hard copies were available at PVPC's offices and at Middlefield Town Hall, and that all residents, businesses and other concerned parties of Middlefield were encouraged to comment on the plan by e-mailing or calling staff contacts at PVPC or the Town. In general, participants agreed with the risk assessment and mitigation strategies selected during this planning process. In addition, the Town posted fliers in key locations throughout Middlefield inviting any interested parties to attend.

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 2018, 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

Middlefield is an isolated hill town, on the cusp of the Berkshire Mountains. Comprised of over 24 square miles, Middlefield is bordered by Peru on the north, Worthington on the northeast, Chester on the southeast, and Becket and Washington on the west. Middlefield is about 35 miles northwest of Springfield, 17 miles east of Pittsfield, and 119 miles west of Boston. It still retains more of its past country-dwelling style than it shows of modern suburban style. In its past, it was never a trendy vacation spot, nor coveted as an upscale neighborhood, although it has long had a few vacationers, and a few wealthy immigrants from more crowded lands. Middlefield was, and is, a place where one lived and worked. Often, working the land was done in tandem with working a job that could provide steady income. Historically, there were mills in town that provided work. Currently, the trend of in-town work is of assorted home-based businesses. Middlefield has always been home to farmers and workers of modest income, who value the unpretentious, friendly life of a farming community, and living in harmony with the land.

Middlefield does not have proximity to any major, developed tourist or recreational attraction. It doesn't have a numbered highway or roadway. It doesn't have shopping, skiing, or any high volume events—other than the annual Town Agricultural Fair on the second weekend in August. Residents appreciate Middlefield's absence from the public's awareness, and the slow influx of change, or outside invasion, that this produces.

Of Middlefield's past identity, the thing most mourned is the loss of vistas once maintained by a predominance of farming and grazing land. At nearly 2,000 feet above sea level, Middlefield has an abundance of high points overlooking the valleys created by the branches of the Westfield River to its south and east. But as maintenance of farming and grazing land has diminished, so have the views from Middlefield's ridgeway roads.

POPULATION CHARACTERISTICS

According to the U.S. Census, there are 521 residents and a total of 286 housing units. The median household income is \$78,750 with 6.8 percent of residents living in poverty (American Community Survey 2012-2016). The median age in Middlefield is 56 and 21.1% of the town was over the age of 65 in 2016 (up from 12.4% in the 2010). This rapidly aging segment of the population is expected to be the most vulnerable to the impact of natural hazards.

DEVELOPMENT

According to 2005 land use statistics, approximately 93% of Middlefield's land exists as undeveloped forest and wetlands. The second largest land use in the town is agricultural uses—4.3% of the land. Additionally, 1.8% of land in town is used for residential purposes. Remaining land uses (commercial, industrial, civic, roads and water) each make up less than 1% of the total land area in town.

Land Use Description	Acres	Percent
Undeveloped (forest, forested wetland, non-forested wetland)	14333.79204	92.72%
Urban/Open/Public	92.72164061	0.60%
Commercial	2.751981655	0.02%
Agricultural	668.2134916	4.32%
Outdoor/Recreational	0.533307657	0.00%
Residential	281.2982951	1.82%
Industrial	2.043528148	0.01%
Transportation	18.69675897	0.12%
Water	59.08534944	0.38%

Source: MassGIS 2005 Land Use Data

ZONING

The Middlefield Zoning Bylaw establishes two base zones, and one overlay zones:

One Residential Zone – AR, Agricultural-Residential

One commercial (business) zones – B, Business;

One overlay zones –FWR, Floodplain and Westfield River Protection

Although appropriate zoning is all relevant to protecting the health and safety of the Town residents, Middlefield’s overlay districts is specifically relevant to natural hazard mitigation.

Floodplain and Westfield River Protection (FWR) District –

The purposes of the FWR are:

- Protect life, public safety and property from flooding hazard
- Preserve the natural flood control and flood storage characteristics of the floodplain
- Promote the preservation of agricultural lands along the Westfield River
- Prevent any alteration to the natural flow of the river
- Protect fisheries and wildlife habitat within and along the river
- Control erosion and siltation
- Enhance and preserve existing scenic or environmentally sensitive areas along the shoreline
- Conserve shore cover and encourage well-designed developments
- Prevent water pollution caused by erosion, sedimentation, nutrient or pesticide run-off and poorly sited waste disposal facilities
- Preserve and maintain the groundwater table and water recharge areas within the floodplain

The district includes all lands that are designated as Zone A on Middlefield Flood Insurance Rate Maps. Within this overlay district, the following uses are allowed by-right: agricultural, forestry and nursery, outdoor recreation, conservation, wildlife management, and buildings existing prior to the adoption of

the overlay district. Uses allowed by special permit include: single family residences (not including mobile homes), residential accessory uses, excavation of earth materials and improvement to existing structures that exceed 25% of the overall square footage of the structure.

NATIONAL FLOOD INSURANCE PROGRAM STATUS

Middlefield is a participating member of the National Flood Insurance Program, and had the following NFIP policy and claim statistics as of 2018:

- Flood Insurance Maps (FIRMs) are used for flood insurance purposes and are on file in the Town Offices
- FIRMs have been effective since January 3, 1986, and their current map went into effect on June 2, 1993.
- Middlefield has 4 in-force policies in effect for a total of \$1,081,100 worth of insurance.
- There have been a total of 4 NFIP claims for which \$44,692 has been paid.
- As of June 2018, there have been no Repetitive Loss Properties in Middlefield.

The Town will maintain compliance with the NFIP throughout the next five-year Hazard Mitigation Planning cycle by monitoring its Flood Plain Overlay District and ensuring that the district accurately reflects the 100-year flood plain and FEMA Flood Insurance Rate Map (FIRM).

INFRASTRUCTURE

Middlefield's infrastructure reflects its traditionally rural character and steep, rugged terrain.

ROADS AND HIGHWAYS

The main road through the center of Town is a two-lane, blacktop road called Skyline Trail, which runs from Route 8 in Hinsdale through Middlefield to merge with Old Chester Road in Huntington. Town Hill Road runs roughly southwest from Skyline Trail down to the Bancroft section of Middlefield. All of the roads to Middlefield are steep and narrow in places. Even though they are hardened roads, they are difficult to maintain and are generally in fair condition. In addition to these roads, the Town has a number of dirt roads that it maintains. In recent years, early winter thaws have made maintaining these roads difficult. Overall, the Highway department is diligent about maintaining and repairing the roads.

PUBLIC TRANSPORTATION

The town does not have public transit. There is also no formalized Dial-a-Ride service similar to the service provided by Franklin Regional Transit Authority in the surrounding hill towns. The Council on Aging does have a volunteer program that matches those in need with rides with volunteer residents.

DRINKING WATER AND SEWER SERVICE

There is no public water supply system in Middlefield. With the exception of one community well in the center of Town, all residents rely on private, individual on-site wells. Residents in the vicinity of the

Town center often have high mineral and iron content in their water. The Town has no plans to develop a public water system in the near future.

Middlefield does not have a public sewer system or any publicly-owned wastewater treatment plants in the Town. All residences and businesses are served by on-site septic systems.

NATURAL RESOURCES

The Town of Middlefield is comprised of a land area of 24 square miles, or approximately 15,460 acres. Although geologically part of the New England Uplands, climatologically the region is closer to the Green Mountains physiographic region. It receives a mean annual precipitation of 48 inches, and a mean annual snowfall of about sixty-five inches. Mean annual days of snow cover of an inch or more are 100, and frost-free days' number between 90 and 120 depending on elevation and exposure. Two significant watershed areas exist in Middlefield. To the east of Skyline Trail, flows go to the southeast forming Glendale and Tuttle Brooks before emptying into the Middle Branch of the Westfield River on the Worthington town line. To the west of Skyline Trail, the Coles and Factory Brook systems flow southwesterly to the West Branch of the Westfield River in the region of Bancroft. These branches converge in Huntington to create the main stem of the Westfield River

Middlefield's climate and open spaces provide ample recreational resources to its residents and its many visitors. Swimming, biking, walking, horseback riding and motorized sports are summer pastimes for an expanded population on its many trails and old roads. Fall brings the foliage season with its tourist traffic and hunting season. Winter sports include cross-country skiing, snowmobiling, hiking, and snowshoeing. Spring mud season discourages recreational pursuits on back roads, but many residents and visitors come to see the spring run-off in the streams and brooks, especially spectacular at Glendale Falls.

TOPOGRAPHY AND SOILS

The watershed area is generally developed on a gneiss bedrock surface and is covered with a mantle of glacial till, kame terrace or glacial moraine deposits. Bedrock outcrop and ledges are common. Soils are primarily upland soils with small areas of sandy and gravelly terrace soils, sandy alluvium, and muck. The dominant upland soils were formed in very compact glacial till and are extremely strong and bouldery with a loamy surface texture.

Middlefield is comprised predominately of five soil types, all of which have developed from glacial till and are derived from mica, schist, and granite rocks. These soils are all relatively shallow and stony. Permeability of soils is good but due to the seasonal high water table and the shallow depth to hardpan or bedrock, drainage generally is only moderate. Middlefield is part of the New England Upland physiographic province. Bedrock generally consists of Precambrian and Paleozoic gneisses, schists and granite intrusives. Wherever bedrock is not exposed at ground surface, the crests and flanks of the hills

are usually covered by a few feet of glacial till. The till was deposited during the advance and retreat of the Pleistocene glaciers when the ice formed and melted.

The following soil types are found throughout Middlefield

1. Pillsbury Association: 0-8% slope, extremely stony, poorly drained, located in slightly concave areas in glacial till uplands. Stones and boulders approximately 5 to 20 feet apart are prominent features of this landscape. Most areas are woodlands with some areas cleared for unimproved pasture. Seasonal high water table and the stones make this soil poorly suited to cultivated crops, hay, and pasture. Constructing roads on raised well-compacted coarse-textured base material and providing adequate side ditches and culverts will help overcome the wetness limitation and protect roads from frost damage. The seasonal high water table and the restricted permeability of the soil are main limitations when installing septic tanks and absorption fields for residential development.
2. Berkshire-Marlow Association: steep, extremely stony, 15-45% slopes. Stones and boulders on 1-15% of the surface are prominent features of the landscape. Most areas of these soils are in woodlands. The steepness of the slope and the stones make these soils generally unsuitable for cultivated crops, hay, and pasture. The main limitation for building site development and sanitary facilities is the steepness of slope. Some areas are shallow to bedrock, which may pose additional limitation.
3. Peru-Marlow Association: 3-15% slopes, extremely stony. These sloping soils are on the sides and crests of glacial uplands. Stones and boulders approximately 3 to 20 feet apart are prominent features of the landscape. Most areas of these soils are in woodlands. Some areas are cleared and used for cultivating crops, hay, and pasture. Constructing roads on well-compacted coarse-textured base materials will help protect roads from frost damage. The seasonal high water table and the restricted permeability of these soils are the main limitations for use as septic tank absorption fields. Foundation perimeter drains and landscaping designed to drain surface water away from buildings as well as keeping basement levels above the seasonal high water table will help avoid interior damage caused by excessive soil water.
4. Lyman-Tunbridge Association: 15-45% slopes, extremely stony, shallow and moderately deep glacial till on steep areas in the mountainous uplands. Bedrock outcrops and many stones and boulders are prominent features of the landscape. Permeability is moderately rapid, but there are some pockets of poorly drained mineral and organic soils. Crop productivity is limited by the bedrock outcroppings and shallow depth to bedrock. Development is limited by the slope and bedrock interference.
5. Tunbridge-Lyman Association: 3-15% slopes, extremely stony. These soils are formed in gently sloping areas on the sides and tops of hills with areas of rock outcropping. Permeability is

moderately rapid with moderate water holding capacity. Rooting depth is limited by bedrock. Most areas are in woodlands because of the stones on the surface and exposed bedrock. These soils are poorly suited to cultivated crops, hay and pasture. The depth to bedrock is the main limitation for development due to the difficulty in road construction, foundation excavations, and septic tank absorption fields. Aerial photography mapping reveals at least nine other soil types, but these represent small areas compared with the five above-listed.

RIVERS AND STREAMS

The entire Town of Middlefield is in the Westfield River watershed. The two major watercourses are the Middle Branch and the West Branch of the Westfield River. Topographically, the watershed area is characterized by moderately steep to steep hills and ridges with streams flowing between. There are two longer tributaries in the watershed. The first is Den Stream/Glendale Brook, which in its course to the Middle Branch provides one of Middlefield's outstanding scenic attractions, Glendale Falls; and the second tributary is Factory Brook, which flows into the West Branch. The Department of Environmental Quality Engineering [DEQE] has classified the Middle Branch of the Westfield River as Class A waters from its sources to the Littleville Dam in Chester. (Class A waters are waters which can be used as a public water supply.)

Rivers and Streams in Middlefield	
Water	Class
Middle Branch of Westfield River	(A)
West Branch of Westfield River	(B)
Tan Brook	(B)
Factory Brook	(B)
McElwain Brook and Den Stream	(A)
Willow Brook	(A)
Bear Mountain Brook	(A)
Tuttle Brook	(A)
Glendale Brook	(A)
Preston Pond and Coles Brook	(B)

Source: Massachusetts Department of Environmental Protection

According to state and Federal laws, waters must be maintained at the standards for their current classification. Local communities must strive to upgrade waters to the best possible classification, Class A. The West Branch of the Westfield River has a Class B status. It is suitable as a cold-water fishery and for recreational purposes, fishing, boating, and swimming. This B Classification starts at the source and extends the whole length of the West Branch.

The only body of fresh water in Middlefield is an unnamed pond that empties into Coles Brook.

AQUIFERS

The aquifer system of Middlefield has not been studied; however, its location in the middle of the Westfield River Basin is probably a major factor in the aquifer recharge. An aquifer is an underground pocket of water, sometimes several miles in length, into which water from the surface filters down. This filtering often takes place through more than 100 feet of soil and removes many impurities from the ground water as it descends.

FORESTS

Approximately 93% of Middlefield's 24 square miles is in forest cover; primarily second and third generation. The major forest type in Middlefield is the northern hardwood forest. This forest type is a transition forest dominated by Eastern hemlock, beech, white pine, yellow birch, and cherry.

Areas of highest elevation in Town are subject to extreme ice and wind damage and often contain the poorer quality timber in the Town. Beech, maple, hemlock with other mixed associates abound in these areas and tend to be short (1-1.5 logs) and of poor quality. The lower elevations tend to contain better quality stands and mixtures of hard maple, white ash, yellow birch, and cherry, which exhibit improved height (1-3 logs) and quality.

CONSERVATION LAND

Middlefield contains a significant amount of protected open space and recreational land. Of the Town's 24 square miles of total land, 67 percent has some form of protection. Thirty-five percent is considered permanently protected with 32 percent in temporary protection.

PRIVATE PARCELS

Of the 10,327 acres of protected land in Middlefield, 47 percent is privately owned. All of the private parcels in Town are enrolled in the Commonwealth's Chapter 61, 61A, or 61B programs; considered a temporary protection. The Massachusetts Chapter 61 tax abatement programs offer landowners a reduction in their property taxes, in return for signing a contract promising that the predominant use of the land will not change during an agreed upon time (ten years for Chapter 61 and Chapter 61B, one year for Chapter 61A). The Chapter 61A program helps farmers by reducing their taxes while they farm their land. The Chapter 61 program helps lower the expenses of maintaining actively managed forestland. Landowners with parcels in the Chapter 61B program receive lower property taxes in exchange for keeping their land in open space for ten years.

One of the benefits to the community of the Chapter 61 programs is that they provide a mechanism for protecting land from development. When a parcel which has been enrolled in one of the Chapter 61 programs is put up for sale, the Town is provided a one hundred and twenty (120) day waiting period during which it can exercise its right of first refusal to purchase the property. Taking advantage of the

right of first refusal is valuable if you have the ability to protect private land when it becomes available for sale. Identifying key parcels and building partnerships with local land trusts and landowners can be an effective planning process resulting in land protection. The right of refusal is transferable.

Four thousand eight hundred and ninety-seven (4,897) acres in Middlefield are enrolled in the Commonwealth's c. 61 program. Of those parcels enrolled in the program, 37 percent are enrolled in the c. 61 forestry program, 30 percent are enrolled in the 61A agricultural program, and 33 percent take advantage of the 61B recreation and open space program.

PUBLIC LAND AND NONPROFIT PARCELS

STATE LAND

There are approximately 5,130 acres of state land in Middlefield, including: Walnut Hill Wildlife Management Area, 814 acres; Middlefield State Forest, 2,388 acres; Fox Den Wildlife Management Area, 1,512 acres; Peru State Forest, 414 acres; and Westfield River Access Area, 2.5 acres. These areas are largely available to the public for hiking, hunting, skiing, nature study and other outdoor activities.

NON-PROFIT PARCELS

Glendale Falls: Glendale Falls are located on a wooded 139-acre property which was sold to the Trustees of Deeds and Reservations by Richard and Janet Waite. This lovely area is traversed by Glendale Brook and is overseen and maintained on a periodic basis by the Trustees. The Falls are actually a series of short cascades over water worn ledges that drop almost two hundred feet to the valley of the Middle Branch. During the dry summer months, the water meanders over the ledges in narrow rivulets, leaving most of the smooth surface of the watercourse dry and free for climbing, picnicking, and sunbathing. When there is heavy run-off in the spring or after summer storms, the Falls become booming rapids completely obscuring the ledges in frothing water. The Falls and surrounding forest of hardwoods, hemlock and mountain laurel are extremely beautiful and provide a most agreeable setting for nature study, hiking, and scenic viewing.

McElwain-Olsen Preserve: This preserve is a 71-acre property located on Arthur Pease Road that was gifted to The Nature Conservancy (TNC) in 1973. This was once an agricultural region but now supports an upland forest community. A portion of Glendale Brook meanders through the eastern portion of the property. Highlights of the preserve include a 100-year-old beech forest with white pine and hemlock, the remains of an old mill, and a ravine that descends into Glendale Brook.

Highland Agricultural Society Fairgrounds: The dramatic hilltop site of the Fairgrounds is located on a parcel of 8.7 acres near the Center of Town, which is owned by the Highland Agricultural Society. The Fairgrounds are available to the public by special permission from the officers of the Society. The Society maintains several buildings and barns at the Fairgrounds, which are used only during the weekend of the Fair in early August. Each year, exhibitors, competitors, and thousands of ticket holders give the peaceful hilltop a brief season of lively activity.

3: HAZARD IDENTIFICATION AND ANALYSIS

The following section includes a summary of disasters that have affected or could affect Middlefield. 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 Middlefield. The table below illustrates a comparison between the relevant hazards in the state plan and in Middlefield’s plan.

Comparison of Hazard identified in the 2013 Massachusetts Hazard Mitigation Plan and the Middlefield Hazard Mitigation Plan	
2013 Massachusetts Hazard Mitigation Plan	Town of Middlefield Relevance
Coastal Hazards	Coastal Hazards are not relevant to Middlefield.
Dam Failure	Dam Failures are relevant in Middlefield.
Drought (Severe Weather)	Drought is relevant in Middlefield.
Earthquake	Earthquakes are not a concern in Middlefield.
Extreme Temperature (Severe Weather)	Extreme Temperatures are a concern in Middlefield.
Flood (including Ice Jam)	Flooding is relevant in Middlefield.
High Wind (Severe Weather)	High Wind is relevant in Middlefield.
Hurricane/Tropical Storm	Hurricanes and tropical storms are relevant in Middlefield.
Ice Storm (Severe Winter Weather)	Ice Storms are a concern for Middlefield.
Landslide	Landslides are not a concern in Middlefield.
Major Urban Fires	Major urban fires are not a concern in Middlefield.
Nor’easter	Nor’easters are a concern in Middlefield.
Snow & Blizzard (Severe Winter Weather)	Snow and Blizzards are a concern in Middlefield.
Thunderstorm (Severe Weather)	Thunderstorms are a concern in Middlefield.
Tornado (Severe Weather)	Tornados are a concern in Middlefield.
Tsunami	Tsunamis are not a concern in Middlefield.
Wildland Fire	Wildland Fires are a concern in Middlefield.

NATURAL HAZARD ANALYSIS METHODOLOGY

This chapter examines the hazards in the Massachusetts State Hazard Mitigation Plan which are identified as likely to affect Middlefield. 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 Middlefield are: floods, severe snowstorms/ice storms, hurricanes, severe thunderstorms / wind / tornadoes, wildfire/brushfire, dam failure, extreme temperatures and drought. Many of these hazards result in similar impacts to a community. For example, hurricanes, tornadoes and severe snowstorms may all 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	
Impact	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:

Hazard Index Ratings	
Rating Number	Meaning
1	Very Low Risk
2	Low Risk
3	Medium Risk
4	High Risk
5	Very High 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
Dam Failures	Small	Low	Minor	Very Low
Drought	Large	Low	Minor	Low
Extreme Temperature	Large	Low	Minor	Moderate
Flooding	Small	Low/High	Limited	High
Hurricanes	Large	Moderate	Limited	High
Severe Snowstorms/ Ice Storms	Large	Very High/High	Minor	High- Snow Very High- Ice
Severe Thunderstorms/Winds/ Tornadoes/Microburst	Medium	High	Limited	High
Wildfire / Brushfire	Large	Low	Critical	Moderate/High

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 breaches 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

According to the Office of Dam Safety, Middlefield has 5 dams located within its boundaries. The location of occurrence for a dam failure has been determined to be "small," with less than 10 percent of land area affected. The local Hazard Mitigation Committee, however, report that only the Virginia Lake Shore Dam is still in place. All of the other dams have been removed or naturally swept away by nature.

Dams in Middlefield			
Dam	Hazard Level	Purpose	Condition
Upper Reservoir Dam	-- (Non Jurisdictional)	--	N/A
Virginia Lake Shore Dam	Low	Recreation	Poor
Golden Fleece Dam	--	--	--
Paper Manufacturing Company Dam	--	--	--
Berkshire Pond Dam	Not currently impounding water		

Source: Office of Dam Safety, 2013.

The location of dams in Middlefield can be seen on the Past and Present Hazards and Critical Infrastructure Map in the appendix.

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 operations 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

Middlefield has experienced four dam failures in its history. According to the Town’s 2003 Open Space and Recreation Plan, Middlefield used to have a number of mills along the Factory Brook in the western section of town. In 1874, the Reservoir Dam across Factory Brook failed destroying the town’s mills. This section of town and the dam were rebuilt. However, the dam failed again in 1901 destroying the mills again. After this dam failure, the mills were not rebuilt and the area reverted back to its agricultural roots—causing the population in town to drop with the departure of industry. There are no records that note whether these dam failures caused monetary damages or if there was any loss of life.

The Hazard Mitigation Committee also reported that the Upper Goose Pond Dam (no longer listed as a dam with the Office of Dam Safety) failed twice in the town’s history washing away the rail lines.

PROBABILITY OF FUTURE EVENTS

As Middlefield’s dams age, and if maintenance is deferred, the likelihood of a dam failure will increase, but, currently the frequency of dam failures is “Low” with 1 to 10 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 hydrograph changes, it is conceivable that the dam can lose some or its entire 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 would likely be “minor” with less than 10 percent of property in the affected area damaged or destroyed. The dam in Middlefield is on the border with surrounding towns and due to Middlefield’s topography, water from a dam failure is likely to flow downstream, impacting neighboring communities. To approximate the potential impact to property and people that could be affected by this hazard, the total value of all property in town, \$50,534,100 is used. An estimated 20 percent of damage would occur to 10 percent of structures, resulting in a total of \$1,010,682 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, Middlefield has a “Very Low” vulnerability from dam or levee failure.

If any of Middlefield’s dams were to fail, they would have a very minimal impact on the town’s critical facilities. All of the dams sit at a lower elevation than the Town’s critical buildings and are not near the town’s main evacuation routes.

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 how deep their wells are dug. Because Middlefield does not provide public water service, all residents rely on private wells for water. 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 1930.¹ 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
2016	D3 conditions in 52% of the state
2017	D3 conditions in 8% of the state
2018	D1 Conditions in 36% of the state

Source: US Drought Monitor

During the summer of 2016, Middlefield, the Pioneer Valley and the state were in the midst of a severe drought, with many areas experiencing D3 conditions. In Middlefield, a number of private wells dried up in this drought and had to be re-drilled at deeper lengths—it should be noted that many of these wells were shallow wells.

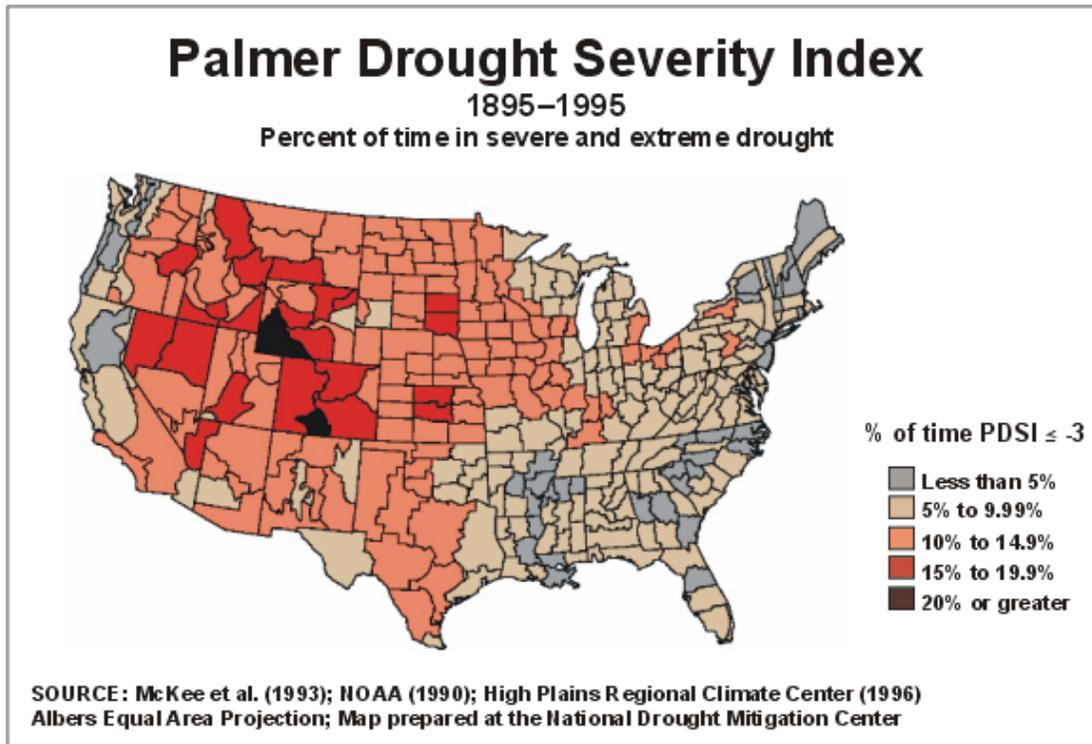
PROBABILITY OF FUTURE EVENTS

In Middlefield, 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

¹ US Geological Survey Water-Supply Paper 2375. "National Water Summary 1989 – Floods and Droughts: Massachusetts." Prepared by S. William Wandle, Jr., US Geological Survey.

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 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.²



IMPACT

Due to the water richness of western Massachusetts, Middlefield is unlikely to be adversely affected by anything other than a major, extended drought. As a result, the impact of a drought would be “minor,” with only minor property damage, disruption on quality of life, or the need to dig a new, deeper well.

VULNERABILITY

Based on the above assessment, Middlefield has a “low” vulnerability in regards to drought. While 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.

² National Drought Mitigation Center – <http://drought.unl.edu>

EXTREME TEMPERATURES

HAZARD DESCRIPTION

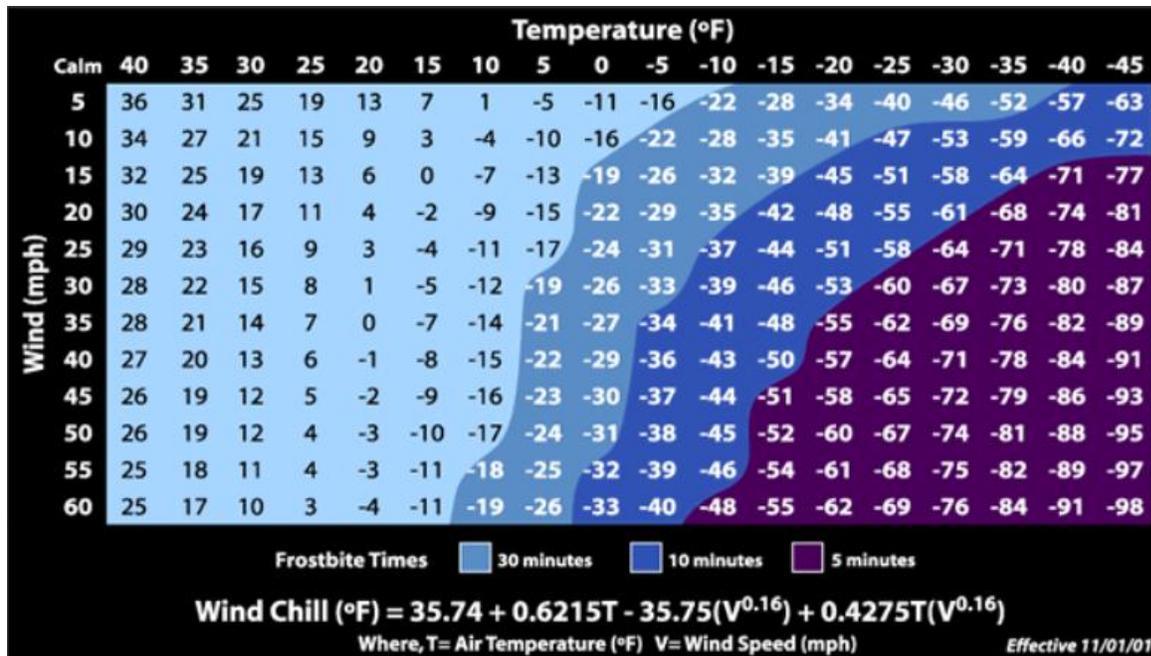
Greater variation and extremes in local atmospheric temperatures due to global changes in climate are among the natural hazards that this plan anticipates. Middlefield is likely to experience more instances of extreme and sustained heat and cold. And, because warmer air holds more moisture, higher temperatures 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.

LOCATION

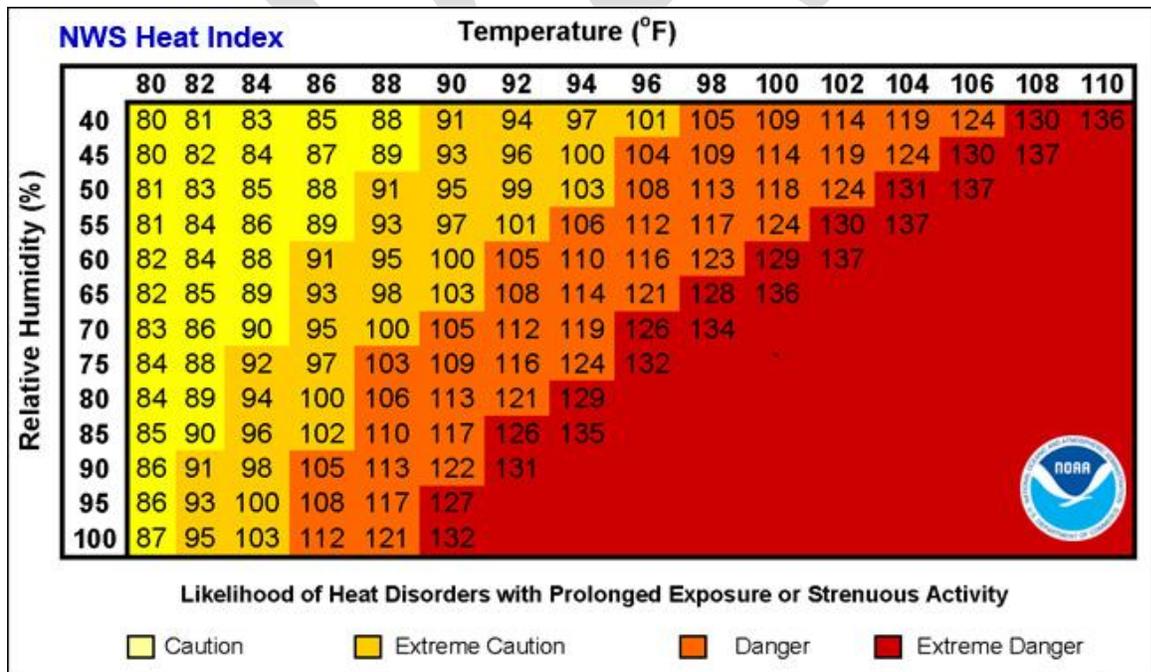
Extreme temperatures would affect the whole community resulting in a "large" location of occurrence, or more than 50 percent of total land area affected.

EXTENT

As per the Massachusetts Hazard Mitigation Plan, the extent (severity or magnitude) of extreme cold temperatures are generally measured through the Wind Chill Temperature Index. Wind Chill Temperature is the temperature that people and animals feel when outside and it is based on the rate of heat loss from exposed skin by the effects of wind and cold. The chart shows three shaded areas of frostbite danger. Each shaded area shows how long a person can be exposed before frostbite develops. In Massachusetts, a wind chill warning is issued by the NWS Taunton Forecast Office when the Wind Chill Temperature Index, based on sustained wind, is -25°F or lower for at least three hours.



For extremely hot temperatures, the heat index scale is used, which combines relative humidity with actual air temperature to determine the risk to humans. The NWS issues a Heat Advisory when the Heat Index is forecast to reach 100-104°F for 2 or more hours. The NWS issues an Excessive Heat Warning if the Heat Index is forecast to reach higher than 105°F for 2 or more hours. The following chart indicates the relationship between heat index and relative humidity:



PREVIOUS OCCURRENCES

The following are some of the lowest temperatures recorded in parts of Massachusetts for the period from 1895 to present³:

- Taunton, MA- -35°F
- Coldbrook, MA -35°F
- Chester, MA- -35°F

The following are some of the highest temperatures recorded for the period from 1895 to present⁴:

- Chester, MA - 107°F

PROBABILITY OF FUTURE EVENTS

The probability of future extreme heat and extreme cold is considered to be "low," or between 1 and 10 percent in any given year.

IMPACT

Extreme cold and extreme heat are dangerous situations that can result in health emergencies for susceptible people, such as those without shelter or who are stranded or who live in homes that are poorly insulated or without heat or air conditioning/some other way to stay cool. The impact of extreme temperatures, the impact of extreme heat or cold in Middlefield is considered to be "minor," with no property damage and very limited affect on humans.

VULNERABILITY

Middlefield's vulnerability from extreme heat and cold is considered to be "Moderate."

Structures and infrastructure within the town are not at risk for damage due to extreme temperatures, but populations that are not prepared to contend with these temperature extremes could be most vulnerable. Extreme cold coupled with power outages could be major issue in Town, as many people's heating source requires an electric start. The Town has supplies for sheltering, but isn't prepared for long-term sheltering. Extreme heat is growing into an ever-presence concern. Many residents don't have air-conditioning, because it wasn't necessary in the past, and none of the Town buildings have air conditioning. This means there isn't a location in town that could serve as a cooling center.

³ <https://www.ncdc.noaa.gov/extremes/scec/records>

⁴ <https://www.ncdc.noaa.gov/extremes/scec/records>

FLOODING

HAZARD DESCRIPTION

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

- *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.

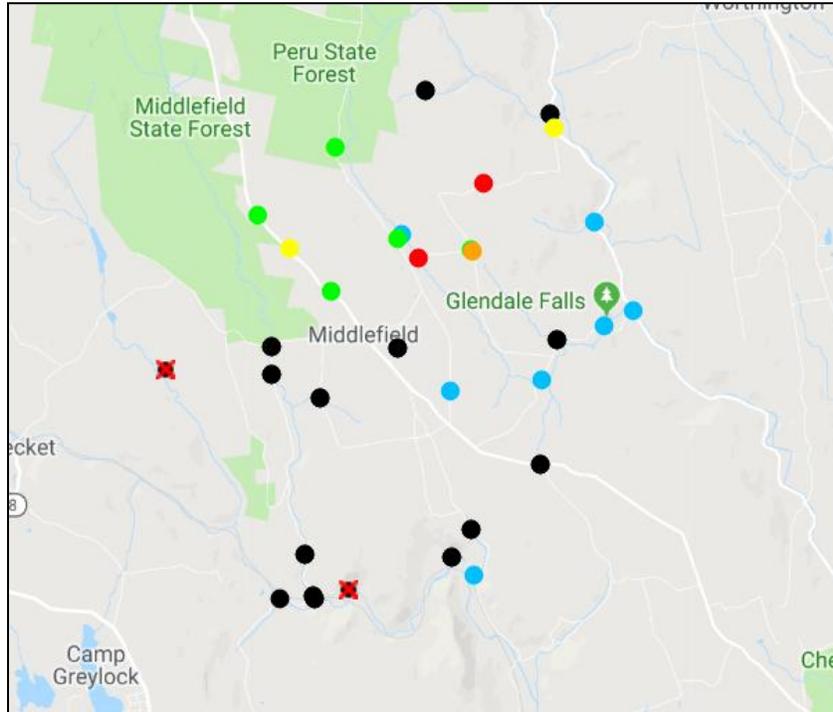
LOCATION

There are approximately 480 acres of land within the FEMA mapped areas subject to inundation by a 1-percent annual chance flood, commonly called the 100-year floodplain and 10 acres of land within areas subject to inundation by a 0.2-percent annual chance flood, commonly called the 500-year floodplain within the Town of Middlefield. Most of this land is in areas adjacent to the Middle Branch of the Westfield River, Factory Brook and Glendale Brook.

In addition, various parts of Middlefield have issues with localized flooding. They include:

- Cone Road closer to East River Road
- Clark Wright Road near Glendale Falls
- Reservoir Road where it intersects with Town Hill Road and Factory Brook
- Chipman and Becket Road- both of these roads are dirt roads and have been especially problematic when temperatures warm prematurely in the winter
- East River Road

In addition to localized flooding, undersized culverts can cause flooding in areas of town. Below is a map of the culverts and stream crossing in Middlefield. Town officials have noted the following culverts as being especially problematic: one on Clark Wright Road and two at the bottom of Reservoir Road.



- No barrier: blue ●■
- Insignificant barrier: blue green ●■
- Minor barrier: green ●■
- Moderate barrier: yellow ●■
- Significant barrier: orange ●■
- Severe barrier: red ●■
- Missing data: magenta ●■
- No crossing: black circle with bold red x ❌
- New crossing pending approval: black circle with red slash ⚡

TIP: To get the most recent information (i.e. most recent 'Date observed in field' AND most recent 'Last updated') for a surveyed crossing, click on it. Please be aware that to view all records for a surveyed crossing, you must use the "Search Crossings" page to search using the crossing code.

Black circles ● are unsurveyed crossings that have been assigned xy crossing codes by using Geographic Information System (GIS) software. Depending on the area covered by your search results, you may not see any black circles until you have zoomed in. When you hover over black points, the xy crossing code will appear.

Source: University of Massachusetts Stream Continuity Project 2018. < https://www.streamcontinuity.org/cdb2/naacc_search_map.cfm >

Based on these locations, flooding has a “small” location of occurrence, with less than 10% percent of 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 Middlefield and surrounding communities in the Westfield River Watershed is 46 inches⁵. Additionally, in the Westfield River Watershed, has approximately five (5) days a years where more than one inch of precipitation is recorded.⁶

PREVIOUS OCCURRENCES

The major floods recorded in Middlefield have been the result of rainfall alone or rainfall combined with snowmelt. Key floods in Middlefield include:

- **The Great New England Flood of 1938**- This region-wide flooding was caused by snow melt and extremely rainy weather. While little information about the flooding impact on Middlefield is documented, neighboring communities reported substantial damage. In Massachusetts, the Great Flood killed ten people and displaced approximately 50,000 people. It caused over \$200,000,000 in damage.
- **August 1955**- Hurricane Connie and Hurricane Diane dropped over 26 inches of rain in less than a week. Across the region, many towns dealt with impassable roads, bridge and dam destruction, and power outages.
- **2003**- A rain storm moved through the region dropping a significant amount of rain in Middlefield in a short amount of time. This washed out Clark Wright Road near Glendale Falls.
- **August 2011**-Hurricane Irene moved the region and dropped an average of approximately 10 inches of rain on an already saturated region. The Westfield River saw extensive flooding, with water even cresting dams in Becket. In Middlefield, the heavy rainfall caused significant erosion

⁵ <http://resilientma.org/datagrapher/?c=Temp/basin/pcpn/ANN/Westfield/&c=Temp/basin/pcpn/ANN/Westfield/>

⁶ http://resilientma.org/datagrapher/?c=Temp/basin/pcpn_1/ANN/Westfield/&c=Temp/basin/pcpn/ANN/Westfield/

issues on Cone Road and lands along the two branches of the Westfield River in town experienced flooding. A gauge on the Westfield River in Huntington (the closest river gauge to Middlefield) reported its highest historic crest in this location during Hurricane Irene. The river crested at 16.78 feet and flood stage on this segment of the river is 9 feet.⁷

More recently, large rain storms have caused localized flooding that has created short term nuisances.

PROBABILITY OF FUTURE EVENTS

Based on previous occurrences, the probability of flooding in Middlefield is "Low," with a 1 to 10 percent probability in any given year and the probability of localized flooding is "High" with a 40 to 70 percent probability in any given year. Flooding frequencies for the various floodplains in Middlefield 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

IMPACT

The impact of a flood event would likely be "Limited" in Middlefield dependent on event severity and precise location. This equates to approximately 3 percent or more of property in affected area damaged. Using the assessed value of all structures in town, \$50,534,100, the total property damage, based on the damage to individual flooding locations discussed in the "location" section, is \$6,846 (assumes 10% damage to 3% of structures). The Town anticipates that in almost all instances, flooding will cause more damage to roads than buildings. 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, Middlefield faces a vulnerability of "High" risk from flooding.

It is anticipated that none of the Town's Critical Facilities, which are clustered at a higher elevation in the Town Center, will be impacted by flooding. East River Road would be the only evacuation route to flood. Lastly, it's anticipated the most residents homes will not be impacted by flooding beyond small amount of water in basements.

⁷ <https://water.weather.gov/ahps2/hydrograph.php?wfo=box&gage=hntm3>

CLIMATE PROJECTIONS

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. Based off of data from the Massachusetts Climate Change Clearinghouse⁸, the average annual precipitation amounts are expected to increase by an additional 1.83 inches by the middle of the century (2050) and by an additional 4.45 inches by the end of the century. Additionally, by the end of the century, Middlefield and the rest of the Westfield River Watershed is projected to see the number of days in a year with precipitation events greater than 1 inch increase by .5 days a year.

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.

⁸ http://resilientma.org/datagrapher/?c=Temp/basin/pcpn_1/ANN/Westfield/&c=Temp/basin/pcpn/ANN/Westfield/

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 Middlefield is at risk from hurricanes and tropical storms, meaning the location of occurrence is "large," with over 50 percent of land area affected. Ridgetops are more susceptible to wind damage and flood-prone areas are susceptible to flooding from heavy rains that usually accompany hurricane.

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 Middlefield are shown in the following table.

Major Hurricanes and Tropical Storms Affecting Middlefield		
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

NOAA’s historical hurricane tracker shows that two Hurricanes tracked directly through Middlefield—an unnamed one 1924 and The Great Hurricane of 1938. The Great Hurricane of 1938 holds the record for bring the most powerful and deadliest hurricane to hit New England. It is believed that the hurricane killed 682 people and destroyed almost 60,000 homes as it moved across New England. There is no local history or knowledge of how the storm directly impacted Middlefield. While they didn’t track through Middlefield, the Hazard Mitigation Committee recalls Hurricane Diane and Hurricane Irene impacting the town. Hurricane Irene dropped a significant amount of rain and caused road washouts and erosion.

PROBABILITY OF FUTURE EVENTS

Middlefield’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 Middlefield faces a “Limited” impact from hurricanes, with more than 10 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, \$50,534,100 is used. Wind damage of 5 percent with 10 percent of structures damaged would result in an estimated \$252,670 of damage. Estimated flood damage to 10 percent of the structures with 20 percent damage to each structure would result in \$1,010,682 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, Middlefield faces a "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 and older buildings.

DRAFT

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 Middlefield is susceptible to severe snowstorms. 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. Middlefield’s topography creates some steep grades, sometimes making plowing difficult and causing snow and ice hazards. The following areas have been identified by the Hazard Mitigation Committee as areas where ice forms during winter storm events:

- Center of Town/areas of town with highest elevations
- Upper Chipman Road
- West Hill Road

The following areas have been identified by the Hazard Mitigation Committee as areas where snow drifts happen during winter storm events:

- Central Section of Bell Road near the Fair Grounds
- Arthur Pease Road between Bell Road and Sky Line Trail
- Skyline Trail near the Town Hall
- Areas of Cone Road and Upper Chipman Road

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. 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>

The Sperry-Piltz Ice Accumulation (SPIA) Index (below) is a prediction tool (algorithm) that can be used in conjunction with National Weather Service data to predict the impact of winter weather in terms of ice damage. It is currently being tested by the National Weather Service and FEMA in several regions with potential implementation in the future. In the meantime, the index provides an outline of the potential damage impacts of ice storms based on accumulation and wind.

The Sperry-Piltz Ice Accumulation (SPIA) Index	
Ice Damage Index	Damage and Impact Descriptions
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1-5 days.
4	Prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and come high voltage transmission lines/structures/ Outages lasting 5-10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

Source: <http://www.spia-index.com/images/SPIAIndexDescription.png>

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. Based on data available from the National Oceanic and Atmospheric Administration, there are 64 winter storms since 1958 that have registered on the NESIS scale. Of these, approximately 30 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
2/11/2014	5.28	3	Major
2/18/1972	4.77	3	Major
03/12/2017	5.03	3	Major
02/18/1977	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
10/29/2011	1.75	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>

In recent history, there has been no loss of life from snow or ice storms in Middlefield, but each year there are incidences of property damage and personal injuries. Most winter storms that hit Middlefield are manageable and simply more of a nuisance in regards to snow removal. The general sense from the Hazard Mitigation Committee is that most residents are prepared to weather the impact of snow and ice storms for short amounts of time. While there is limited local data on the storms and their impacts on the Town, the Hazard Mitigation Committee recalled a significant snow storm in 1957 and an 'endless' amount of snow in 2013 and 2014. These storms had a limited impact on the community, beyond the time and costs associated with snow removal.

The major concern regarding both snow and ice storms is the loss of power. Middlefield is at the end of the power lines, which often means that they are one of the last communities to be reached by Eversource. In the past, the Chester Municipal Light Plan has helped restore service to the town, but there is no formal agreement between the MLP and Eversource. Given the prevalence of private wells, this also meant the most residents were without access to water until power was restored.

There currently isn't good local data on ice storms in Middlefield. According to the state hazard mitigation plan, there were 20 ice storms in Hampshire County between 1971 and 2012. This equates to a major ice storms every two years. Given Middlefield's high elevation, they deal with small ice storms almost annually. The last ice storm to cause significant damage was in 2008.

PROBABILITY OF FUTURE EVENTS

Based upon the availability of records for Hampshire County, the likelihood that a severe snow storm will hit Middlefield in any given year is "Very High," or a 70 to 100 percent probability in any given year. Furthermore, in Hampshire County, it is expected that an ice storm can be anticipated every other or a "High" probability.

IMPACT

The impact of an event would be "Minor," with less than 10 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, \$ \$50,534,100, is used.

An estimated 20 percent of damage would occur to 10 percent of structures, resulting in a total of \$1,010,682 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, Middlefield faces a "High" vulnerability from severe snow storms and "Very High" vulnerability from ice storms.

The Town's power and communication infrastructure could be vulnerable to the impacts of a severe snow or ice storm. This could cause residents and businesses to lose power, heat and water and could

impact the Town's ability to operate normally. Additionally, buildings with flat roofs are especially vulnerable to damage, especially when the snow is wet and heavy. In Middlefield, only the Town Hall has a large flat roof. There is however very little concern about snow load on the roof because wind blows off most of the snow. Lastly, because Middlefield substantially canopy cover, a severe snow or ice storm could also cause a lot of damage in the form of downed trees.

CLIMATE PROJECTIONS

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.

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

LOCATION

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 between 10 and 50 percent of total land area. Ridgetops and areas prone to flooding are expected to be most vulnerable.

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.

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

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

Source: <http://www.spc.noaa.gov/misc/tables/hailsiz.htm>

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

Rainfall Records for Middlefield, 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"	10.40"
July	4.33"	9.73"
August	7.56"	18.68"
September	3.86"	8.67"
October	3.39"	9.06"
November	2.44"	7.56"
December	2.99"	7.25"

Source: <http://www.myforecast.com/bin/climate.m?city=19373&metric=false>

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. As the climate changes, the frequency of these event is likely to increase.

Within Massachusetts, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester. The most common months are June, July, and August, but the Great Barrington, MA tornado (1995) occurred in May, the Windsor Locks, CT tornado (1979) occurred in October and the Goshen-Conway Tornado (2017) occurred in February. Nine incidents of tornado activity (F3 or less) have occurred in Hampshire County since 1954 and no known tornados have touched down in Middlefield. The closest tornados to touch down near Middlefield were an EF1 tornado in Worthington in 1984 and an EF1 in Goshen and Conway in 2017.

Most recently, on February 25, 2017, an EF1 tornado touched down in Conway and Goshen, Massachusetts. The tornado damaged dozens of homes, hundreds of trees and left 75% of the residents without power. This was the first tornado in Massachusetts to touch down in February since record keeping stated in the 1950s. In 2011, a tornado ranked F3 (Severe Damage) on the Fujita Scale of Tornado Intensity, blew through the region impacting the towns of West Springfield, Westfield, Springfield, Monson, Wilbraham, Brimfield, Sturbridge, and Southbridge. The tornado and related storm killed 3 people, resulted in hundreds of injuries across the state and caused significant amounts of property damage.

Middlefield experienced a microburst in the southwest section of town (near West Hill Road, Town Hill Road, and Harry Pease Road), which only caused damage to trees. A number of communities in the greater region have also experienced microbursts recently including Chicopee and Easthampton.

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 in Middlefield is "low," or between 1 and 10 percent in any given year. Based upon local knowledge and the increased prevalence of microburst in surrounding communities, the estimated probability of a microburst in Middlefield is "moderate," or between 10 and 40 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 "Very High" probability (70 to 100 percent chance in any given year) of a severe thunderstorm or winds affecting the town.

Overall, there is a "High," or 40 to 70 percent, probability that Middlefield will be impact by severe wind, microbursts, tornados and/or thunderstorms in a given year.

IMPACT

Overall, the Town of Middlefield faces a "Limited" impact from severe thunderstorms, winds, microbursts or tornadoes, with between 10 and 25 percent of the town affected. The potential for locally catastrophic damage is a factor in any severe weather event. In Middlefield, 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. These codes came into regulations in the first edition of the Massachusetts State Building Code, which went into effect on January 1, 1975. Most of the town's housing stock and Town buildings were built before this date.

To approximate the potential impact to property and people that could be affected by severe weather, tornado, or wind, the total value of all structures in town, \$50,534,100 is used. An estimated 100 percent of damage would occur to 1 percent of structures, resulting in a total of \$5,053,410 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, Middlefield has a "High" vulnerability from severe thunderstorms, winds, microbursts and tornadoes.

The entire town would be vulnerable to the destruction caused by severe thunderstorms, wind, microbursts 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 older buildings. Most, if not all of the town's critical facilities, were designed to withstand lower wind speeds and could be damaged or destroyed by high wind events, microbursts of tornadoes.

DRAFT

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 lightning
- *Crown fires* move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions.

LOCATION

Approximately 14,333 acres of Middlefield (93%) is forested and therefore at risk of wildfire. The location of occurrence is "large," with more than 50% percent of land area affected.

Areas along the town's Southern border near Becket and Chester, Massachusetts have been noted as the most likely to experience wildfire and/or brushfire due to the presence of railroad tracks. Trains running along this section of town have been known to throw off sparks, due to friction, which can cause fires. The steep terrain in this section of the town makes response to fires challenging.

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 Middlefield, 93 percent of the land is forested (14,333 acres), 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 Middlefield's landscape, including vital watershed lands, in a short period of time. Middlefield's rugged terrain could also make it difficult for emergency personnel to contain and fight a wildfire.

Based major wildfires that have occurred in western Massachusetts, it is estimated that such a fire would likely destroy between 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 Litchia 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

As a point of reference, the total number of fire incidences in Middlefield for the last five available years is provided below. These include structural, automotive and brush fires.

Total Fire Incidents in Middlefield	
2011	1
2012	0
2013	0
2014	0
2015	0

Source: Massachusetts Fire Incidence Reporting System, County Profiles, 2015 Fire Data Analysis

The Hazard Mitigation Committee remembers very little activity of past fire activity in recent history. The closest and most disastrous instance of wildfire that the committee could recall was a fire in the 1960s on Gobble Mountain in Chester.

PROBABILITY OF FUTURE EVENTS

In accordance with the Massachusetts Hazard Mitigation Plan, the Hazard Mitigation Committee found it difficult to predict the likelihood of wildfires in a probabilistic manner because the number of variables involved. However, given the presence of previous wildfires, and their proximity to the Town, the likelihood of a future wildfire is determined to be “Low,” or between a 1 and 10 percent probability in any given year.

Climate scenarios project summer temperature increases between 2°C and 5°C 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

Middlefield faces a “critical” impact from wildfires, with extensive 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, \$50,534,100 is used.

An estimated 100 percent of damage would occur to 15 percent of structures, resulting in a total of \$7,580,115 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, Middlefield faces a “Moderate” to “High” vulnerability from wildfire and brushfires.

Because so much of Middlefield is forested, the whole town, all its critical facilities and evacuation routes are vulnerable.

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, earthquakes and tsunamis were determined to not be a threat.

DRAFT

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 Middlefield has been identified utilizing a Critical Facilities List provided by the State Hazard Mitigation Officer. Middlefield'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 identified as non-essential and not required in an emergency response event, but which are considered essential for the everyday operation of the Town.
- Facilities or institutions that include special populations which would need additional attention in the event of a hazard event.

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: Town Hall- 188 Skyline Trail

Alternate: Fire Station 6 Bell Road

Fire Station

Fire Station- 6 Bell Road

Police Station

Police Station-188 Skyline Trail

Highway Garage

Highway garage- 4 Bell Road

Water Department

The town does not supply water to any of the Residents.

Emergency Fuel Stations

The town has a tank of diesel fuel at the highway garage and can get gasoline from Chester Electric (Town Road- Chester) in times of emergency.

Emergency Electrical Power Facility

There are no substations in town.

The Town Hall does generate electricity through solar panels, but that energy is fed into the grid. Additionally, there is a propane generator at the Town Hall and generators are slated to be installed into the Highway Garage and Fire Station by Fall of 2018.

Emergency Shelters

Town Hall has the supplies and backup power source needed to shelter residents.

Dry Hydrants, Fire Ponds, and Water Sources

There is a dry hydrant at Azure Green- 16 Bell Road

Bancroft and Factory Brook serve as surface water supplies that can be used. Access via fire truck is difficult, but the fire department has portable pumps that they can bring to the site as needed.

Helicopter Landing Sites

Fair Grounds-7 Bell Roads (wires make it fairly tight to get in to)

Azure Green- 16 Bell Road has a large parking lot, need a formal agreement

Communications

Cell Towers: Closest cell tower is in Chester. Cell coverage in town is a real challenge. Verizon and AT&T work better than some providers, but still spotty. Considering a cell phone booster at the Town Hall.

Primary Evacuation Routes – All have steep slopes

Skyline Trail

Chester Road

Town Hill

East River Road

Bridges Located on Evacuation Routes

Skyline Trail- 0 bridges

Chester Road- 1 bridge- slated for replacement in 2020

Town Hill Road- 4 bridges- 1 has a posted light weight restriction

CATEGORY 2 – NON EMERGENCY RESPONSE FACILITIES

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

Municipal Buildings

Senior Center- Skyline Trail

Salt Shed- Bell Road

Transfer Station (shed) – Bell Road

Library – Skyline Trail

Problem Culverts

Reservoir Road (2)

Clark Wright Road

CATEGORY 3 – FACILITIES/POPULATIONS TO PROTECT

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

Hospitals

Berkshire Medical Center- Pittsfield

Baystate Noble Hospital- Westfield

Cooley-Dickenson- Northampton

Level 1 Trauma Centers via helicopter

Baystate Medical Center- Springfield

Albany Medical Center- Albany, NY

Special Needs Population

Populations with Special Needs are fairly dispersed through town. One of the strengths of being a small town though is that everyone knows everyone and always check in on each other.

Despite this, the Council on Aging is currently working on pulling together a list of particularly vulnerable populations that they will share with the Highway Superintendent, Fire Department and Emergency Management Director.

Elderly Housing/Assisted Living

No housing or assisted living communities in town that are age restricted. General population is aging and the elderly live in private homes dispersed throughout the community.

Recreation Areas

Glendale Falls

Keystone Arches Trail

Branches of the Westfield River (no formal access points)

Middlefield Fair Grounds

Middlefield State Forest
Playground near Council on Aging
Town Hall
Library

Daycares

No official day cares

Places of Worship

Middlefield Congregational Church- Intersection of Skyline Trail and Bell Road

Historic Buildings/Sites

Elijah Churchill Gravesite- Bell Cemetery- Skyline Trail
Senior Center-Skyline Trail
Historic District- Town Center
Keystone Arches- Westfield River

Apartment Complexes

No apartment complexes in town.

Schools

There are no schools in Middlefield. Middlefield is part of the Gateway Regional School District. Elementary students go to school at the Chester Elementary School in Chester, MA. High school and middle school students attend Gateway Regional High School and Gateway Regional Middle School in Huntington, MA. In addition, high school students can attend the Smith Vocational Technical High School in Westfield, MA.

Employment Centers

Azure Green- Bell Road
Town Hall and Associated Buildings
Left Field Farm
Bedrock Design

Camps

No camps in town.

CATEGORY 4 – POTENTIAL RESOURCES

Food/Water

There are no stores in town that sell food and water. Everyone in town travels to Pittsfield or Westfield to shop. Because of the distance they need to travel, most residents have a well-stocked pantry. There is currently no plan in place to get food if long-term sheltering were needed.

Hospitals/Medical Supplies

Hilltown Community Health Center- Huntington
Hilltown Community Health Center- Worthington
MedExpress Urgent Care- Dalton
Hilltown Veterinary Clinic- Washington

Gas

There are no places to get gas or diesel in Middlefield. The closest gas stations are in Russell, Dalton and Lee. The closest place to get diesel fuel is at Wheeler Oil in Chester. The town has an agreement in place with Chester and can fuel its vehicles at their Highway Department if needed.

Heating Oil

Wheeler Oil, Chester

Building Materials Suppliers

LP Adams-Dalton and more options in Pittsfield

Heavy & Small Equipment Suppliers

Pittsfield Lawn and Tractor- Pittsfield
Many of Town residents have large equipment that could be used in time of need

Gravel Pits/Asphalt Plants

Donovan Bros, Inc. - Huntington
Tonlino and Sons Crushed Stones- Otis

Critical Facilities and Evacuation Routes Potentially Affected by Hazard Areas

Hazard Type	Hazard Area	Critical Facilities Affected	Evacuation Routes Affected
Dam Failure	Area near Coles Brook (Could impact a small number of homes)	None.	None.
Drought	Whole Town	If severe enough, all critical facilities could be impacted because they rely on well water.	None.
Flooding	Pull from MAP	None.	Town Hill Road (Has never been impassable due to flooding.)
Hurricanes	Whole Town	Same as flooding and high winds depending on extent of winds and flooding.	
Severe Snowstorms/ Ice Storms	Whole Town (Buildings with large flat roofs)	All critical facilities could be impacted if loss of power. (Some buildings have propane generators that could sustain energy for a few weeks.)	All evacuation routes. (Steep slopes could cause ice issues and Downed Trees could block roads.)
Severe Thunderstorms/ Wind/Tornado/ Microburst	Whole Town (Especially areas prone to flooding and higher elevations)	All of the town's critical facilities are located at a higher elevation that could be impacted by wind.	If downed trees, all evacuation routes could be impacted.
Wildfire/Brushfire	Whole Town (mainly along the railroads)	No critical facilities or roads in area along the tracks.	

5: MITIGATION CAPABILITIES & STRATEGIES

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

Middlefield 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 are in place. Middlefield also has appropriate staff dedicated to hazard mitigation-related work for a community its size, including a Town Administrator, Emergency Management Director, a professionally run Department of Public Works, a part-time Building Inspector, and a Tree Warden. Middlefield has some of the recommended plans in place including a Comprehensive Emergency Management Plan and an Open Space and Recreation Plan. The Town is also taking steps to complete a Capital Improvements Plan that will guide future purchases and improvements in town.

Not only does Middlefield 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 other volunteer positions. The Town collaborates closely with surrounding communities and is party to Mutual Aid agreements through the MEMA. Middlefield 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.

Middlefield's most obvious hazard mitigation need is for federal funds to implement prioritized actions. While Middlefield is a well-managed, fiscally sound Town, it is not a wealthy community. Additionally, given their lack of a commercial or industrial tax base and the large percentage of land in town held in tax-exempt status, the residents of Middlefield fund all of the town's needs through property taxes and there is little excitement to raise these taxes any further. Thus, Middlefield has very limited financial resources to invest in costly hazard mitigation measures. Middlefield is, however, committed to locally matching all HMGP grants received and in the past has actively pursued all relevant state programs that can lead to assistance and funding including being a designated Green Community and participating in the Governor's Community Compact Program.

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 Middlefield has also 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, wildfires/brushfires, dam failures, extreme temperatures and drought.

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:

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.

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. Infrastructure like dams and culverts are in place to manage the flow of water.

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 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.

SEVERE THUNDERSTORMS / WINDS / TORNADOES/ MICROBURSTS

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.

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. Middlefield requires that all people wanting to open burn on their property get a permit from the Fire Chief. In addition, they must call the fire chief to make sure it is a safe place to burn and burning is limited to certain seasons.

EXISTING MITIGATION CAPABILITIES

The Town of Middlefield has 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 Middlefield. These various initiatives are summarized, described and assessed on the following pages and have been evaluated in the “Effectiveness” column. For a status report of completed strategies that were identified in our 2009 Hazard Mitigation plan, see the table of “Completed and Deleted Mitigation Strategies” later in this section, as well as the completed FEMA Capability Assessment worksheet included in Appendix E.

Existing Mitigation Capabilities				
Strategy	Action Type	Description	Hazards Mitigated	Effectiveness / Improvements
Flood Control Structure	Capital	There are five dams in Middlefield.	Flooding	Somewhat effective. Need to ensure that dam owners realize that it is their responsibility to inspect their dams
Culvert Replacement	Capital	Have worked to maintain culverts in town.	Flooding	Very effective. Costly to do, so seeking grant funding for additional replacements.
Floodplain Protection District	Regulation	Areas delineated as part of the 100-year floodplain are protected by strict use regulations	Flooding	Very Effective. No Changes.
Earth Removal	Regulation	Requires special permit approval for earth removal	Flooding	Somewhat Effective. Consider creating more performance-based evaluations.
Site Plan Approval	Regulation	Specific requirements for new construction to be integrated into the existing environment.	Flooding/ Drought	Somewhat Effective.
Subdivision Rules and Regulations	Regulation	Definitive Plan-- Proposed septic or sewer and water supply must be shown. Additionally-- Hydrology Study and Drainage Calculation; Sanitary Sewer Study; Water Study;	Flooding	Effective. No Changes.

Environmental Impact Statement; Development Impact Statement;				
Open Space and Recreation Plan	Planning Document	Inventories natural features and promotes natural resource preservation in the town, including areas in the floodplain; such as wetlands, groundwater recharge areas, farms and open space, rivers, streams and brooks.	Flooding/ Drought	Effective at inventorying sensitive resource areas. Needs to be updated
National Flood Insurance Program Participation	Program	There are 4 homeowners with flood insurance policies.	Flooding	Effective. No changes.
Driveway Review During Permitting	Regulation	The Highway Superintendent reviews plans for all new driveways built in town to ensure that run-off and erosion is properly managed.	Flooding	Effective. No changes.
State Building Code	Regulation	The town of Middlefield has adopted the Massachusetts State Building Code.	Severe Snow/ Ice Storms/ Hurricanes/ Severe Wind/ Tornadoes/ Microbursts/ Earthquakes	Effective. No changes.
Backup Electric Power	Operational	Shelter has backup power. Soon all critical facilities will have generators	Severe Snow/Ice Storms	Very Effective. No changes.
Tree Management	Operational	Eversource is on a 5 year trimming schedule. Highway Superintendent will contact Eversource if any immediate problems.	Severe Snow/ Ice Storms	Very effective.
Use Regulations- Prohibited Uses	Regulation	Mobile homes/ trailers are prohibited in all zone districts in town.	Hurricanes/ Severe Wind/ Tornadoes/ Microbursts	Effective. No changes.
Site Plan Approval	Regulation	Special granting authority can request Fire Department inspection/review of any plan.	Wildfire/ Brushfire	Effective. No changes.

Burn Permits	Regulation	Residents must obtain burn permits, and personnel provide information on safe burn practices.	Wildfire/Brushfire	Somewhat Effective.
Public Education/ Outreach	Operational	Emergency Management Director has preparedness handouts at Senior Center and at Voting locations.	Wildfire/Brushfire	Effective. No changes.
New Dam Construction Permits	Regulation	State law requires a permit for the construction of any dam/	Dam Failure	Effective. No changes.
Dam Inspections	Regulation	DCR has an inspection schedule that is based on the hazard rating of the dam (Low, medium, high hazard)	Dam Failure	Ineffective-responsibility of inspections falls to dam owners who may not have money to comply. Identify sources for funding for dam safety inspections.

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 Middlefield 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).

New and Continuing Mitigation Strategies to be Implemented

Action Type	Description	Hazards Addressed	Responsibility/ Oversight	Priority	Estimated Cost	Funding Source	Time Frame
Structure and Infrastructure Projects	Seek funding to replace Clark Wright Road culvert (design work has already been completed).	Flooding, Hurricanes, Severe Storms	Highway Department, Selectboard, Finance Committee, Town Administrator	High 1a	High	Division of Ecological Restoration, HMGP	1-2 years
Local Plans and Regulations	Set up a system to document the impacts (damage and costs) of undersized culverts throughout town.	Flooding, Hurricanes, Severe Storms	Highway Department	High 1b	Low	Staff Time	6-12 months
Local Plans and Regulations	Hire a firm to conduct a comprehensive culvert assessment and erosion study, so that the Town can better prioritize limited resources.	Flooding, Hurricanes, Severe Storms	Highway Department, Selectboard, Finance Committee	High 1c	Medium	MVP Action Grant	2-3 years
Structure and Infrastructure Projects	Seek funding to replace problem culverts as identified through the documented impacts system and comprehensive culvert assessment.	Flooding, Hurricanes, Severe Storms	Highway Department, Selectboard, Finance Committee, Town Administrator	High 1d	High	Division of Ecological Restoration, HMGP	Ongoing
Structure and Infrastructure Projects	Seek funding to replace/upgrade bridge on Town Hill Road that is currently posted as light.	All	Highway Department, Selectboard, Finance Committee, Town Administrator	High 2a	High	MassDOT small bridges, HMGP	1-2 years
Structure and Infrastructure	Seek funding to replace/upgrades bridges throughout town as necessary.	All	Highway Department, Selectboard, Finance Committee, Town Administrator	High 2b	High	MassDOT small bridges, HMGP	Ongoing
Local Plans and Regulations	Finalize Capital Improvement Plan to ensure that have a plan to maintain and replace critical equipment and facilities in order to respond to hazards	All	Selectboard, Finance Committee, Highway Department	High 3	Low	Staff Time	6-12 months

Structure and Infrastructure Projects	Consider installing cell phone signal booster at some of the Town Buildings to ameliorate communication issues	All	Emergency Management Director, Highway Superintendent	High 4	Low	EMPG, Town Funding	6-12 months
Local Plans and Regulations	Pursue funding to participate in state's new Municipal Vulnerability Preparedness Program.	All	Emergency Management Director, Town Administrator	High 5	Low	Staff Time, LTA request to PVPC to help with application	6-12 months
Structure and Infrastructure Projects / Preparedness	Install generator in the Council on Aging. This is the last town facility without back up power. Additionally, if power goes out in winter, staff constantly needs to go in to ensure that pipes don't burst.	Severe Winter Weather, Hurricanes, Severe Wind	Town Administrator, Highway Superintendent, Emergency Management Director	Medium 1	Low	Town Funding, HGMP, MVP Action Grant, Sheltering Grants	2-4 years
Education and Awareness Programs/ Preparedness	Finalize list of vulnerable populations in town and formalize a plan for providing access to water, information, shelter, and food stores to these people in the events of a severe storm.	All	Emergency Management Director, Council on Aging	Medium 2	Low	Staff and Volunteer Time	1-2 years
Education and Awareness Programs/ Preparedness	Collect, periodically update, and disseminate information on natural hazard preparation.	All	Emergency Management Director, Council on Aging	Medium 3	Low	Staff and Volunteer Time	Ongoing
Structure and Infrastructure Projects/ Preparedness	Install air conditioning in Council on Aging building and Town Hall so that they can function as cooling stations. (Many residents don't have air conditioning in homes because Middlefield has never had to contend with high heat days that are becoming more common.) Explore moving AC unit from Old Store to COA and purchasing portables for Town Hall.	Extreme Temperatures	Town Administrator, Highway Superintendent, Emergency Management Director	Medium 4	Low	Staff Time (to move AC unit from Store) Town Funding, EMPG, Sheltering Grants	1-2 years
Structure and Infrastructure Projects	Explore roadway designs that will cause fewer washouts on Clark Wright Road, Cone Road and other dirt roads in town.	Flooding, Hurricanes, Severe Storms	Highway Superintendent	Medium 5	Medium	Staff Time, MVP Action Grant, HMGP	3-5 years

Local Plans and Regulations/ Preparedness	Conduct a feasibility study to determine the best location for a shower in Town Hall. (The installation of a shower would help with facilitating long-term sheltering if needed.)	All	Emergency Management Director, Town Administrator, Selectboard	Medium 6	Low	Town Funding, Sheltering Grants	2-4 years
Structure and Infrastructure Project/ Preparedness	Seek funding to install shower in Town Hall.	All	Emergency Management Director, Town Administrator, Selectboard	Medium 7	Low	Town Funding, Sheltering Grants	2-4 years
Local Plans and Regulations	Pursue funding to complete Master Plan and Update Open Space and Recreation Plan	All	Town Administrator, Planning Board, Conservation Commission, Selectboard	Low	Low	EOEEA Land Use Planning Grants, PVPC DLTA, Community Compact	3-5 years

DRAFT

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 September 17, 2018 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:

- **Middlefield Comprehensive Emergency Management Plan** (particularly the Critical Infrastructure Section) – the Critical Infrastructure section was used to identify those infrastructure components in Middlefield that have been identified as crucial to the function of the Middlefield; also, this resource was used to identify special needs populations as well as potential emergency shortcomings.
- **Middlefield Open Space, Recreation Plan** this Plan was used to identify the natural context within which the Middlefield 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 town's mitigation efforts would be sensitive to the surrounding environment.
- **Middlefield Zoning Ordinance and Subdivision Regulations** – Middlefield's Zoning Ordinance and Subdivision Regulations 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.

In addition to integrating existing plans into the update of this Hazard Mitigation Plan, the Hazard Mitigation Committee will make a concerted effort to integrate this plan and its contents and recommendations into any planning processes the Town conducts moving forward.

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 are 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 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.

7: APPENDICES

APPENDIX A - TECHNICAL RESOURCES

1) AGENCIES

Agency	Phone Number
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	(413) 442-1521
Cape Cod Commission	(508) 362-3828
Central Massachusetts Regional Planning Commission	(508) 693-3453
Franklin Regional Council of Governments	(413) 774-3167
Martha's Vineyard Commission	(508) 693-3453
Merrimack Valley Planning Commission	(978) 374-0519
Metropolitan Area Planning Council	(617) 451-2770
Montachusett Regional Planning Commission	(978) 345-7376
Nantucket Planning and Economic Development Commission	(508) 228-7236
Northern Middlesex Council of Governments	(978) 454-8021
Old Colony Planning Council	(508) 583-1833
Pioneer Valley Planning Commission	(413) 781-6045
Southeastern Regional Planning and Economic Development District	(508) 823-1803
MA Board of Building Regulations & Standards	(617) 227-1754
MA Coastal Zone Management	(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	(617) 770-3000
New England Disaster Recovery Information X-Change	(781) 485-0279
MA Highway Dept, District 2	(413) 582-0599
MA Division of Marine Fisheries	(617) 626-1520
MA Division of Capital & Asset Management and Maintenance	(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.	(781) 224-9876
NOAA: 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

Source	Agency
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)	Dept. Housing + Community Dev, 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	MA Emergency Management Agency
Flood Plain Management Services	US Army Corps of Engineers
Mitigation Assistance Planning (MAP)	MA Emergency Management Agency
Mutual Aid for Public Work	Western Massachusetts Regional Homeland Security Advisory
National Flood Insurance Program (NFIP) †	MA Emergency Management Agency
Power of Prevention Grant by NESEC‡	MA Emergency Management Agency
Roadway Repair & Maintenance Program	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 Programs	MA Department of Environmental Protection
Wetlands Programs	MA Department of Environmental Protection
Municipal Vulnerability Preparedness Planning and Action Grants	MA Executive Office of Energy and the Environment

† 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.

‡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.

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://wpx.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/disaster/	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/geog/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.tornadoproject.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.iaa.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.

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**Middlefield Hazard Mitigation Committee
Meeting #1 Agenda**

**Middlefield Town Hall
June 15, 2018- 10:00am-12:00pm**

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
 - i. Committee Meeting 1- 6/15 @ 10am
 - ii. Committee Meeting 2- 6/29 @ 10am
 - iii. Committee Meeting 3- 8/24 @ 10am
 - iv. Committee Meeting 4- 9/7 @10 am
 - v. Committee Meeting 5- 9/21 @ 10am
 - vi. Public Meeting 1- 7/23 @7pm (Selectboard)
 - vii. Public Meeting 2- 9/17 @ 7pm (Selectboard)
3. Identification of Relevant Hazards and their perceived risk
4. Community Capability Assessment (if time permits)
5. Homework:
 - a. Critical Facilities: come prepared to fill in list and map

Middlefield Hazard Mitigation Committee Meeting #1- Sign In

Date: June 22, 2018 @ 10am
 Location: Middlefield Town Hall

Name	Position	Email
Jackie Duda	Health Asst	jackie.duda@yahoo.com
Ann Marie Visconti	EMD/EMS	viscoam@verizon.net
Joe Keams	Chair of Fire Com.	mlkeams2@verizon.net
Duane Pease	Town Administrator	dcp354@hotmail.com
Skip Savery	Highway Supt	skip.savery@gmail.com
Laura Lawrence	Assessor	West Hill LABS @ AOL.COM
MARY Ann Pease	Tax Collector	MATP 354@HOTMAIL.COM

**Middlefield Hazard Mitigation Committee
Meeting #2 Agenda**

**Middlefield Town Hall
June 29, 2018 10am**

1. Continue with Hazard Identification
 2. Identify and Map Critical Facilities
- Planning process and requirements
 - 3-5 committee meetings
 - 2 public outreach meetings
 - MEMA / FEMA review and conditional approval
 - Select Board adoption
 - FEMA final approval
 - Schedule for committee and public outreach meetings
 - Committee Meeting 1- 6/15 @ 10am
 - Committee Meeting 2- 6/29 @ 10am
 - Committee Meeting 3- 8/24 @ 10am
 - Committee Meeting 4- 9/7 @10 am
 - Committee Meeting 5- 9/21 @ 10am
 - Public Meeting 1- 7/23 @7pm (Selectboard)
 - Public Meeting 2- 9/17 @ 7pm (Selectboard)

Town of Middlefield HMP Commit Meet #2
June 29, 2018 - Middlefield Town Hall

Name	Position	Email
Ashley Eaton	PVPC	
Ron Radwisch	Fire Chief A	
Judy Hoag	BoS	
Joe Kearns	Fin Com.	
Duane Prase	Town Admin	
Skip Oswey	Highway Supt.	
Ann Marie Visconti	EMD	
Laura Spencer	Assessor	

**Middlefield Hazard Mitigation Committee
Meeting #3 Agenda**

**Middlefield Town Hall
August 24, 2018 @ 9:00am**

1. Review of draft plan
 2. Finalize Risk Assessment
 3. Begin brainstorm of possible mitigation actions
- Planning process and requirements
 - 3-5 committee meetings
 - 2 public outreach meetings
 - MEMA / FEMA review and conditional approval
 - Select Board adoption
 - FEMA final approval
 - Schedule for committee and public outreach meetings
 - Committee Meeting 1- 6/15 @ 10am
 - Committee Meeting 2- 6/29 @ 10am
 - Committee Meeting 3- 8/24 @ 10am
 - Committee Meeting 4- 9/7 @10 am
 - Committee Meeting 5- 9/21 @ 10am
 - Public Meeting 1- 7/23 @7pm (Selectboard)
 - Public Meeting 2- 9/17 @ 7pm (Selectboard)

**Middlefield Hazard Mitigation Committee
Meeting #4 Agenda**

**Middlefield Town Hall
September 14, 2018 @ 9:00am**

1. Work through mitigation action table
 2. Prepare for Public Meeting #2
- Planning process and requirements
 - 3-5 committee meetings
 - 2 public outreach meetings
 - MEMA / FEMA review and conditional approval
 - Select Board adoption
 - FEMA final approval
 - Schedule for committee and public outreach meetings
 - Committee Meeting 1- 6/15 @ 10am
 - Committee Meeting 2- 6/29 @ 10am
 - Committee Meeting 3- 8/24 @ 9am
 - Committee Meeting 4- 9/13 @ 9am
 - Public Meeting 1- 7/23 @7pm
 - Public Meeting 2- 9/17 @ 7pm

Middlefield Hazard Mitigation Committee Meeting #4- Sign In

Location: Middlefield Town Hall

Date: September 14, 2018

Name	Position
Ashley Eaton	PVPC
Skip Sawery	Highway Supt.
Susan Rose	Town Administrator
Joe Keane	Finance Com.
Ann Marie Visconti	EMD



Planning for Disasters

Come learn about and share your thoughts on Middlefield's Hazard Mitigation Plan.

July 23, 2017 @ 7:00 pm
Middlefield Town Hall
188 Skyline Trail, Middlefield

The Town's hazard mitigation plan outlines ways the Town could become less vulnerable to damage caused by natural hazards such as flooding, winter storms and tornadoes.

Contact Ashley Eaton with questions or ideas:
aeaton@pvpc.org or 413-781-6045



Middlefield Hazard Mitigation Plan Update Public Meeting 1

Sign-In

Date: 7/23/19 @ 7pm

Location: Middlefield Town Hall

Name	Email (if want to be notified of second meeting)
Ann Marie Visconti	
Stephanie Harris	
Gita Tassaf	
Anna Pense	
Thomas Austin	
Kim Savery	
Joe Keam	
Jack Popette Jr	
David Blanc	
Ronald Roberts	
Skip Gour	



MEDIA RELEASE

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

FOR IMMEDIATE RELEASE
July 12, 2018

Town of Middlefield Schedules Public Engagement Event For Hazard Mitigation Plan

Middlefield residents, business owners, stakeholders and representatives from surrounding communities are invited to provide comments on the development of the Town of Middlefield's Hazard Mitigation Plan on Monday, July 23, 2018 at 7:00 p.m. at the Middlefield Town Hall, 188 Skyline Trail. 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 and concerns.

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 Middlefield 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.



Planning for Disasters

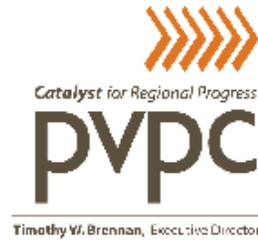
Come learn about what can be done to reduce risks associated with natural disasters.

September 17, 2018 @ 7:00 pm
Middlefield Town Hall
188 Skyline Trail, Middlefield

This meeting is part of the Town's Hazard Mitigation Plan, which outlines ways the Town could become less vulnerable to damage caused by natural hazards such as flooding and winter storms.

Contact Ashley Eaton with questions or ideas:
aeaton@pvpc.org or 413-781-6045





MEDIA RELEASE

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

FOR IMMEDIATE RELEASE
September 11, 2018

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

Middlefield residents, businesses, and surrounding community residents and representatives are invited to provide comments on the Town of Middlefield Hazard Mitigation Plan on Monday, September 17, 2018, at 7:00pm at the Middlefield Town Hall on 188 Skyline Trail.

The purpose of the Hazard Mitigation Plan is to identify and assess Middlefield'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 Middlefield, 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 will be 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 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.

APPENDIX C – LIST OF ACRONYMS

Acronym	Meaning
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

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Grading Schedule (BCEGS) Score		
Fire Department ISO Rating	Unknown	Rating: Because an all volunteer fire department and no fire hydrants in town, likely low score.
Site plan review requirements	Yes	Site plan review is in place and adequately enforced when triggered.

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	Yes	Zoning ordinance in place and administered effectively by the Planning Board. Have more stringent zoning controls in area along river
Subdivision ordinance	Yes	Not updated recently. Doesn't consider hazards or development patterns to minimize them.
Floodplain ordinance	Yes	Floodplain overlay district. Administered through the Planning Board and Conservation Commission
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	No	
Flood insurance rate maps	Yes	Paper maps were created in the 1980s. Possible update happening.
Acquisition of land use for open space and public recreation uses	Yes	Town owns very little land for open space and recreation use. Much of Middlefield's land is owned by the state or non-profit organizations or land trusts.
Other		

How can these capabilities be expanded and improved to reduce risk?

Having a master plan, capital improvements plans and an up-to-date open space and recreation plan could be beneficial in helping the town consider their future needs and goals and the ways they will achieve them. These plans could also integrate likely hazards into them and reinforce the actions needs to ameliorate them.

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	Planning board adequately skilled
Mitigation Planning Committee	Yes	Ad-hoc committee. Meet when needed.

Maintenance programs to reduce risk (e.g. tree trimming, clearing drainage systems)	Yes	Highway Superintendent is currently maintaining and fixing what they have. Eversource operates on a 5-year tree trimming cycle.
Mutual aid agreements	Yes	Fire and DPW are part of a state-wide mutual aid agreement. Police part of a region-wide mutual aid agreement. While not part of a formal agreement, the Chester Municipal Light Plant has helped in the past. Have regionalized Ambulance service out of Hinsdale.

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)	Zoning Enforcement Agent. Professional official that works in both Middlefield and Becket.
Floodplain Administrator	No	
Emergency Manager	Yes (PT)	
Community Planner	No	Can obtain free technical assistance from planners through Pioneer Valley Planning Commission Membership
Civil Engineer	No	
GIS Coordinator	No	Can obtain free technical assistance from GIS analysts through Pioneer Valley Planning Commission Membership
Other	--	

Technical	Y/N	Describe capability Has capability been used to assess/mitigate risk in the past?
Warning systems/services (Reverse 911, outdoor warning signals)	Yes	Code Red System. Also have an outdoor siren at the
Hazard data and information	Yes	
Grant writing	Yes	Many of the town's staff and volunteers have written successful grants. Also receive assistance from Hilltown Economic Development Coordinator and PVPC regarding grant writing.
Hazus analysis	No	
Other	No	

How can these capabilities be expanded and improved to reduce risk?

Town wide push to sign people up for Code Red could be beneficial.

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/No	No dedicated fund. Currently all paid through the General Fund. Once 10 year Capital Improvement Plan is finalized, could move forward with establishing a designated fund
Authority to levy taxes for specific purposes	Yes	With limitations at the state level. Very limited appetite to raise taxes
Fees for water, sewer, gas or electric services	No	The town does not provide any of these services.
Impact fees for new development	No.	
Storm water utility fee	No.	
Incur debt through general obligation bonds and/or special tax bonds	Yes.	Have bonded to fund schools, but no other activities
Community development block grants	Yes.	Works with PVPC to apply for competitive CDBG funding through the state
Other federal funding programs		Secured EMPG Grant for \$2,200 to buy a safety trailer. Fire Department is often awarded grants through federal programs.
State funding programs		Chapter 90 Road Funds, Green Communities Energy Efficiency work, Mass Works, Small Bridge program grants, Public Health funding
Other		

How can these capabilities be expanded and improved to reduce risk?

The town could pursue state's new Municipal Vulnerability Preparedness certification in order to gain access to MVP Action grant monies, which are to be spent directly on mitigating and preparing for extreme weather in our changing climate.

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	Council on Aging, Conservation Commission, Porchlight, Volunteer Fire Department, Middlefield Fair Grounds, Meals on Wheels, The Trustees, The Nature Conservancy
Ongoing public education or information program (e.g. responsible water use, fire safety, household preparedness, environmental education)	Yes	Handouts on preparedness handed out at voting location and at the senior center. Annually hold first responder and CPR training in town.

Natural disaster or safety related school programs	Unknown	Because part of a regional school system and the physical schools are outside of the town, committee is unaware of the trainings that may or may not happen in schools.
StormReady certification	No	
Firewise Communities certification	No	
Public-private partnership initiatives addressing disaster-related issues	No	
Other		

How can these capabilities be expanded and improved to reduce risk?

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