

The City of Chicopee

Local Natural Hazards Mitigation Plan

Adopted by the Mayor of Chicopee on [REDACTED]

Prepared by:
The Chicopee Natural Hazards Mitigation Planning Committee

and

The Pioneer Valley Planning Commission
26 Central Street, Suite 34
West Springfield, MA 01089
(413) 781-6045
www.pvpc.org

This project was funded by a grant received from the Massachusetts Emergency Management Agency (MEMA) and the Massachusetts Department of Conservation Services (formerly the Department of Environmental Management)

Acknowledgements

The Chicopee Board of Aldermen extends special thanks to the Chicopee Natural Hazards Mitigation Planning Committee as follows:

Jim Dawson, Planning Department

Kate Brown, Planning Department

Tom Hamel, Wastewater Department

Stephen S. Burkott, Fire Chief/Emergency Manager

Stan Kulig, Department of Public Works

Dave Gosselin, Engineering Department

Tammy Szlachetka, Health Department

Rich Nunes, Police Department

Jean Fitzgerald, Conservation Chair

The Chicopee City Council offers thanks to the Massachusetts Emergency Management Agency (MEMA) for developing the Commonwealth of Massachusetts Natural Hazards Mitigation Plan ([www.state.ma.us/dem/ programs/mitigate/index.htm](http://www.state.ma.us/dem/programs/mitigate/index.htm)) 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

Catherine Miller, Principal Planner/Co-Project Manager

Todd Zukowski, Senior Planner/GIS Specialist

Jim Scace, GIS Specialist

Table of Contents

1: INTRODUCTION	1
Hazard Mitigation.....	1
Planning Process	1
2: LOCAL PROFILE	4
Community Setting	4
Infrastructure	5
Natural Resources.....	6
Development.....	14
3: HAZARD IDENTIFICATION & ANALYSIS	17
Profiling the Natural Hazards.....	17
Natural Hazard Identification and Vulnerability Assessment	18
4: CRITICAL FACILITIES	39
Critical Facilities within Hazard Areas	39
Category 1 – Emergency Response Services	39
Category 2 – Non Emergency Response Facilities	42
Category 3 – Facilities/Populations to Protect.....	42
5: MITIGATION STRATEGIES.....	49
General Mitigation Measures	49
Flooding	51
Severe Snow/Ice Storm.....	53
Hurricanes/Severe Wind	55
Tornadoes/Microbursts.....	55
Wildfire/Brushfire	56
Earthquake.....	57
Dam Failure	58
Drought.....	59
Hazardous Materials	60
6: PRIORITIZED IMPLEMENTATION SCHEDULE	62
7: PLAN ADOPTION & IMPLEMENTATION	65
APPENDICES.....	68
Appendix A – Technical Resources	68
Appendix B – List of Acronyms.....	71
Appendix C – Natural Hazard Analysis Methodology	72
Appendix D – Past & Potential Hazards/Critical Facilities Map	74
Appendix E – Documentation of the Planning Process	75
Appendix F – Public Outreach	Error! Bookmark not defined.

1: INTRODUCTION

Hazard Mitigation

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

Planning efforts, like the one undertaken by the City of Chicopee and the Pioneer Valley Planning Commission, make mitigation a proactive process. Pre-disaster planning emphasizes actions that can be taken before a natural disaster occurs. Future property damage and loss of life can be reduced or prevented by a mitigation program that addresses the unique geography, demography, economy, and land use of a community within the context of each of the specific potential natural hazards that may threaten a community.

Preparing a local natural hazard mitigation plan before a disaster occurs can save the community money and facilitate post-disaster funding. Costly repairs or replacement of buildings and infrastructure, as well as the high cost of providing emergency services and rescue/recovery operations, can be avoided or significantly lessened if a community implements the mitigation measures detailed in the plan. FEMA requires that a community adopt a pre-disaster mitigation plan as a condition for mitigation funding. For example, the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA), and the Pre-Disaster Mitigation Program are programs with this requirement.

Planning Process

Planning for natural hazard mitigation in Chicopee involved an ad hoc Hazard Mitigation planning committee. The natural hazard mitigation planning process included the following tasks:

- Reviewing and incorporating existing plans and other information (Appendix E lists documents consulted)
- Identifying the natural hazards that may impact the community.
- Conducting a Vulnerability/Risk Assessment to identify the infrastructure at the highest risk for being damaged by the identified natural hazards, particularly flooding.

- Identifying and assessing the policies, programs, and regulations a community is currently implementing to protect against future disaster damages.
- Identifying deficiencies in the current strategies and establishing goals for updating, revising or adopting new strategies.
- Adopting and implementing the final Local Natural Hazards Mitigation Plan.

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

Public Committee Meetings

Public meetings of the planning committee were all held at the Chicopee Department of Public Works, 115 Baskin Drive on the dates listed below. Agendas for these meetings are included in Appendix E. The City posted agendas for public notice in advance of all meetings.

June 30, 2009, 9:30-11:00 am: First Chicopee Hazard Mitigation Planning Meeting—overview of Hazard Mitigation planning and start review of draft plan

July 28, 2009, 9:30-11:00 am: Second Chicopee Hazard Mitigation Planning Meeting—continue review of draft plan

September 23, 2009, 9:30 – 11:00 am: review Hazard and Critical Infrastructure map

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

Public Involvement in the Planning Process

On December 15, 2007 the Pioneer Valley Planning Commission (PVPC) sent a press release to all area media outlets to inform private citizens that Chicopee was one of 32 communities in the Pioneer Valley committed to developing a local Hazard Mitigation plan. The notice explained that the public would be kept informed of Chicopee's progress. On June 30, 2008 the PVPC sent a new media release to all media outlets updating them on the status of Chicopee's hazard mitigation planning process. PVPC issued another media release on February 5, 2009. These press releases (Appendix F) resulted in a series of news articles (Appendix F) that enhanced awareness of Chicopee's Hazard Mitigation Planning Process.

In addition to media outreach, all public meetings were posted at Chicopee City Hall (Appendix G) in compliance with the Commonwealth of Massachusetts' open meeting law.

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

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

Involving Neighboring Jurisdictions

In the initial stages of the planning process for this mitigation plan, the Pioneer Valley Planning Commission conducted a series of outreach efforts to make the public aware of the regional mitigation process. In October of 2005, the Planning Commission notified all Select Boards and Chief Elected Officials that their community could participate in the region's mitigation planning process. Again, on April 4, 2006, the Planning Commission mailed a notice of planning activities to all Chief Elected Officials and Select Boards in the Pioneer Valley. Both mailings explained the purpose of mitigation planning and invited communities to participate in either Round I or Round II of the region's mitigation planning process.

On November 20th, 2007 the Pioneer Valley Planning Commission presented the planning process that led to the creation of the *Chicopee Local Natural Hazards Mitigation Plan* to the Western Regional Homeland Security Council, the planning entity responsible for orchestrating the homeland security planning activities of Berkshire, Franklin, Hampden and Hampshire Counties. Collectively, this body is responsible for 101 communities.

Additionally, the Hampshire Regional Emergency Planning Committee was provided with updates of the Hazard Mitigation Planning Process on April 20, 2007 and again on December 21, 2007. There is no regional emergency planning committee in Hampden County, but public safety officials were informed of Chicopee's natural hazard mitigation planning efforts through a variety of informal and formal means, including discussions of the regional hazard mitigation planning processes underway by PVPC staff as well as City of Chicopee staff and MEMA staff.

On ____ , 2009: The Mayor adopted the Local Natural Hazard Mitigation Plan. Meeting held at Chicopee City Offices.

2: LOCAL PROFILE

Community Setting

Chicopee is located along the Connecticut River in a section of Western Massachusetts popularly known as the Pioneer Valley. The City is bordered on the south by Springfield, on the east by Ludlow, and on the north by South Hadley and Granby. The Connecticut River separates Chicopee from its western neighbors -- West Springfield and Holyoke. Chicopee, one of the first settled areas in Western Massachusetts, is the second largest city in the Pioneer Valley.

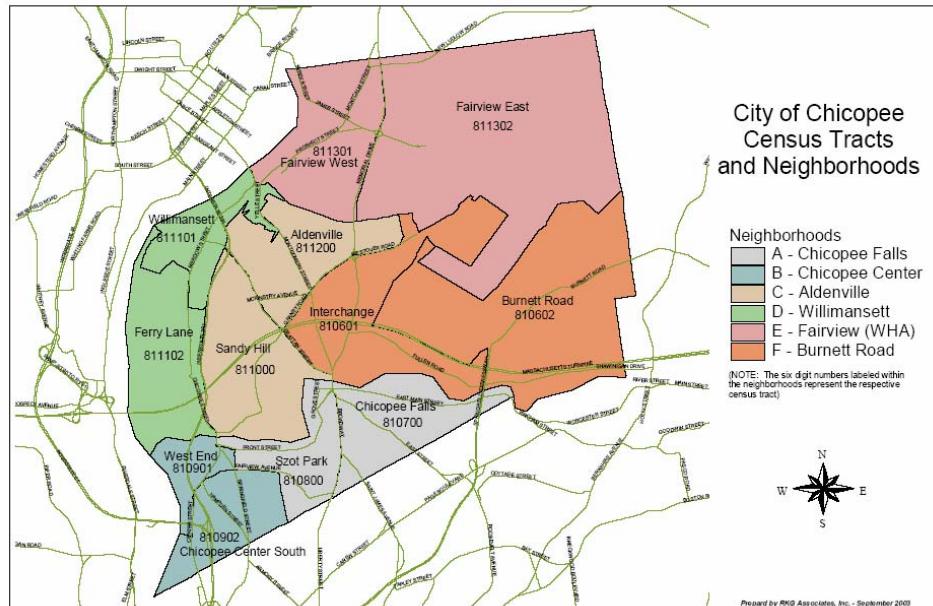
Chicopee followed a pattern of urban development shared by many mill towns. In the 1600s the area that became Chicopee had an agrarian based economy supplemented by fledgling mills to serve local needs.

Scattered farmsteads became the nuclei for village development. These villages were incorporated into the Town of Chicopee in 1848 but maintained much of their original identity. The neighborhoods of Chicopee Center, Willimansett, Chicopee Falls, Sandy Hill, Ferry Lane, Fairview, and Aldenville

referred to in this plan are based on those old villages. The Burnett Road neighborhood was a farming area rather than a village and the Interchange neighborhood developed after the Massachusetts Turnpike was constructed. By the 1800s manufacturing supplanted agriculture and there was an elaboration of residential and commercial development. Chicopee is now classified as 100% urban and retains only remnants of its agricultural past.

Industrial and commercial pockets surrounded by residential use characterize land use patterns inherited from previous generations. This was further reinforced by zoning, which, when adopted in 1940, tended to be descriptive of existing conditions rather than designed to direct change.

Today, Chicopee is a thriving commercial, residential, and industrial center. The City is home to the Westover Industrial Airparks, developed following the deactivation of Chicopee's Westover Field, built in 1940. Despite its reserve status, Westover Air Reserve



Base is a major contributor to the region's economy, and served as the nation's deployment center for troops during the Persian Gulf War, a demonstration of this area's strategic advantage of overseas transport.

Chicopee is also headquarters for Callaway Golf and home to one of the largest printing plants of Wall Street Journal (Dow Jones & Co.) publisher, as well as Elms College. The Chicopee Provision Company is a major producer of Polish kielbasa under the Blue Seal brand. Chicopee also held an annual kielbasa festival until the mid 1990s, at which the World's Largest Kielbasa was proudly unveiled.

Along with the rest of the Springfield metropolitan area, Chicopee has seen some loss in population, in part due to a loss of employment opportunities in the region. However, since 2000, there is some evidence (although not conclusive) that this trend may be reversing. Chicopee's current population, according the 2000 Census, is 54,653 residents.

Infrastructure

Chicopee's infrastructure reflects its industrial roots, it's location in the urban core of the Connecticut River Valley, and it's historical growth from separate villages.

Roads and Highways

Dubbed the "Crossroads of New England," Chicopee is located at the intersection of I-91 and the Mass Pike, providing convenient access to anywhere within the greater region. It is also served by the I-391 and I-291 byways, as well as several smaller regional transportation arteries – Route 141, Route 116, Route 33, and Route 20 and 20A. Additionally, the City is served by a dense network of streets, reflecting its urban character.

Transit

The Pioneer Valley Transit Authority (PVTA) provides extensive bus service throughout Chicopee and its neighboring towns. PVTA contracts with MV Transportation (based in Chicopee) to also offer paratransit, a door-to-door demand responsive van service.

Rail

A rail line runs north-south through Chicopee, closely following I-91, and hugging the Connecticut River banks. Amtrak operates trains out of Springfield and Amherst which pass through Chicopee.

Air

Westover Metropolitan Airport shares the runway with Westover Air Reserve Base. The airport offers private passenger and cargo service.

Public Water and Sewer Service

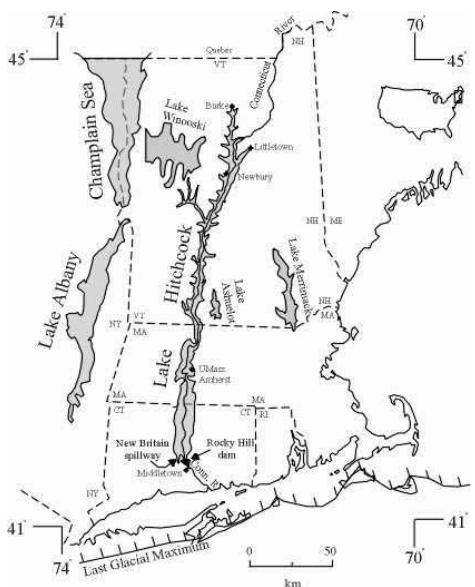
Chicopee provides water and sewer services to the vast majority of City residents. A small number of residences/businesses in the Burnett Road area rely on septic systems.

Natural Resources

GEOLOGY, SOILS AND TOPOGRAPHY

Topographic/Geologic Features

Chicopee lies within the Connecticut River Valley, which is underlain by sedimentary and volcanic rock known as the Portland Formation. The relative relief of the City is 240 feet. The lowest point in the City is 70 feet above sea level at the confluence of the Chicopee and Connecticut rivers. The highest point in the City is in Fairview at an elevation of approximately 290 feet. Geologically, Chicopee's topographical features are very young having been created indirectly as a result of glacial action that ended about 10,000 years ago.



Chicopee's western boundary is the Connecticut River. The Connecticut River flows 409 miles from its source near the Canadian border to its mouth at the Long Island Sound. The Connecticut River is the largest in New England, traversing four states and occupying a drainage basin of 11,250 square miles. The Chicopee River joins the Connecticut River in Chicopee and is the largest of the Connecticut River's four major tributaries.

At the end of the last ice age a large lake -- Lake Hitchcock -- covered the Connecticut River Valley. The Connecticut River was blocked by glacial fill in the Hartford, Connecticut area forming a lake that filled the valley for about 160 miles north of the natural dam. Layers of sediment deposited seasonally at the bottom of the lake in layers known as varves.

Varves can be counted like tree rings to estimate the age of a lakebed. Lake Hitchcock is estimated to have existed for at least 4,100 years. During this period a tremendous volume of sediment laden water originating in the Belchertown Plateau filled the Chicopee River. As the Chicopee River flowed into Lake Hitchcock these sediments were deposited creating a delta where the water bodies converged. The clay, sand and gravel deposits throughout the valley are valuable resources for construction. (Source: "Glacial Lake Hitchcock," Rittenour, Tammy Marie, Connecticut River Homepage; See also "Geological History of the Connecticut River Valley by Professor Richard D. Little, Website, EarthView)

Soils (map)

U.S. Natural Resource Conservation Service (formerly U.S. Soil Conservation Service) maps indicate that Chicopee has two primary soil associations. The predominant soil types in Chicopee reflect their derivation from the sand delta formed when glacial waters flowed down the Chicopee River to Lake Hitchcock. The sand deposits are underlain by bedrock composed of shale, sandstone and conglomerate, mostly red in

color. Clay from the old lake bottom has been exposed in various places along the face of the terrace escarpments where the two rivers cut through the delta after Lake Hitchcock emptied.

Overall Chicopee's soils are deep, sandy and well drained. Soils support septic systems although in some cases systems must be designed to slow down infiltration. The soils also support current initiatives for on-site retention of stormwater for new development and redevelopment. Erosion is a problem when terrace escarpment soils are exposed to human activity including construction, point source discharges and recreational vehicles. Chicopee's local Conservation Commission has adopted strict regulations to protect terrace escarpment soils from further impact.

Chicopee's zoning does not extend protection to topographically challenged areas including slopes exceeding 25% or resource areas other than floodplain identified on 1978 FEMA (Federal Emergency Management Agency) maps.

LANDSCAPE CHARACTER: NATURAL AND BUILT

The physical layout of Chicopee was dictated by the constraints of the natural landscape. Willimansett is physically separated from the terrace areas of Aldenville and Fairview by the Willimansett bluffs – the edge of the Connecticut River flood plain. Topography, wetlands and streams governed historical development patterns and transportation routes. Mental neighborhood maps coincided with distinctive landscape features that formed visual barriers, barriers to travel, or complicated the conduct of agriculture or business.

Man-made features also have played a role in the geographic partitioning of the City. The Massachusetts Turnpike effectively isolated the Sandy Hill and Burnett Road areas and Westover Air Force Base created a neighborhood of its own.

Land Forms and Scenic Areas

Connecticut River Views

The Willimansett Bluffs curve through the Willimansett and Aldenville sections of the city offering views of neighboring cities and the Holyoke Mountain Range. The James Street Bluffs wind through the Fairview section of the city offering views of the Holyoke Dam and South Hadley Falls and beyond. The bluffs are comprised of steep terraced escarpments dissected in places by deep ravines. The flood control dikes along the Connecticut River also provide scenic views of the Connecticut River to the west and the bluffs at the edge of the Connecticut River flood plain to the east.

Chicopee River Views

A high point overlooking the former Oxford County Club affords views to Springfield and the Bircham Bend Chicopee River oxbow. This is a truly beautiful place that puts on spectacular seasonal displays. The Oxford County Club and adjacent City of Springfield properties have been combined to form the Chicopee River Business Park, which is described in more detail elsewhere in this report.



The Deady, Davitt, and Veteran's Memorial Bridges offer views of the Chicopee River. The Deady Bridge is a fine place to enjoy views of Chicopee Falls. The Falls are never dry, even during low water times in the summer. In the winter they often display picturesque cascades of icicles. (Photo: Chicopee Falls from the north bank of the Chicopee River at the Deady Bridge.)

HISTORIC RESOURCES

In addition to natural features, Chicopee is rich in historical resources. Over nine hundred buildings have been identified as having historical or architectural significance. The National Register of Historic Places includes the Edward Bellamy House, Chicopee City Hall, Dwight Manufacturing Company Housing District, Polish National Home, and Ames Manufacturing Company. The City has also designated four historic districts.

- Dwight Mills Historic District in Chicopee Center (Mill housing, commercial and industrial buildings). National Register designation 6/3/77.
- Church Street in Chicopee Falls (Residential, includes Edward Bellamy House). National Register Designation 10/2/79. Local historic district designation 10/2/79.
- Springfield Street Historic District Springfield and Chapin Streets near Chicopee Center (mostly residential) National Register Designation 2/25/91. Local historic district designation 9/20/91.
- Cabotville Commons in Chicopee Center was approved in 1999. The area is mostly residential including an association of 1800s mill housing and Victorian apartments surrounding Lucy Wisniowski Park. The park is a remnant of Chicopee's commons.

WATER RESOURCES

Surface Water

Chicopee's greatest natural asset is its location along two rivers. The Connecticut and Chicopee Rivers provide the City with a total of about 19 miles of riverfront land. Both rivers offer views, habitat, power generation and recreational opportunities such as boating, fishing and informal trails along dikes and natural banks.

Chicopee River

The Chicopee River Watershed - the largest of the 27 major drainage basins in Massachusetts - drains more than 720 square miles of central Massachusetts before joining the Connecticut River in the City of Chicopee. It incorporates all or part of 39 cities and towns, 842 miles of brooks and streams including three major river systems: the Swift, Ware, and Quabog Rivers, and 170 lakes, ponds, and reservoirs.

European settlers of the early 1600s recognized the potential of the river's steep gradient, which drops from 100' to 50' in the two and a half mile stretch between Chicopee Falls and the upper confluence. These newcomers harnessed this source of waterpower for mills in the late seventeenth century. The river sustained industrial development well into the 1900s when the availability of electricity liberated manufacturing from the confines of the riverbanks.

There is no formal public access to the Chicopee River. Most of the riverfront is privately owned. Settlers seemed to have turned their backs on the river early on and the pattern persisted. For example, older homes sited on or near the river are not designed to maximize views or access. Accessory buildings are often located in such a manner that further limits views and access. Access on the south bank between the confluence and Chicopee Falls was once limited by railroad tracks. The railroad has since abandoned the line and the land is owned variously by several private companies and the City. Steep slopes limit access to the north bank. East of Chicopee Falls the north bank is primarily privately owned but sparsely developed due to the potential for flooding. The south bank is essentially built out.

Connecticut River

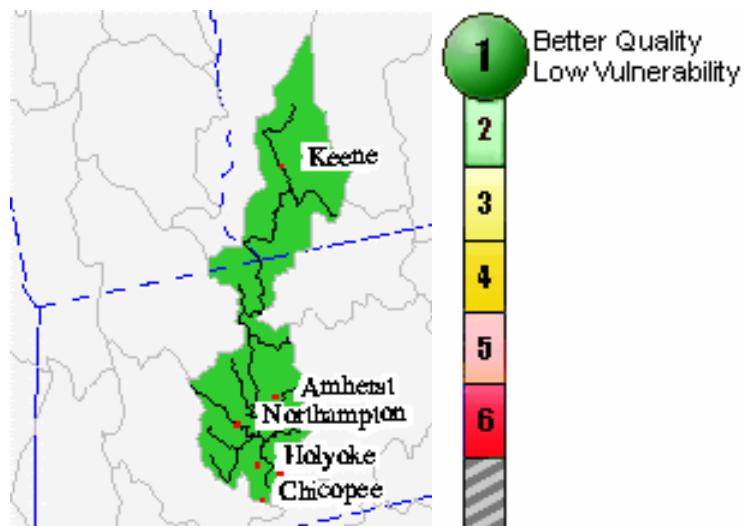
On June 27, 1998, President Clinton named the Connecticut River one of only fourteen American Heritage Rivers in the nation.

The American Heritage River designation is intended to bring recognition, assistance and possible funding from the federal government to aid communities and institutions in the four-state valley in achieving their economic revitalization, environmental conservation and cultural preservation goals. The heart of the nomination is an Action Plan comprised of 29 projects, which include riverfront revitalization initiatives, access initiatives for people and for spawning fish, CSO abatement, riverbank erosion abatement and restoration, scenic views promotion in farming areas and watershed-based initiatives to prevent and mitigate non-point source pollution to the river.

The Connecticut River north of the Holyoke Dam flows through a pastoral setting only recently affected by the pressures of residential development. The riverbanks south of the dam have been subjected to the effects of urban industrial development since the early nineteenth century.

The Holyoke Dam delimits a change in water quality. North of the dam the river, once infamous for its pollution, has been reclaimed. This section of the river currently is used extensively for boating, fishing, swimming and other forms of water based recreation. South of the dam, despite reduction of industrial wastes, combined sewer overflows continue to contaminate the water.

PVPC continues efforts to bring this problem to the forefront. Working with several Connecticut River communities, including Chicopee, PVPC has structured a "Connecticut River 2020 Strategy" to promote coordinated action on river clean up, resource protection and economic



development. The revitalization of Connecticut River is also identified as a key strategy in PVPC's regional Plan for Progress.

Flood Hazards

The Connecticut River's natural floodplain is developed with residential, commercial and industrial properties. Access to the Connecticut River along its Chicopee traverse is limited by three miles of flood protection dike constructed by the Army Corps of Engineers following a severe flood in 1936. The dike's location minimizes the flood hazard areas along the Connecticut River to a narrow strip between the dike and the river.

Recreation

Recreational use of both the Connecticut River and the Chicopee River along Chicopee shorefronts currently is limited. Boating on the Connecticut, accessed from the Medina and Syrek Streets boat ramps, is common and both rivers are used for fishing. The shoals on the Chicopee River near Chicopee Center are a favorite fishing spot. There are opportunities for enhancement of informal hiking trails and picnic areas along both rivers.

Chicopee is one of many Pioneer Valley communities working on plans for bike and pedestrian paths along its riverfronts. Most of these paths are federally funded as transportation enhancements. These paths will provide additional river access, recreational opportunities, and alternative commuting routes.

Management of Water Supply

Management of the upper reaches of the Chicopee River watershed is of critical importance to the areas downstream. The City of Chicopee relies on the Quabbin Reservoir, created by the impoundment of the Swift River's three branches in 1938, for its water supply. Additionally, Class A water from the Ware River is seasonally diverted to the Quabbin.

The Massachusetts Water Resource Authority (MWRA) manages the Quabbin water supply, but water management at the local level is the responsibility of the Chicopee Water Department under the direction of the Chicopee Board of Water Commissioners.

Water Quality

The most current Water Quality Assessment Report for the Chicopee River basin is posted on Massachusetts' Department of Environmental Protection website. Overall, the message seems to be that we are doing better but have a way to go before either river will support harvesting of fish for consumption and use of the water that involves direct contact.

Confluence Area

The Chicopee River/Connecticut River confluence area contains a total of 135 acres, 96 of which are part of Chicopee flood control system. Some of the area is associated with the Hampden Steam Plant acquired by the City of Chicopee in 1985 as a taking for failure to pay back taxes. On September 9, 1992 the City and the Department of Environmental Protection (DEP) signed an agreement to demolish the building and

dedicate the site as permanent open space and conservation land. The building has since been removed. Delta Park, an industrial complex since demolished and part of an ongoing cleanup effort, is also part of the confluence.

Brooks: Chicopee River Tributaries.

Bisbee Brook originates in Springfield and flows north as an intermittent stream to empty into the Chicopee River a short distance from the mouth of Abbey Brook. This short brook drains a developed area and has marginal value as an open space resource.

Poor Brook also originates in Springfield flowing northward across Springfield conservation land, residential subdivisions, and the Chicopee River Business Park into the Chicopee River adjacent to Oxford Marsh.

Cooley Brook's headwaters originate within a 200-acre wetland and inland meadow in the Town of Ludlow. Much of the watershed is included within the boundaries of the Chicopee Municipal Golf Course off Burnett Road. Cooley Brook is the main feeder of the Chicopee Reservoir, the City's main water supply until Chicopee tied into the Quabbin Reservoir in 1949. The old reservoir is now part of the Chicopee Memorial State Park and has been developed as a high-use, active recreation area. The total acreage is 575 acres including two 25-acre ponds. Cooley Brook's associated marsh almost is completely contained by the park boundaries and offers protection for wildlife and opportunities for the more intrepid hiker to explore a relatively unspoiled natural environment. Cooley Brook continues from the reservoir southwest to its junction with the Chicopee River approximately three-fourths of a mile above Chicopee Falls.

Fuller Brook originates in Ludlow where it is called Higher Brook. It winds through the southeast corner of Chicopee to meet the Chicopee River at Bircham Bend, a meander located where the river crosses the boundary between the cities of Springfield and Chicopee. Much of this stream is steeply banked and undeveloped. Fuller Brook is regularly monitored for possible effects from either of the large landfills flanking its banks on either side. The Oregon Sportsmen's Club, a private club controlling 49.6 acres of residentially zoned land, is located on the southern bank of Fuller Brook.

Abbey Brook originates in the City of Springfield. The brook flows through Szt Park, a 69.7-acre recreational area, and into the Chicopee River. The brook was dammed in the past to create an ice pond. Once suitable for swimming, Bemis Pond would require extensive work to return to active recreational use but is suitable for passive recreational uses such as hiking and picnicking along its banks.

Hearthstone Brook flows NW - SE into the Chicopee River. Hearthstone Brook was the subject of an award for a successful bioengineering stream restoration project.

Brooks: Connecticut River Tributaries:

Chicopee River described previously in this narrative.

Willimansett Brook crosses Chicopee from east to west. It is channeled, piped and dammed at various places along its course to finally flow into the Connecticut north of the Willimansett/Holyoke Bridge.

Theroux Brook flows into the Connecticut close to Chicopee's northern boundary. In the late 1990s this brook was subject of a reclamation project discussed elsewhere in this narrative.

Other brooks of note in Chicopee include:

Stony Brook, which is part of an extensive watershed that includes parts of Chicopee, Granby, Ludlow and South Hadley. The Chicopee section is located within the Westover ARB and is not accessible to the public.

Girl Scout Brook is an old brook with a new name that is located east of the Chicopee reservoir.

Ponds

Coburn Pond is a shallow one-and-a-half acre private pond located off Coburn Street in Willimansett. The pond is used for fishing and skating and could be made suitable for public use. The pond is fed by a small stream that has cut a deep ravine into the Willimansett bluffs from an area off Montgomery Street.

Pond Lily is a local designation for large swamp located on the northern fringe of the City. This wetland system crosses into the Town of Granby to the north and is probably connected to wetlands in the Town of Ludlow to the east. The system appears to have been interrupted by the construction of Westover Air Force Base in the late 1930's. The marsh is crossed by New Ludlow Road and Old Ludlow Road and is adjacent to the Granby landfill facility. Although a large section of this system appears to be undisturbed there is some development in the area. Most disturbing on the Chicopee side, is a junk yard that is sufficiently out of the way as to escape regular monitoring for wetlands impacts and expansion into resource areas.

Roberts Pond (aka Mountain Lake) in earlier open space plans has been described as "a large, attractive, and potentially problematic area in north central Chicopee." Roberts Pond was created by damming the Willimansett Brook as part of a flood control project after devastating area floods in the 1930s. The pond was once a private recreation area but more recently the property has been vacated and in various ownerships. In 2005 the dam was breeched and the lake was drawn down by order of the Office of Dam Safety. Willimansett Brook is now reestablishing itself in the former lake bed while the owner decides his next course of action. The City is interested in acquiring the property to create a park but there are legal issues to resolve.

Langewald Pond is upstream from Roberts Pond and is also part of the Willimansett Brook drainage system. The pond is almost completely filled with sediment.

Wanda Pond is a small pond located in the Sandy Hill area of the City off Szetela Drive and Wanda Street. It may have been once used as an ice pond.

Wade Lake. Chicopee shares Wade Pond with Ludlow and Granby. It is located on Westover ARB at the northeast corner of Chicopee. Source is Muddy Brook which flows

south from Granby. Muddy Brook becomes Stony Brook when it crosses the Chicopee line. This is a manmade feature -- originally a reservoir -- and now used mostly for fishing.

Aquifer Recharge

Although Chicopee does not supply water through any public well system, the majority of the land is an aquifer recharge area with potential for ground water supply. Ground water can be found in the beds of sand and gravel that underlie the Chicopee River. Pollution of the river, however, poses problems with this source. Small quantities of fresh water can be extracted from the bedrock and from a thin layer of gravel found on top of the bedrock. Given the costs associated with such operations, it is unlikely that any of these methods of groundwater extraction ever will be used. There are some private wells in Chicopee but the water is not used for domestic supply.

Water Supply

The Chicopee Water Department was established in 1892 as a public water supply. Chicopee once supported its own reservoir. The former reservoir is now part of Chicopee Memorial State Park and is used for recreational purposes only. Since the completion of the Chicopee Valley Aqueduct in 1950, Chicopee has received all of its water from the Quabbin Reservoir.

Construction on the Quabbin Reservoir began in 1936. Filling commenced on August 14, 1939 and was completed in 1946 when water first flowed over the spillway. The Quabbin Reservoir was filled with water from the Swift River and flood skimming from the Ware River during eight months of the year. At the time, the 412 billion-gallon reservoir was the largest man-made reservoir in the world that was devoted solely to water supply.

Starting at the Quabbin Reservoir, water supplied to Chicopee travels approximately 11 miles through the Chicopee Valley Aqueduct to Nash Hill Reservoir, an intermediate holding reservoir containing 24 million gallons of water. From the Nash Hill facility the water travels another 1.8 miles to the Chicopee Water Treatment Plant on Burnett Road at the Chicopee/Ludlow city line. After treatment, which includes chlorinating to disinfect the water and corrosion control, the water travels through the water distribution system, a labyrinth of over 240 miles of water mains ranging in size from 4 to 36 inches.

A one million-gallon water storage tank has been constructed in the Fairview section of the City to correct pressure problems. The tank, working in conjunction with a booster pumping station maintains water pressure in an area of the City that previously experienced water supply and pressure problems during the summer months. In addition, the tank insures that an adequate water supply is available for fire protection. The water tank was put into service in June of 1992 and has made a significant difference in water availability for the residents of Fairview and for the growing industrial base in the northeastern section of the City.

Water Treatment

The MWRA completed construction of the Quabbin Water Treatment Plant in March of 2000 to improve the quality of drinking water delivered to Chicopee, Wilbraham, and

South Hadley Fire District #1 -- the three communities serviced by the Chicopee Valley Aqueduct. The plant is located in Ludlow.

Covered Storage for Distribution Reservoirs

Uncovered distribution reservoirs allow pathways for contaminants to enter the drinking water, result in higher water temperatures that favor bacteria growth, allow sunlight to promote plant and algae growth, and limit options for corrosion control. Almost all of the cities and towns of Massachusetts currently have covered distribution storage tanks. As part of the Integrated Water Supply Improvement Program, MWRA had phased out five active open distribution storage reservoirs throughout the service area and constructed new covered tanks to provide the necessary distribution storage for peak demands and emergency service. Water quality problems caused by algae and other natural occurrences should be all but eliminated.

The Chicopee's Nash Hill storage reservoir was completed in 1999. The project includes construction of two 12.5 million gallon tanks for total of 25 million gallons of covered storage. The existing open reservoir has been drained and modified to serve as on-site detention basin. (Source: WMBRA website, 2005. Visit for updates, maps and photographs.)

Sewers

Chicopee's sewer service is being upgraded to meet federal and state mandates and City demands. Combined sanitary and storm sewers throughout the older sections of the City result in a lack of capacity during storms. Consequently raw sewage is dumped into the rivers during high discharge periods. All new development is required to separate storm and sanitary sewer systems in order to limit pressure on the existing City systems. City policy is to separate sanitary and storm systems whenever they are exposed such as during street reconstruction.

In the 1990's, Chicopee received a federal grant through EPA to study an innovative natural filtering system to be located near the confluence of the Chicopee and Connecticut Rivers. The system, known as a constructed wetland, would be designed to mimic the function of a natural wetland system. The design and engineering plans for this system were completed but no funds are currently available for its construction. It was hoped that the system would be included as an educational feature in a park proposed for the same site.

Forests and Fields

Despite the density of development in Chicopee, almost one quarter (23%) of Chicopee's land is forested.

Development

Chicopee's pattern of land use evolved from its industrial heritage and late 20th century suburbanization. In turn, Chicopee's topography and rivers shape and constrain these culturally determined land use patterns.

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

The Chicopee Zoning Ordinance establishes 14 base zones, and two overlay zones:

- Four residential zones –Residential A, B, C, and D Districts;
- Two commercial zones – Commercial A and A-1 Districts;
- Four business zones – Business A, B, and C Districts, and Central Business District (CBD);
- Three industrial zones – Industrial, Industrial Planned Unit Development (IPUD) Type 1, IPUD Type 2;
- One mixed use zone – Mixed Use (MXD) District; and
- Overlay zone #1 – Floodplain Overlay District.
- Overlay Zone #2 – Mill Conversion and Commercial Center Overlay District (also mixed use)

Although appropriate zoning is all relevant to protecting the health and safety of the City residents, Chicopee's Floodplain Overlay District is specifically relevant to natural hazard mitigation. It applies to those areas within the boundary of the 100-year flood that are considered hazardous according to FEMA. It limits and restricts some uses to prevent potential flood damage.

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

Current Development Trends

Today, the vast majority of Chicopee's 15,260 acres is residential, totaling more than 5,011 acres. Undeveloped land is the second most prolific land use, at approximately 4,257 acres. But this is followed closely by transportation at approximately 2,347 acres, demonstrating Chicopee's extensive road and highway network. Urban open/public land constitutes 1,209 acres, with commercial land (approximately 577 acres) and industrial land (approximately 622 acres) making up the rest of the City's urban fabric. Water comprises almost 670 acres of land in Chicopee, and there are 426 acres of outdoor recreational land throughout City. The final 166 acres of land are characterized as agricultural, again signifying the City's character.

Currently, development in Chicopee is encouraged by existing zoning and other land use regulations to seek areas where the environmental conditions and existing public utilities support such development. However, Chicopee is significantly built-out, so land use regulations need to focus more on redevelopment efforts.

Development in Hazard Areas

Most of the hazards identified in this plan are regional risks and, as such, all new development falls into the hazard area. The exception to this is flooding and inundation in the event of a dam failure. According to the Community Information System (CIS) of FEMA, there were no structures located within the Special Flood Hazard Area (SFHA) in Chicopee as of June 2005, the most current records in the CIS for the City of Chicopee. For the high hazard dams, inundation zones are mapped as part of the Emergency Action Plans required of dam owners by the Commonwealth of Massachusetts. To date, an analysis of development trends in these inundation zones has not been conducted.

Chronic Flooding

Since the construction of the dikes along the Connecticut River and Chicopee Rivers, chronic flooding has not been a significant problem in the City. Snow melt and spring rains are generally accommodated by natural drainage areas and constructed drainage facilities. Unusually large melts or more intense storm events are more likely to cause problems for individual homeowners than large sections of the City. Exceptions to this include some isolated street flooding.

Sedimentation

The City has had some sedimentation problems in a small stream located just south of the Massachusetts Turnpike off Memorial Drive(Route 33). The problem is related to the development of several large projects in the area. This is one of the many sites constantly monitored by the Chicopee Conservation Commission. As previously mentioned, Langewald Pond has been degraded by siltation, as well as by pollution. Throughout the City there are problems with sediments collecting in drainage pipes and stormwater catch basins. However, since the last open space plan, the City has acquired specialized maintenance equipment to clean municipal drainage facilities. Consequently, in the past few years the City improved the effectiveness of its existing storm water management system.

Development Impact

Most new development is controlled through Subdivision Control Law, zoning, and the City's site plan review regulations. Provisions include onsite stormwater management, landscaping, and, in some zoning districts, imperious coverage limitations. Chicopee's Conservation Commission, Department of Public Works, and Planning Board have all played increasing active roles in regulating new development through adoption of stricter regulations and encouraging best management practices.

3: HAZARD IDENTIFICATION & ANALYSIS

Profiling the Natural Hazards

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

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

Table 3.1: Hazard Profiling and Risk Index Worksheet

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

Natural Hazard Identification and Vulnerability Assessment

The following is a description of natural and manmade disasters, and the areas affected by them, that have or could affect the City of Chicopee. These natural and manmade disasters are: floods, severe snowstorms/ice storms, hurricanes/severe winds, tornadoes/microbursts, wildland fires/brushfires, earthquakes, dam failure, drought, man-made hazards-hazardous materials. The Past and Potential Hazards/Critical Facilities Map (Appendix D) reflects the contents of this analysis.

Vulnerability Assessment Methodology

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

Total value of all structures in Chicopee (2006): \$3,647,617,320

Median value of a home in Chicopee (2006): \$177,450

Average household size: 2.4 persons

Human losses are not calculated during this exercise, but could be expected to occur depending on the type and severity of the hazard. Most of these figures exclude both the land value and contents of the structure. The damage calculations are rough estimate and likely reflect worst-case scenarios.

Computing more detailed damage assessment based on assessor's records is a labor-intensive task and beyond the scope of this project.

Flooding

The average annual precipitation for Chicopee and surrounding areas in western Massachusetts is 46 inches. There are three major types of storms that bring precipitation to Chicopee. Continental storm systems generally originate from the west. These storms are typically low-pressure systems that may be slow-moving frontal systems or more intense, fast-moving storms. Precipitation from coastal storms, also known as nor'easters, that travel into New England from the south constitute the second major storm type. In the late summer or early fall, the most severe type of these coastal storms, hurricanes, may reach Massachusetts and result in significant amounts of rainfall. The third type of storm is the result of local convective action. Thunderstorms that form on warm, humid summer days can cause locally significant rainfall.

Floods can be classified as either *flash floods*, which are the product of heavy, localized precipitation in a short time period over a given location or *general floods*, which are caused by precipitation over a longer time period in a particular river basin. There are several local factors that determine the severity of a flooding event, including: stream and river basin topography, precipitation and weather patterns, recent soil moisture conditions, amount of impervious surface area, and the degree of vegetative clearing. Furthermore, flooding can be influenced by larger, global climate events. Global

warming and climate change have the potential to shift current rainfall and storm patterns. Increased precipitation is a realistic result of global warming, and could potentially increase the frequency and intensity of flooding in the region. Currently, floods are one of the most frequent and costly natural hazards in the United States.

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

In contrast, general flooding events may last for several days. Excessive precipitation within a watershed of a stream or river can result in flooding particularly when development in the floodplain has obstructed the natural flow of the water and/or decreased the natural ability of the groundcover to absorb and retain surface water runoff (e.g., the loss of wetlands and the higher amounts of impervious surface area in urban areas).

A floodplain is the relatively flat, lowland area adjacent to a river, lake or stream. Floodplains serve an important function, acting like large "sponges" to absorb and slowly release floodwaters back to surface waters and groundwater. Over time, sediments that are deposited in floodplains develop into fertile, productive farmland like that found in the Connecticut River valley. In the past, floodplain areas were also often seen as prime locations for development. Industries were located on the banks of rivers for access to hydropower. Residential and commercial development occurred in floodplains because of their scenic qualities and proximity to the water. Although periodic flooding of a floodplain area is a natural occurrence, past and current development and alteration of these areas will result in flooding that is a costly and frequent hazard. In addition to damage of buildings directly in the floodplain, development can result in a loss of natural flood storage capacity and can increase the water levels in water bodies. Flood levels may then increase, causing damage to structures not normally in the flood path.

The Floodplain Map for Chicopee shows the 100-year and 500-year flood zones identified by FEMA flood maps. The 100-year flood zone is the area that will be covered by water as a result of a flood that has a one percent chance of occurring in any given year. Likewise, the 500-year flood has a 0.2 percent chance of occurring in any given year. In Chicopee, the flood plain of the Connecticut River is a narrow band that follows the City's western border. The 500-year floodplain for the Connecticut River is slightly larger than the 100-year floodplain, and located north of Bolduc Lane along Route 116. There are several residential structures within the Connecticut River's 500-year floodplain. The floodplain for the Chicopee River is larger than that of the Connecticut River. The mouth of the Chicopee River has the second largest amount of floodplain land in Chicopee; is the floodplain area downstream from Dwight Dam, sections of the Interstate-391 on/off-ramp are located. The largest amount of floodplain land in Chicopee is upstream from the Chicopee Dam. Here, the floodplain

can be located by finding the intersection of Morton Lane and Fuller Road; the floodlands in this section of town contain two EPA Tier II facilities. The major floods recorded in Western Massachusetts during the 20th century have been the result of rainfall alone or rainfall combined with snowmelt. Chicopee has experienced local flooding events over the last decade. In October 2005 the city experienced 15 inches of rainfall in two weeks, causing basement flooding, roadside drainage washouts, and property damage. Generally, these small floods have had minor impacts, temporarily impacting roads and residents' yards and basements. In September 2008 the city experienced nine inches of rain in several days. Steadman and Lorraine Streets were flooded and impassable and yards and basements along the streets were flooded.

Flooding (100-year base flood): Medium Low Risk

There are approximately 611 acres of land within the FEMA mapped 100-year floodplain and 85 acres of land within the 500-year floodplain within the City of Chicopee. According to the Community Information System (CIS) of FEMA, there were 25 structures located within the Special Flood Hazard Area (SFHA) in Chicopee as of August 1999, the most current records in the CIS for the City of Chicopee. Therefore, a vulnerability assessment for a 100-year flood equals approximately \$4.5 million of damage, with approximately 65 people impacted.

Specific vulnerability assessments were estimated for sites within the SFHA which have been susceptible to 100-year floods in the past, they are described below.

Location

Buckley Blvd area/ Fuller Rd area

- NW Chicopee on Ct River and SE Chicopee on Chicopee River.
Description of flooding problem
- 4.5 million potential but no recorded flooding in at least 50 years
- Cost for repairing or replacing any power lines, telephone lines, and contents of structures are not included.

Extent

See information in Location section

Previous Occurrences

See information in Location section

Probability of Future Events

100% per definition of 100 year flood, but not for 100 years.

Flooding (localized) – Medium-Low Risk

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

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

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

Location

Steadman and Lorraine Streets

- Low place
- Street and basement flooding
- Intermittent problem -- when we get heavy rain in short duration.
- Vulnerability assessment: \$2.7 million
- Cost for repairing or replacing any power lines, telephone lines, and contents of structures are not included.

Roy Street/ Shaw Park Ave.

- Low place
- Street and basement flooding
- Intermittent problem -- when we get heavy rain in short duration.
- Vulnerability assessment: \$ 1.5 million
- Cost for repairing or replacing any power lines, telephone lines, and contents of structures are not included.

Fuller Road

- Low place
- Street and basement flooding
- Intermittent problem -- when we get heavy rain in short duration.

- Vulnerability assessment: \$4.5 million. Cost for repairing or replacing any power lines, telephone lines, and contents of structures are not included.

East Main Street

- Low place
- Street and basement flooding
- Intermittent problem -- when we get heavy rain in short duration.
- Vulnerability assessment: \$2 million. Cost for repairing or replacing any power lines, telephone lines, and contents of structures are not included.

Extent

See information in Location section

Previous Occurrences

See information in Location section

Probability of Future Events

High

Severe Snow/Ice Storm – High Risk

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

Research on climate change indicates that there is great potential for stronger, more frequent storms as the global temperature increases. Severe winter storms typically occur during January and February; however, they can occur from November through early April.

Location

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

City wide

Any severe winter weather incident can cause critical snow and ice hazards city-wide.

Britton Street, New Ludlow Road, James Street & Buckley Blvd

These streets are located in the northern part of Chicopee. The western most sections of Britton, New Ludlow, James, and Buckley at the edge of the Connecticut River bluffs can be hazardous in winter due to the combination of snow, ice and grade.

Granby Road

Granby Road more or less parallels the north side of the Chicopee River bluffs. The western most section of the road can be hazardous in winter due to the combination of snow, ice, grade and one particularly tight curve.

Memorial Drive

Memorial Drive (Route 33) runs north south, dissecting the city at midpoint. The southern section of the road as it makes the grade from the Chicopee River can be hazardous in winter.

Extent

New England generally experiences at least one or two severe winter storms each year with varying degrees of severity. Research on climate change indicates that there is great potential for stronger, more frequent storms as the global temperature increases. Severe winter storms typically occur during January and February; however, they can occur from November through early April.

The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service (Kocin and Uccellini, 2004) characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10 inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS gives an indication of a storm's societal impacts.

NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. The aerial distribution of snowfall and population information are combined in an equation that calculates a NESIS score which varies from around one for smaller storms to over ten for extreme storms. The raw score is then converted into one of the five NESIS categories. The largest

NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers.

Previous Occurrences

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

Probability of Future Events

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

Hurricanes/Severe Wind – Medium-High Risk

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

The intensity of a hurricane is measured using a 1-5 rating called the Saffir-Simpson Hurricane Scale. According to NOAA's National Hurricane Center, Saffir-Simpson "...is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall. Wind speed is the determining factor in the scale..."

The 5 categories are:

- Category 1—winds at 74-95 mph, with storm surge generally 4-5 feet above normal;
- Category 2 —winds at 96-110 mph, with storm surge generally 6-8 feet above normal;
- Category 3—winds at 111-130 mph, with storm surge generally 9-12 feet above normal;
- Category 4—winds at 131-155 mph, with storm surge generally 13-18 feet above normal;
- Category 5—winds greater than 155 mph, with storm surge generally greater than 18 feet above normal.

Location

All of Chicopee is at risk from wind damage and the flood-prone portions of town to flooding from the heavy rains.

In Massachusetts, several hurricanes have made landfall since 1851, several of which impacted Western Massachusetts. These include the Great New England Hurricane of 1938, Hurricane Carol in 1954, Hurricane Gloria in 1985 and Hurricane Bob in 1991. Hurricanes are ranked as category 1-5, using the Saffir-Simpson Scale, with category 5 hurricanes being the most severe. Hurricanes Carol, Gloria, and Bob ranged from category 1-3, meaning winds ranged from 74-130 mph with the potential for roofing and window damage to buildings, damage to unanchored mobile homes, trees, or poor construction, and/or flooding.

Extent

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

- Estimated wind damage: 5% of the structures with 10% damage, \$18,238,087;
- Estimated flood damage: 10% of the structures with 20% damage, \$72,952,346;
- Vulnerability assessment for a hurricane event (both wind and flood damages): \$91,190,433;
- Cost of repairing or replacing the roads, bridges, utilities, and contents of structures is not included.

Previous Occurrences

In Massachusetts, several hurricanes have made landfall since 1851, some of which affected Western Massachusetts. These include: The Great New England Hurricane of 1938, Hurricane Carol in 1954, Hurricane Gloria in 1985 and Hurricane Bob in 1991. Hurricanes are ranked as category 1-5, using the Saffir-Simpson Scale, with category 5 hurricanes being the most severe. Hurricanes Carol, Gloria, and Bob ranged from category 1-3, meaning winds ranged from 74-130 mph with the potential for roofing and window damage to buildings, damage to unanchored mobile homes, trees, or poor construction, and/or flooding.

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

Table 3.2 Major Non-Winter Storms to Affect Westfield Area

Hurricane/Storm Name	Year	Saffir/Simpson Category (when reached MA)
Great Hurricane of 1938	1938	Unclear, 3 or 4
Great Atlantic Hurricane	1944	1
Carol	1954	3
Edna	1954	1

Diane	1955	Tropical Storm
Donna	1960	Unclear, 1 or 2
Groundhog Day Gale	1976	Not Applicable
Gloria	1985	1
Bob	1991	2
Floyd	1999	Tropical Storm

Probability of Future Events

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

Tornadoes/Microbursts – Medium-High Risk

Tornadoes are swirling columns of air that typically form in the spring and summer during severe thunderstorm events. In a relatively short period of time and with little or no advance warning, a tornado can attain rotational wind speeds in excess of 250 miles per hour and can cause severe devastation along a path that ranges from a few dozen yards to over a mile in width. The path of a tornado may be hard to predict because they can stall or change direction abruptly.

For more than three decades, the method for evaluating the severity of a tornado involved relating the degree of damage to the intensity of the wind, using the Fujita Scale, known as the F-scale (1 through 5 with 5 being the most severe). This generalized method has been problematic, according to information from NOAA's Storm Prediction Center, as different winds may be needed to cause the same damage depending on how well-built a structure is, wind direction, wind duration, battering by flying debris, and a bunch of other factors. The process of rating the damage itself is largely a judgment call, according to NOAA's Storm Prediction Center. Even meteorologists and engineers highly experienced in damage survey techniques often came up with different F-scale ratings for the same damage.

As of February 2007, an enhanced F-Scale should be used. NOAA's Storm Prediction Center reports,

The Enhanced F-scale is a much more precise and robust way to assess tornado damage. It classifies F0-F5 damage as calibrated by engineers and meteorologists across 28 different types of damage indicators (mainly various kinds of buildings, but also a few other structures as well as trees). The idea is that a "one size fits all" approach just doesn't work in rating tornado damage, and that a tornado scale needs to take into account the typical strengths and weaknesses of different types of construction....In the Enhanced F-scale, there will be different, customized standards for assigning any given F rating to a well built, well anchored wood-frame house compared to a garage, school, skyscraper,

unanchored house, barn, factory, utility pole or other type of structure. In a real-life tornado track, these ratings can be mapped together more smoothly to make a damage analysis. Of course, there still will be gaps and weaknesses on a track where there was little or nothing to damage, but such problems will be less common than under the original F-scale. As with the original F-scale, the enhanced version will rate the tornado as a whole based on most intense damage within the path. *There are no plans to systematically re-evaluate historical tornadoes using the Enhanced F-scale.*

Within Massachusetts, tornadoes have occurred most frequently in Western and Central Massachusetts which includes Hampden County.

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

Location

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

Extent

Risk of tornadoes is considered to be medium in Hampden County. Tornadoes seldom occur in this part of the country; therefore, assessing damages is difficult. Furthermore, buildings have not been built to Zone 2, Design Wind Speed Codes. The entire City of Chicopee is vulnerable.

- Tornadoes/microburst hazard estimates 20% damage to 10% of structures in City;
- Vulnerability assessment estimates in damages; \$72,952,346;
- Estimated cost does not include building contents, land values or damages to utilities.

Previous Occurrences

No known tornados have ever touched down in Chicopee, however there have been numerous high-wind storms and hail events. In Western Massachusetts, the majority of sighted tornadoes have occurred in a swath which includes Chicopee. Thirteen incidents of tornado activity (all F2¹ or less) occurred in the area between 1959 and 2005.

Probability of Future Events

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

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

Wildfires/Brushfire – Medium-Low Risk

Wild fires 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 wild fires and brushfires can consume homes, other buildings and/or agricultural resources. Typical causes of brushfires and wildfires are lightning strikes, human carelessness, and arson.

According to FEMA, there are three different classes of wild fires: surface fires, ground fires and crown fires. The most common type of wild fire is a surface fire that burns slowly along the floor of a forest, killing or damaging trees. A ground fire burns on or below the forest floor and is usually started by lightning. Crown fires move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions. While wildfires or brushfires have not been a significant problem in Chicopee, there is always a possibility that changing land use patterns and weather conditions will increase a community's vulnerability. For example, drought conditions can make forests and other open, vegetated areas more vulnerable to ignition. Once the fire starts, it will burn hotter and be harder to extinguish. Soils and root systems starved for moisture are also vulnerable to fire. Residential growth in rural, forested areas increases the total area that is vulnerable to fire and places homes and neighborhoods closer to areas where wildfires are more likely to occur. Global climate changes may also influence precipitation patterns, making the region more susceptible to drought and therefore, wildfires.

Hampden County has approximately 273,000 acres of forested land, which accounts for 67% of total land area. Forest fires are therefore a potentially significant issue. In Chicopee, approximately 23% of the City's total land area is in forest, or about 3,484 acres, and is therefore at risk of fire.

Location

Only isolated areas of Chicopee are susceptible to wildfire as there is very little undeveloped land in the city. However, the adjacent town of Ludlow (east of Chicopee) has large forested areas so a wildfire in that community could affect Chicopee.

Extent

The extent of the damage from a wildfire is likely to be limited due to the lack of vast forested areas in Chicopee. However, a wildfire spreading from Ludlow could be more damaging if the fire were to affect the Westover Municipal Airport where a large number of hazardous chemicals and fuel are stored.

- Up to 8 structures could be impacted by a wildfire in one of the City's agricultural areas;

- Assuming 100% damage to 100% of the structures, not including costs repairing or replacing any power lines, telephone lines, and contents of structures;
- Vulnerability assessment estimates approximately \$440,000 in damages for a wildfire.
- Damage at Westover Municipal Airport has not been estimated.

Previous Occurrences

Brushfires are somewhat common in Chicopee, but the v majority are small and quickly contained. According to the Massachusetts Fire Incident Response System (2005), there were 113 other fires (or brushfires) in Chicopee. As a point of comparison, a total of 307 fires were reported in Chicopee during the same period of time. There were 29 separate cases of arson recorded in Chicopee during the same period of time, and 17 of these were reported as brush fires.

Probability of Future Events

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

Earthquakes – Low Risk

An earthquake is a sudden, rapid shaking of the ground that is caused by the breaking and shifting of rock beneath the Earth's surface.

The magnitude of an earthquake is measured using the Richter Scale, which measures the energy of an earthquake by determining the size of the greatest vibrations recorded on the seismogram. On this scale, one step up in magnitude (from 5.0 to 6.0, for example) increases the energy more than 30 times.

The intensity of an earthquake is measured using the Modified Mercalli Scale. This scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures on a scale of I through XII, with I denoting a weak earthquake and XII denoting a earthquake that causes almost complete destruction.

Location

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

Extent

Massachusetts introduced earthquake design requirements into their building code in 1975. However, these specifications apply only to new buildings or to extensively-modified existing buildings. Buildings, bridges, water supply lines, electrical power lines and facilities built before 1975 may not have been designed to withstand the forces of an earthquake. The seismic standards have also been upgraded with the 1997 revision of the State Building Code.

- Significant potential for serious damage in downtown Chicopee;
- Structures are mostly wood frame construction, so loss estimates predict 20% of City assessed value, not including Costs of repairing or replacing roads, bridges, power lines, telephone lines, or the contents of the structures;
- Vulnerability assessment estimates approximately \$729.5 million.

Previous Occurrences

Nineteen earthquakes, of an intensity of V or greater on the Modified Mercalli scale, have centered in Massachusetts since it was colonized by Europeans. An earthquake of an intensity of V is felt by nearly everyone; many folks are awakened. Some dishes and windows are broken. Unstable objects are overturned, and clocks may stop. A shock in 1755 reached intensity VIII at Boston and was felt across the state. In addition, Massachusetts was affected by some of the more severe Canadian shocks plus the earthquake of 1929 that centered on Grand Banks of Newfoundland.

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

Ground shaking from earthquakes can rupture gas mains and disrupt other utility service, damage buildings, bridges and roads, and trigger other hazardous events such as avalanches, flash floods (dam failure) and fires. Un-reinforced masonry buildings, buildings with foundations that rest on filled land or unconsolidated, unstable soil, and mobile homes not tied to their foundations are at risk during an earthquake.

Earthquakes can occur suddenly, without warning, at any time of the year. New England experiences an average of 30 to 40 earthquakes each year although most are not noticed by people.

Table 3.3: New England Earthquakes (1924-2002)²
magnitude 4.2 or higher

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

Plattsburg, NY	April 20, 2002	5.1
----------------	----------------	-----

Table 3.4: New England States Record of Earthquakes²

State	Years of Record	Number of Earthquakes
Connecticut	1568 - 1989	137
Maine	1766 - 1989	391
Massachusetts	1627 - 1989	316
New Hampshire	1728 - 1989	270
Rhode Island	1766 - 1989	32
Vermont	1843 - 1989	69
New York	1737 - 1985	24
Total Earthquakes in New England (1568-1989)		1,239

Probability of Future Events

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

Dam Failure – Medium Risk

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

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

on by severe storm events. Most earthen dam failures occur when floodwaters overtop and erode the material components of the dam.

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

The state has three hazard classifications for dams:

- High Hazard: Dams located where failure or improper operation will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.
- Significant Hazard: Dams located where failure or improper operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.
- Low Hazard: Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected.
- Non-jurisdictional: The storage capacity of the impoundment and height of dam are such that they need not be regulated.

The inspection schedule for dams is as follows:

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

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

Location

According to DCR sources, as well as local knowledge, there are currently ten (10) dams³ in Chicopee. The follow table identifies the dams within the City as well as whether they are classified as low, significant, non-jurisdictional or high hazard.

Table 3.4: Dams in Chicopee

Dam name/ date built	ID	Owner	Purpose	Condition/last inspected	Hazard Risk
-------------------------	----	-------	---------	-----------------------------	-------------

Mountain Lake Dam/1923 (Roberts Pond)	MA00530	JH JH Inc.	None	Unsafe City drained	High
Chicopee Reservoir Dam	MA00720	Comm of MA—DCR	Recreation	Fair June 2006	High
Upper Bemis Pond Dam/1954	MA00069	Chicopee Parks Dept.	Recreation	Good June 1998	Low
Lower Bemis Pond Dam/1862	MA00531	Chicopee Parks Dept.	Recreation	Fair Nov. 2006	Significant
Wade Lake Dam	MA01269	Town of Ludlow	Recreation	Fair April 1999	Significant
Chicopee Falls Dam/1894	MA00719	City of Chicopee	Hydropower	Good May 1997	Low
Dwight Dam/1850	MA00721	Consolidated Edison Energy Massachusetts, Inc.	Hydropower	No. cond. Info. Aug. 2004	Low
Oxford Country Club	MA01846	Westmass Area Development Corporation	Unknown	No information	Non-jurisdictional
Morton Brook Res. Dam/1892	MA02530	Comm of MA—DCR	Recreation	Satisfactory May 2006	Non jurisdictional*
Veteran's Memorial S.P. Dam	MA02531	Comm of MA—DCR	Recreation	No cond. info. Sept. 1999	Non jurisdictional*

Source: Massachusetts Department of Conservation and Recreation (DCR), Office of Dam Safety, December 2007, informed by local knowledge of LEPC.

† Licensed by the Federal Energy Regulatory Commission.

* Jurisdictional determinations made by DCR based on storage capacity of impoundment and height of dam.

Extent

A vulnerability assessment was done for the inundation area below the two high risks, Mountain Lake Dam and Chicopee Reservoir Dam, and the three significant risks, Upper Bemis Pond Dam, Lower Bemis Dam, and Wade Lake Dam. All assessments assume 100% damage to 100% of the structures, but does not include costs of repairing or replacing the road, or any power or telephone lines, or the contents of structures;

Mountain Lake Dam

- ★ Details of threat: This dam is partly breached and no longer creates a lake. The former lakes feeder brook has reestablished itself in the lake bed. However because there is part of the structure remaining, debris that collect on the trash rack can impound sufficient water to become a threat to downstream residents should the dam suffer further damage.
- ★ Vulnerability assessment estimates millions in damages;

Chicopee Reservoir Dam

- ★ Greatest threat is to Chicopee's main water line. To repair this line would require heavy disinfection for contamination at the point of shut down, due to the beaver dam downstream.
- ★ Vulnerability assessment estimates are unknown

Upper Bemis Pond Dam,

- ★ Water levels of Upper Bemis and Lower Bemis Pond are the same. Breach in Upper Bemis Dam would most likely unite the pond with no damage to property. However, because the dam is a pleasant place to walk, anyone on the dam at the time of breach might suffer injury.
- ★ Vulnerability assessment estimates would be limited to the cost of replacing the dam or removing or stabilizing the remnants.

Lower Bemis Dam

- ★ This is a small impoundment. If the dam was breached there might be a possibility of damage to 2 buildings and Front Street. Buildings include Chicopee Parks & Recreation Office, and Chicopee Electric Light. The other impacts would be to wildlife and habitat of an associated wetland.
- ★ Vulnerability assessment estimates are low.

Wade Lake Dam

- ★ Threat if any would be to northeast section of Westover Air Reserve Base.
- ★ Vulnerability assessment estimates cannot be calculated.

Previous Occurrences

July 17, 1922 the concrete dam at Langwald Pond "gave way and the freed torrent burst a wooden dam at Robert [sic] Pond." Damage was estimated at \$300,000. (*New York Times, July 18, 1922*) The wooden dam at Robert's Pond aka Mountain Lake was replaced with an earthen structure. This structure failed in 2006 but with no damage to property or any personal injury.

Probability of Future Events

Based upon the past events, it is reasonable to say that there is a low frequency of dam failure in Chicopee. However, the failed structure at Robert's Pond is still a threat to developed areas downstream.

Drought – Medium Low Risk

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

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

Location

A drought would affect all of Chicopee.

Extent

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

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

Previous Occurrences

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

Chicopee has had limited experience with severe drought conditions. The City has not experienced a threat to its water supply, and doesn't anticipate any severe water shortages throughout City. However, the conditions at the Quabbin Reservoir dictate the City's water supply. A severe drought, coupled with sustained demand from eastern Massachusetts, could impact the amount of water available to the city.

Probability of Future Occurrences

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

Man-Made Hazards – Hazardous Materials – Medium Risk

Hazardous materials are chemical substances, which if released or misused can pose a threat to the environment or health. These chemicals come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials.

Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products containing hazardous chemicals are used and stored in homes and businesses

routinely. These products are also shipped daily on the nation's highways, railroads, waterways, and pipelines.

The Toxics Release Inventory (TRI), a publicly available EPA database that contains information on specific toxic chemical releases and other waste management activities reported annually by certain covered industry groups as well as federal facilities.

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

Chicopee relies on the regional HazMat team centered in Chicopee for responding to incidents involving hazardous materials through a mutual aid agreement. Chicopee is located at the intersection of MassPike and I-91 in a major metropolitan area that supports many industries that either produce or require hazardous chemicals in their manufacturing process. There is a history of major accidents involving chemical spills, and transportation of chemicals and bio-hazardous materials by vehicle transport on any of the highways or other major thoroughfares is a concern. Large areas of hazardous materials storage increase the potential for future incidents. Chicopee is not concerned with what happens within its boundaries and also with air and water born releases from other municipalities.

Location

There are 44 Tier II Hazardous Materials storage facilities within the City; these facilities are included on the Past & Potential Hazards/Critical Facilities Map (Appendix D). TRI (latest available at this publication date is 2007) reports for Chicopee show low release rates for Chicopee.

Table 3.7 Tier II Hazardous Materials storage facilities in Chicopee

Site Name	Site Address
American Specialty Grinding Co.	904 Sheridan Street
Con-way Central Express	106 New Lombard Road
Randolph Products Company	33 Haynes Circle
Dow Jones & Company, Inc.	200 Burnett Road
Pioneer Valley Refrigerated Warehouse	149 Plainfield Street
Bay Oil Company	38 Plainfield Street
Eastern Etching And Manufacturing	35 Lower Grape Street
Verizon Chicopee Co (ma858806)	1790 Westover Road
Westover Air Reserve Base	160 Airman Drive
Hercules Incorporated	1111 Grattan Street
BFI Waste Services Of Massachusetts, LLC	845 Burnett Road
Laidlaw Transit Inc.	730 Fuller Road
Verizon Chicopee Co (ma858307)	29 Riverview Terrace

Table 3.7 Tier II Hazardous Materials storage facilities in Chicopee

Site Name	Site Address
Leoni Wire, Inc.	301 Griffith Road
Trugreen Chemlawn	2160 Westover Road
U.S. Tsubaki - Automotive Division	106 Lonczak Drive
Nash Field Flood Control Pumps	130 Ferry Street
Paderewski Flood Control Pump	149 Paderewski Street
City Of Chicopee Flood Control Depot Ps	66 Depot Street
Potvins Auto Body	400 Hampden Street
Chicopee Electric Substations 2, 4, & 6	75 Front Street
Penske Truck Leasing Co., LP	30 Fuller Road
Avery Dennison - Office Products	1 Better Way
Tyco Healthcare Ludlow	2 Ludlow Park Drive
Avery Dennison, FRNA, Chicopee	318 Griffith Road
Chicopee Water Treatment Plant	1356 Burnett Road
Elms College	291 Springfield Street
Friendly Ice Cream Corporation	1045 Sheridan Street
City Of Chicopee	59 Jones Ferry Lane
City Of Chicopee	66 Dwight Street
City Of Chicopee Water Pollution Control	80 Medina Street
Northeast Utilities Shawinigan Substation	385 Shawinigan Road
Ted Ondrick Co. LLC	58 Industry Road

Extent

The extent of hazardous chemical release is not predictable as it is dependent on the location including whether it is from a stationary or moving source, amount and type of chemical released, and weather conditions at the time of the release, but given the range of chemicals present in Chicopee the extent could range from limited to critical.

Previous Occurrences

EPA Envirofacts reports are extremely detailed but difficult for the average layperson to use to derive a data set to characterize hazardous releases. However based on data published for the period between 1988 and 2007, there are 149 references to releases in Hampden County, 20 of which were in Chicopee. It appears that proper disposal is also included in the release data. Some of the industries cited in the report are no longer in business.

Probability of Future Events

The likelihood of a catastrophic release is very low.

4: CRITICAL FACILITIES

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

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

Critical Facilities within Hazard Areas

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

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

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

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

Category 1 – Emergency Response Services

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

- 1) Emergency Operations Center
Fire Station - 80 Church Street

- 2) Fire Station
Chicopee Fire Department – 80 Church Street
- 3) Police Station
Chicopee Police Department – 110 Church Street
- 4) Highway Department
115 Baskin Drive
- 5) Water Department
27 Tremont Street
- 6) Emergency Fuel Stations

All City Vehicles other than Police and Fire
Chicopee Department of Public Works
115 Baskin Drive

Police Department Vehicles
Chicopee Police Department
110 Church Street

Fire Department Vehicles
Chicopee Fire Department Headquarters
80 Church Street
- 7) Emergency Electrical Power Facility
Chicopee Police Department - 110 Church Street
Chicopee Fire Department - 80 Church Street
Station 3 – 96 Cabot Street
Station 4 – 654 Burnett Road (no generator)
Station 5 – 580 Chicopee Street
Station 7 – 739 Grattan Street
Station 8 – 900 James Street
- 8) Emergency Shelters:

Barry School, 44 Connell Street*
Belcher School, 10 Southwick Street*
Bowe Elementary School, 115 Hampden Street*
Bowie School, 80 D.A.R.E. Way*
Litwin School, 135 Litwin Lane*
Stefanik School, 720 Meadow Street *
Lambert-Lavoie School, 99 Kendall Street*
Streiber Memorial School, 40 Streiber Dr*

Bellamy Middle School, 314 Pendleton Ave.*
Chicopee Comprehensive High School, 617 Montgomery St.**
Chicopee High School, 820 Front Street**
Chicopee Academy, 650 Front Street**
Chicopee Child Development Center, 989 James Street*
Children's Creative Corner, 249 Broadway*
Cricket's Corner, 254 Hampden Street*
Fairview Middle School, 26 Memorial Avenue*
Selser School, 12 D.A.R.E. Way*
Side by Side Preschool, Inc., 24 Streiber Drive*
V.O.C. Child Care – Szetela, 66 Macek Drive*
Valley Cap Day Care, 1024 Chicopee Street*
Westover Early Childhood Center (Headstart), 31 Griffith Road*
Westover Job Corps Head Start, 103 Johnson Road*
Fairview Veterans Memorial Middle, 26 Memorial Ave.

*Emergency lights only.

**Emergency generator

9) Water Sources

10) Transfer Station

Connecticut Valley Sanitary Waste Disposal, Inc., 161 New Lombard Road

11) Helicopter Landing Sites

Chicopee Armory, 371 Armory Drive

12) Communications

Radio Towers
739 Grattan Street
15 Court Street
332 Chicopee Street

Cellular
165 Front Street
650 Front Street
820 Front Street
154 Grove Street
31 Jamrog Drive
514 Montgomery Street
645 Shawinigan Drive
17 Springfield Street
247 Springfield Street
2 Valier

13) Primary Evacuation Routes

Interstate 90 (Massachusetts Turnpike)

Route 141

Route 391
Route 291
Route 116
Route 33

Bridges/Culverts Located on Evacuation Routes:

Interstate 90 Massachusetts Turnpike (Bridges) – Cooley Brook, Fuller Brook, Connecticut River, Chicopee River
Route 141 (Culvert/Bridges) – Poor Brook, Chicopee River
Route 391 (Bridges) – Chicopee River, Connecticut River
Route 116 (Bridge) – Chicopee River
Route 33 (Culvert) – Willimansett Brook

Category 2 – Non Emergency Response Facilities

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

1) Water Supply

Chicopee purchases its water from the Massachusetts Water Resources Authority and sells a portion of its water to Westover Air Reserve Base. Water flows 14.72 miles from MWRA sources along the Chicopee Valley Aqueduct.

Category 3 – Facilities/Populations to Protect

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

1) Special Needs Population

Nursing homes

Birch Manor Rehabilitation & Skilled Nursing Center - 44 New Lombard Road
Willimansett Center West, 546 Chicopee Street
Willimansett Center East, 11 St. Anthony Street

2) Elderly Housing/Assisted Living

The Arbors at Chicopee, 929 Memorial Drive
Birch Manor Nursing Home, 44 New Lombard Rd
Cabot Manor V.O.C., 1 Stonina Drive
Willimansett Center West, 546 Chicopee St
Willimansett Center East, 11 St. Anthony Street
Arbors at Chicopee, 929 Memorial Drive

Dom Polski Housing, 136-144 Cabot Street
McKinley House, 70 Asinof Avenue
Sunshine Village, 75 Litwin Lane

Chicopee Housing Authority, 128 Meetinghouse Road

Birch Bark Place Apartments, 630 Chicopee Street
Cabot Manor Apartments, Plante Circle
Canterbury Arms Apartments, 165 East Main Street
Edward J. Bury Apartments, 4-52 Benoit Avenue
Edmund W. Kida Apartments, 42-94 Riverview Terrace
Fairhaven Apartments, 400 Britton Street
George D. Robinson Apartments, Grocki Drive, Peloquin Drive, Robinson Drive, Volpe Drive
Memorial Apartments, Memorial Drive, Debra Drive
Valley View Apartments, 7 Valley View Court

3) Public Buildings/Areas

Hampden District Court, 30 Church St
Chicopee City Hall, 17 Springfield Street (Annex - 274 Front Street)
Chicopee Public Library, 449 Front Street
Senior Center, 7 Valley View Court

4) Schools

Barry School, 44 Connell St.
Belcher School, 10 Southwick St.
Bellamy School, 314 Pendleton Ave
Bowe School, 115 Hampden St
Bowie School, 80 Dare Way
Chicopee Academy, 650 Front Street
Chicopee Comprehensive High School, 617 Montgomery St.
Chicopee High School, 820 Front Street
Fairview Veterans Memorial Middle School, 26 Memorial Ave.
Lambert Lavoie School, 99 Kendall
Litwin School, 165 Litwin Lane
Selser School, 2 Dare Way
St. Patrick's, Montgomery Street
Stefanik School, 720 Meadow St.
Streiber School, 40 Streiber Drive
Szetela Early Childhood Development Center, 66 Macek Drive
Telecommunications Center – 816 James Street
Holy Name School, 63 South St.
Holyoke Catholic High School, 134 Springfield St.
St. Joan of Arc/St. George School, 587 Grattan St.
St. Stanislaus School, 534 Front St.
Elms College, 291 Springfield St.
The Arbors Kids, 999 Memorial Dr.
Chicopee Child Development Center, 989 James St.

Children's Creative Corner, 249 Broadway
Crickets Corner, 254 Hampden St.
Side By Side Preschool, Inc., 27 Streiber Dr.
V.O.C. Child Care – Szetela School, 66 Macek Dr.
Valley Cap Day Care, 1024 Chicopee St.
Westover Early Childhood Center (Headstart), 31 Griffith Rd.
Westover Job Corps Head Start, 103 Johnson Rd

5) Churches

Antioch Church-God In Christ, 237 Hampden St.
Assumption Catholic Church, 104 Springfield St.
Beulah Baptist Church, 755 Prospect St.
Christ's Community Church, 103 Springfield St.
Church Of Christ, 284 Montgomery St.
Church Of New Covenant, 938 Chicopee St.
Church-Fountain Salvation, 676 Chicopee St.
Faith United Methodist Church, 191 Montcalm St.
First Central Baptist Church, 50 Broadway St.
First Congregational Church, 306 Chicopee St.
Grace Episcopal Church, 156 Springfield St.
Grace Episcopal Church, 19 Pleasant St.
Greek Orthodox Church, 30 Grattan St.
Holy Name Church, 33 South St.
Iglesia De Dios Esmirna, 95 Main St.
New Beginning Church Of God, 17 Quarry Ave.
New Creations Discipleship, 450 Memorial Dr.
New England Christian Center, 450 Memorial Dr.
Pioneer Valley Baptist, 56 Perkins St.
St Anne's Catholic Church, 30 College St.
St Christopher's Episcopal Church, 27 Streiber Dr.
St Mary's Church, 840 Chicopee St.
St Rose De Lima, 600 Grattan St.
St Stanislaus Church, 566 Front St.
Tabernacle Baptist Church, 603 New Ludlow Rd.
United Pentecostal Church, 40 Newbury St.
Victory Chapel, 54 Center St.

6) Historic Buildings/Sites

There are 805 historical sites listed for Chicopee. Chicopee Center has the largest concentration of these structures.

7) Apartment Complexes (privately owned)

Ames Privilege, 1 Springfield St.
Dom Polski Housing, 136-144 Cabot St.
Falls View Housing, 132 East Main St.

Falls View Family Housing, 42-96 Grove St.
MacArthur Terrace, 70 Broadway
McKinley House Apartments, 38 Asinof Ave.
Sunshine Village, 75 Litwin Lane
Columba Court Apartments, 80 & 92 Columba St.
Hilltop Garden Apartments, 46-70 Columba St.
Granby Road Arms Apartments, 199-213 Granby Rd.
Westover Job Corps Center, 103 Johnson Rd.
Valentine Apartments, 97-109 Grape St.
Park Place Apartments, 61 Abbey Memorial Dr.
Townhouse Garden Apartments, 24-187 Theroux Dr.
Mason Manor Apartments, 265 New Ludlow Rd.
Bayberry Arms Apartments, 265-269 College St.
McCarthy Ave. Apartments, 213-215 & 219-221 McCarthy Ave.; 260-264 College St.
Montcalm Heights Apartments, 419 Montcalm St. & 185 New Ludlow Rd.
Fairfield Apartments, 627-633 & 635-639 Pendleton Ave.
The Kendall Apartments, 4-A Springfield St.
Maplewood Apartments, 16-18 America St.
Sunrise Court Apartments, 300 East Main St.
Mall Apartments, 68-91 Ebdert St.
Aldenview Estates, 149 Dale St.

Chicopee Housing Authority

Birch Park Place Apartments, 630 Chicopee St.
Cabot Manor Apartments, Stonina Dr. & Plante Cir.
Canterbury Arms Apartments, 165 East Main St.
Edmund W. Kida Apartments, 42-94 Riverview Terr.
Edward J. Bury Apartments, 4-52 Benoit Ave.
Fairhaven Apartments, 400 Britton St
George D. Robinson Apartments, Grocki Dr.
George D. Robinson Apartments, Peloquin Dr.
George D. Robinson Apartments, Robinson Dr.
George D. Robinson Apartments, Volpe Dr.
Leo P. Senecal Apartments, Chicopee St.
Leo P. Senecal Apartments, Marshall Ave.
Leo P. Senecal Apartments, Elmer Dr.
Leo P. Senecal Apartments, Meetinghouse Rd.
Leo P. Senecal Apartments, Elcon Dr.
Leo P. Senecal Apartments, Meadow St.
Mac Arthur Terrace, 65 & 70 Broadway
Memorial Apartments, Memorial Dr.
Memorial Apartments, Debra Dr.
Valley View Apartments, Valley View Ct.

- 8) Employment Centers
Westover Airport

Category 4 – Potential Resources

Contains facilities that provide potential resources for services or supplies.

- 1) Food/Water
- 2) Hospitals/Medical Supplies
- 3) Gas/Heating Oil/Propane
Gasoline

Heating Oil

Propane
- 4) Building Materials Suppliers
- 5) Heavy & Small Equipment Suppliers

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

Hazard Type	Hazard Area	Critical Facilities Affected	Evacuation Routes Affected
Flooding (100-year)	Chicopee River	DPW at 115 Baskin could be cut off and lose power but would not be damaged	Fuller Road
Flooding (localized)	Low spots, steams and ponds	None in close proximity for localized flooding	Route 33, Fuller Road, Lower Chicopee and Meadow Street
Severe Snow/Ice Storm	City wide	Could be any facility	Any
Hurricane/Severe Wind	City wide	Could be any facility	Any
Wildfire/Brushfire	City wide – low potential	Could be any facility	Any
Earthquake	City wide	Could be any facility	Any
Dam Failure	See list	None in close proximity to dams	Front Street
Drought	City wide	None	None
Hazardous Materials	Any facility where hazardous materials are stored or any transportation route	Could be any facility	Any

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

5: MITIGATION STRATEGIES

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

Goal Statement

To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to natural disasters. To provide adequate shelter, water, food and basic first aid to displaced residents in the event of a natural disaster and to provide adequate notification and information regarding evacuation procedures, etc., to residents in the event of a natural disaster.

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

- Zoning Ordinances
- Subdivision Regulations
- Site Plan Regulations
- Community Development Plan
- Open Space and Recreation Plan
- CEM Plan
- Other relevant Ordinances as identified (Fire Department Burn Permit Procedures, Building Code, etc.)

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

General Mitigation Measures

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

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

What's the CEM Plan?

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

specifically under the category of "mitigation," but are instead tools for preparedness. The Hazard Mitigation Planning Committee recognizes that these are also important recommendations for the City, and has included them here:

EXAMPLES

Action Item: Examine current notification system including feasibility of new siren warning system, internet radio system, or Reverse 911. Develop a preliminary project proposal and cost estimate.

Responsible Department/Board: *City Council, Local Emergency Planning Committee*

Proposed Completion Date: 2011

Action Item: Collect, periodically update, and disseminate information on emergency information, what to include in a 'home survival kit,' how to prepare homes and other structures to withstand flooding and high winds, and the proper evacuation procedures to follow during a natural disaster.

Responsible Department/Board: Local Emergency Planning Committee

Proposed Completion Date: 2010

Action Item: Establish system to inventory supplies at existing shelters and develop a needs list and storage requirements. Establish arrangements with local or neighboring vendors for supplying shelters with food and first aid supplies in the event of a natural disaster.

Responsible Department/Board: Local Emergency Planning Committee, Emergency Management Director, School Department

Proposed Completion Date: Ongoing

Action Item: Work to certify Local Emergency Planning Committee with full status for Hazardous Materials emergency planning.

Responsible Department/Board: Local Emergency Planning Committee, Emergency Management Director

Proposed Completion Date: Ongoing

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 City's water bodies and waterways.

Current Mitigation Measures

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

Table 5-1: Existing Flood Hazard Mitigation Measures

Existing Strategy		Description	Effectiveness	Potential Changes
Flood Control Structures		Extensive system of dikes along the Connecticut and Chicopee Rivers	No breaches since construction	
Culvert Replacement		Priority list of necessary culvert replacements and other construction projects to effectively manage flooding.	Very effective for managing flood control needs.	Seek funding from HMGP for top-priority projects.
Zoning Ordinance	Floodplain Overlay District	Areas delineated as part of the 100-year floodplain are protected by strict use regulations.	Very effective for preventing incompatible development within the flood prone areas.	
	Garden Industrial Planned Unit Development (IPUD)	Restricts development to maximum of 70% impervious surface.	Somewhat effective for encouraging groundwater infiltration on-site.	Consider adding additional stormwater management regulations.
	Garden Industrial Planned Unit Development (IPUD) Type II	Restricts development to maximum 70% impervious surface, and includes strict regulations for stormwater management on-site.	Effective for encouraging groundwater infiltration on-site, and managing stormwater.	
	Soil Removal and Landfill	Permit required for any grading, fill, emphasizes environmental concerns.	Somewhat effective for preventing water pollution.	Consider creating more performance-based evaluations.
	Site Plan Approval	Proposed uses must meet requirements for drainage and grading.	Somewhat effective for managing impacts of development.	
Subdivisi	Impact and Limitations	Chicopee Conservation Commission reviews all	Effective for preventing impacts to wetlands.	

		development projects for wetland impacts		
Minimum Standards for Development	Drainage systems requirements	Effective for preventing impacts to water bodies and managing stormwater.		
	Control of erosion and sedimentation			
	Flood prone areas development restrictions			
Chicopee Open Space Plan	Inventories natural features and promotes natural resource preservation in the City, including areas in the floodplain; such as wetlands, groundwater recharge areas, farms and open space, rivers, streams and brooks.	Effective in identifying sensitive resource areas, including floodplains. Encourages forest, farmland protection, help conserve the City's flood storage capacity.	Work to implement relevant goals and policies in Plan.	
National Flood Insurance Program Participation	As of 2006, there were 39 homeowners with flood insurance policies.	Somewhat effective, provided that the City remains enrolled in the National Flood Insurance Program.	The City should evaluate whether to become a part of FEMA's Community Rating System.	

Future Mitigation Measures

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

Action Item: Replace priority culverts on Stormwater Management Project List, pending availability of funding.

Responsible Department/Board: Department of Public Works

Proposed Completion Date: Ongoing

Action Item: Create more performance-based evaluations for soil removal and landfill

Responsible Department/Board: DPW, Planning, and City Council

Proposed Completion Date: 2012

Action Item: Implement the goals and strategies of the Chicopee Community Development Plan dealing with protection of floodplain, forests, and farmland.

Responsible Department/Board: Conservation Commission, Planning Board, City Council,

Proposed Completion Date: Ongoing

Action Item: Evaluate whether to become a part of FEMA's Community Rating System, pending availability of funding.

Responsible Department/Board: City Council, Board of Assessors, Emergency Management Director

Proposed Completion Date: 2011

OTHER POSSIBILITIES

Action Item: Identify zoning tools needed to provide incentives for guiding development to the most suitable and least hazardous areas of City, pending availability of funding.

Responsible Department/Board: Planning Board

Proposed Completion Date: 2011

Action Item: Inventory dams, bridges, power lines, telephone lines and develop estimate of what would cost to replace with major events, pending availability of funding.

Responsible Department/Board: Department of Public Works, Board of Assessors

Proposed Completion Date: 2012

Action Item: Educate citizens living in the floodplain about the NFIP, pending availability of funding.

Responsible Department/Board: Building Inspector

Proposed Completion Date: 2011

Severe Snow/Ice Storm

Winter storms can be especially challenging for emergency management personnel. The Massachusetts Emergency Management Agency (MEMA) serves as the primary coordinating entity in the statewide management of all types of winter storms and monitors the National Weather Service (NWS) alerting systems during periods when winter storms are expected. Even though the storm has usually been forecast, there is no certain way for predicting its length, size or severity. Therefore, mitigation strategies must focus on preparedness prior to a severe snow/ice storm.

Current Mitigation Measures

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

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

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

Existing Strategy		Description	Effectiveness	Potential Changes	
Subdivision Regulations	Minimum Standards for Development	Telephone and electrical utilities must be placed underground	Effective for preventing power loss.	Work with WMECO to facilitate underground utilities as allowed.	
		Street grade regulations (minimum 0.5%; maximum 8%); and intersection grade regulations (maximum 2%).	Effective.		
State Building Code		The City of Chicopee has adopted the Massachusetts State Building Code.	Effective.		
Backup Electric Power		Shelters have backup power, three mobile generators	Very effective in case of power loss.		
Tree Management		List of dangerous trees created annually by WMECO.	Very effective, preventative collaboration.		

Future Mitigation Measures

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

- ★ Determine if existing generators at shelters are effective, replace if not effective.
- ★ Increase enforcement of restrictions prohibiting residents from plowing snow into the road.
- ★ Determine if existing generators at shelters are effective, replace if not effective.
- ★ Increase enforcement of restrictions prohibiting residents from plowing snow into the road.

Hurricanes/Severe Wind

Of all the natural disasters that could potentially impact Chicopee, hurricanes provide the most lead warning time because of the relative ease in predicting the storm's track and potential landfall. MEMA assumes "standby status" when a hurricane's location is 35 degrees North Latitude (Cape Hatteras) and "alert status" when the storm reaches 40 degrees North Latitude (Long Island). Even with significant warning, hurricanes can do significant damage – both due to flooding and severe wind.

The flooding associated with hurricanes can be a major source of damage to buildings, infrastructure and a potential threat to human lives. Therefore, all of the flood protection mitigation measures described in Table 5-1 can also be considered hurricane mitigation measures.

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

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

Tornadoes/Microbursts

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

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

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

Existing Strategy		Description	Effectiveness	Potential Changes
Zoning Ordinance	Zone Districts – Residential D	Mobile homes are permitted in this district, with regulations on density, required open space, etc.	Somewhat effective for preventing damage to susceptible structures	
	Floodplain Overlay District	No mobile homes allowed.		

	Wireless Communications Facilities	Wireless communication towers/facilities need special permit. Standards restrict height and setbacks.	Effective for preventing damage to nearby structures.	
Subdiv Regs	Minimum Standards for Development	Telephone and electrical utilities must be placed underground	Effective for preventing power loss.	Work with WMECO to facilitate underground utilities as allowed.
	State Building Code	The City has adopted the MA State Building Code.	Effective.	
	Tree Management	List of dangerous trees created annually for WMECO.	Very effective, preventative collaboration.	

Wildfire/Brushfire

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

Current Mitigation Measures

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

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

Existing Strategy		Description	Effectiveness	Potential Changes
Zoning Ord	Site Plan Approval	Special granting authority can request Fire Department inspection/review of any plan.	Effective.	
	Burn Permits	No residential burning allowed	Extremely effective	
	Public Education/Outreach	The Fire Department has an ongoing educational program in the schools.	Effective.	None.

Future Mitigation Measures

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

Action Items: Increase education; including pre-season review of regulations in public outreach campaign and/or invoking penalties for offenders

Responsible Department/Board: Fire Department

Proposed Completion Date: Ongoing

Earthquake

Although there are five mapped seismological faults in Massachusetts, there is no discernable pattern of previous earthquakes along these faults nor is there a reliable way to predict future earthquakes along these faults or in any other areas of the state. Consequently, earthquakes are arguably the most difficult natural hazard to plan for.

Most buildings and structures in the state were constructed without specific earthquake resistant design features. In addition, earthquakes precipitate several potential devastating secondary effects such as building collapse, utility pipeline rupture, water contamination, and extended power outages. Therefore, many of the mitigation efforts for other natural hazards identified in this plan may be applicable during the City's recovery from an earthquake.

Current Mitigation Measures

The City's most relevant existing mitigation measures are described in the following table.

Table 5-5: Existing Earthquake Hazard Mitigation Measures

Existing Strategy		Description	Effectiveness	Potential Changes
Zoning Ord	Wireless Communications Facilities	Wireless communication towers/facilities need special permit. Standards restrict height and setbacks.	Somewhat effective for preventing damage to nearby property	
	State Building Code	The City of Chicopee has adopted the State Building Code.	Effective for new buildings only.	Evaluate older structures categorized as critical facilities to determine if they are earthquake resistant.

Future Mitigation Measures

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

Action Item: Consider evaluation of older critical facilities to determine if they are earthquake resistant.

Responsible Department/Board: Building Inspector, Emergency Management Director

Proposed Completion Date: 2013

Action Item: Ensure that all identified shelters have sufficient back-up utility service in the event of primary power failure.

Responsible Department/Board: Emergency Management Director

Proposed Completion Date: 2011

Dam Failure

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

Current Mitigation Measures

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

Table 5-6: Existing Dam Failure Hazard Mitigation Measures

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

Future Mitigation Measures

Recent changes in legislation have shifted some of the responsibility of dam safety onto dam owners. The City recognizes the need to adjust to this change. Several potential changes to the City's current strategies have been identified in the above table, and

these, as well as recommendations for other future mitigation strategies, are compiled below:

Action Item: Obtain all most recent maps of inundation areas and evacuation routes for high hazard dams.

Responsible Department/Board: Emergency Management Director

Proposed Completion Date: 2011

Action Item: Work with maps of inundation zones for high hazard dams and analyze development trends in these locations, pending availability of funding.

Responsible Department/Board: Planning Department

Proposed Completion Date: 2011

Action Item: Educate citizens living in inundation zones about evacuation routes in case of dam failure, pending the availability of funding.

Responsible Department/Board: Local Emergency Planning Committee

Proposed Completion Date: 2011-12

Drought

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

Current Mitigation Measures

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

Table 5-7: Existing Drought Hazard Mitigation Measures

Existing Strategy		Description	Effectiveness	Potential Changes
Zoning Ordinance	Garden Industrial Planned Unit Development (IPUD)	Restricts development to maximum of 70% impervious surface.	Somewhat effective for encouraging groundwater infiltration on-site.	Consider adding additional stormwater management regulations.

	Garden Industrial Planned Unit Development (IPUD) Type II	Restricts development to maximum 70% impervious surface, and includes strict regulations for stormwater management on-site.	Effective for encouraging groundwater infiltration on-site, and managing stormwater.	
Subdiv/Site Plan Review Regs	Impact and Limitations	Conservation Commission reviews all subdivision/development proposals with potential wetland impacts	Effective for preventing impacts to wetlands.	
Chicopee Open Space Plan	Makes recommendations for protecting Chicopee's water quality/supply.	Somewhat effective for raising awareness about protecting water quality, supply, and conservation.	Implement plan goals. Enhance this section in plan update beginning 2010.	
Water Department Drought Protocol	Water Department has plan for water use reductions during droughts	Effective	Update as new technology is available.	

Future Mitigation Measures

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

Action Item: Implement the goals and strategies of the Chicopee Open Space Plan dealing with protection of natural resources, particularly those dealing with protection of waterbodies.

Responsible Department/Board: Conservation Commission, Planning Department, Water Department

Proposed Completion Date: Ongoing

OTHER POSSIBILITIES

Action Items: Revise the Water Supply Protection Overlay District, utilizing the state model from DEP, with a focus on clarifying definitions, pending availability of funding.

Responsible Department/Board: Planning Department, Water Department, Conservation Commission

Proposed Completion Date: 2012

Hazardous Materials

Hazardous materials are in existence throughout City, and are constantly being moved on Chicopee's roads and highways. However, there is no way to anticipate where and

when a hazardous materials spill or explosion could take place. Therefore, it makes is somewhat difficult to determine mitigation strategies, but Chicopee has some regulations currently in place to mitigate the impacts of a hazardous materials disaster.

Table 5-8: Existing Hazardous Materials Hazard Mitigation Measures

Existing Strategy		Description	Effectiveness	Potential Changes
Zoning Ord	Industrial District	No hazardous conditions or emissions permitted.	Somewhat effective for preventing haz-mat fire, spill.	Define what constitutes hazardous materials and wastes.

Future Mitigation Measures

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

Action Item: Include regulations for hazardous materials/wastes storage in Industrial District, and other applicable zone districts, if necessary

Responsible Department/Board: Planning Department, Planning Board, City Council

Proposed Completion Date: 2011

6: PRIORITIZED IMPLEMENTATION SCHEDULE

Summary of Critical Evaluation

The Chicopee Hazard Mitigation Planning Committee reviewed each of the recommendation future mitigation measures identified, and used the following factors to prioritize mitigation projects. This list of factors is derived from FEMA's STAPLE+E criteria.

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

Project Prioritization

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

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

Table 6.1: Prioritized Implementation Schedule – Action Plan

Priority	Mitigation Action	Responsible Department/Board	Proposed Completion Date/ Reporting Date	Funding Source/ Estimated Cost	Incorporation into Existing Plans
1	Obtain all most recent maps of inundation areas and evacuation routes for high hazard dams.	Emergency Management Director Planning Department	2010	none	TBD
3	Work to certify Local Emergency Planning Committee with full status for Hazardous Materials emergency planning.	Local Emergency Planning Committee Emergency Management Director	2011-13	Staff, budgeted funding, grants	TBD
2	Work with maps of inundation zones for high hazard dams and analyze development trends in these locations, pending availability of funding.	Planning Department	2010-11	staff time	TBD
4	Establish system to inventory supplies at existing shelters and develop a needs list and storage requirements. Establish arrangements with local or neighboring vendors for supplying shelters with food and first aid supplies in the event of a natural disaster.	Local Emergency Planning Committee	2011	Staff, budgeted funding, grants	TBD
5	Educate citizens living in inundation zones about evacuation routes in case of dam failure, pending the availability of funding.	Local Emergency Planning Committee Fire Department Police Department	2010-11	Volunteers, staff, grants	TBD

6	Implement the goals and strategies of the Chicopee Open Space Plan dealing with protection of natural resources, particularly those dealing with protection of waterbodies.	Conservation Commission Planning Department Water Department	2010-11	Staff, budgeted funding, grants	TBD
7	Collect, periodically update, and disseminate information on emergency information, what to include in a 'home survival kit,' how to prepare homes and other structures to withstand flooding and high winds, and the proper evacuation procedures to follow during a natural disaster.	Local Emergency Planning Committee	2011	Volunteers, staff, grants	TBD
8	Examine current notification system including feasibility of new siren warning system, internet radio system, or Reverse 911. Develop a preliminary project proposal and cost estimate.	City Council Local Emergency Planning Committee Fire Department Police Department	2012	Staff, budgeted funding, grants	TBD

7: PLAN ADOPTION & IMPLEMENTATION

Plan Adoption

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

Plan Implementation

The implementation of the Chicopee Local Natural Hazards Mitigation Plan will begin following its formal adoption by the Mayor and approval by MEMA and FEMA.

Those city departments and boards responsible for ensuring the development of policies, bylaw revisions, and programs as described in Sections 5 and 6 of this plan will be notified of their responsibilities immediately following approval. The Chicopee Local Emergency Planning Committee will oversee the implementation of the plan.

Plan Monitoring and Evaluation, Public Involvement

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

The Chicopee Natural Hazards Planning Committee will meet on an annual basis or as needed (i.e., following a natural disaster) to monitor the progress of implementation, evaluate the success or failure of implemented recommendations, and brainstorm for strategies to remove obstacles to implementation. Those parties noted in Section 6 of the plan, will be responsible for seeing that the actions are implemented and will report on their progress at the annual plan review meetings. In addition, specific recommendations germane to other plans in use by the City will be integrated into those plans as appropriate.

Outreach to the public, surrounding communities, agencies, businesses, academia, non-profits, or other interested parties outside of the city of Chicopee will be done in advance of each annual meeting in order to solicit their participation in assessment of the plan. Following these discussions, it is anticipated that the committee may decide to reassign the roles and responsibilities for implementing mitigation strategies to different city departments and/or revise the goals and objectives contained in the

plan. The approved Chicopee Hazard Mitigation Plan will be available for public review at the City Hall, public library and at the PVPC offices for ongoing public review and comment. At a minimum, the committee will review and update the plan every five years, beginning in the fall of 2013. The meetings of the committee will be organized and facilitated by the Emergency Management Director or the Chicopee Board of Aldermen.

Incorporation of Plan Requirements into other Planning Mechanisms/ Documents

At times when the City of Chicopee is considering creation of or changes to local planning documents or procedures including, but not limited to comprehensive plans, capital improvement plans, zoning and building codes site reviews and permitting processes the information and recommendations contained in this plan will be reviewed by the people and committees involved in those processes and, when appropriate, will incorporate those recommendations into the new planning procedures.

CERTIFICATE OF ADOPTION
CITY OF CHICOPEE, MASSACHUSETTS
MAYOR MICHAEL D. BISSONNETTE
A RESOLUTION ADOPTING THE CHICOPEE
NATURAL HAZARD MITIGATION PLAN

WHEREAS, the City of Chicopee established a Committee to prepare the Chicopee Hazard Mitigation plan; and

WHEREAS, several public planning meetings were held between February and March 2009 regarding the development and review of the Chicopee Hazard Mitigation Plan; and

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

WHEREAS, a duly-noticed public hearing was held by the Board of Alderman on _____, 2009 to formally approve and adopt the Chicopee Hazard Mitigation Plan.

NOW, THEREFORE BE IT RESOLVED that Mayor Bissonnette adopts the Chicopee Hazard Mitigation Plan.

ADOPTED AND SIGNED this _____, 2009.

Michael D. Bissonnette
Mayor of Chicopee

ATTEST

APPENDICES

Appendix A – Technical Resources

1) Agencies

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

2) Mitigation Funding Resources

404 Hazard Mitigation Grant Program (HMGP)	Massachusetts Emergency Management Agency
406 Public Assistance and Hazard Mitigation	Massachusetts Emergency Management Agency
Community Development Block Grant (CDBG).....	DHCD, also refer to RPC
Dam Safety Program.....	MA Division of Conservation and Recreation
Disaster Preparedness Improvement Grant (DPIG)	Massachusetts Emergency Management Agency

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

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

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

3) Internet Resources

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

NASA Natural Disaster Reference Database	http://ltpwww.gsfc.nasa.gov/ndrd/main/html	Searchable database of worldwide natural disasters.
U.S. State & Local Gateway	http://www.statelocal.gov/	General information through the federal-state partnership.
National Weather Service	http://nws.noaa.gov/	Central page for National Weather Warnings, updated every 60 seconds.
USGS Real Time Hydrologic Data	http://h20.usgs.gov/public/realtime.html	Provisional hydrological data
Dartmouth Flood Observatory	http://www.dartmouth.edu/artsci/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.iiaa.iix.com/ndcmapp.html	A multi-disaster risk map.
Earth Satellite Corporation	http://www.earthsat.com/	Flood risk maps searchable by state.
USDA Forest Service Web	http://www.fs.fed.us/land	Information on forest fires and land management.

Appendix B – List of Acronyms

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

Appendix C – Natural Hazard Analysis Methodology⁴

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

The matrix is organized into the following sections: Type of Hazard, Location of Occurrence, Extent of Impacts, Previous Occurrences, Probability of Future Occurrence, and Hazard Index. The Hazard Index was completed to rank the hazards according to the frequency of occurrence and the amount of potential damage likely to occur. The Hazard Index forms the basis for concentrating the future mitigation efforts outlined in this plan. A description of each of the matrix categories is provided below. The completed Matrix is shown as Table 3.1 ([Section 3, page 17](#)).

Previous Occurrences

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

Location of Occurrence

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

Table C.1: Location of Occurrence, Percentage of City Impacted of Given Natural Hazard	
Location of Occurrence	Percentage of City Impacted
Large	More than 50% of the city affected
Medium	10 to 50% of the city affected
Small	Less than 10% of the city affected

Extent of Impacts

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

Table C.2: Extent of Impacts, Magnitude of Multiple Impacts of Given Natural Hazard	
Extent of Impacts	Magnitude of Multiple Impacts
Catastrophic	Multiple deaths and injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of facilities for 30 days or more.
Critical	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.

Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.
Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.

Probability of Future Occurrence

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

Table C.3: Frequency of Occurrence and Annual Probability of Given Natural Hazard

Frequency of Occurrence	Probability of Future Event
Very High	70-100% probability in the next year
High	40-70% probability in the next year
Moderate	10-40% probability in the next year
Low	1-10% probability in the next year
Very Low	Less than 1% probability in the next year

Hazard Index

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

The Hazard Ratings are labeled as follows:

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

Appendix D – Past & Potential Hazards/Critical Facilities Map

Appendix E – Documentation of the Planning Process

Chicopee Hazard Mitigation Planning Committee
Meeting #1 February , 2009 __ pm
Chicopee City Hall
AGENDA

1) Introduction & Purpose of Committee

2) What is Hazard Mitigation Planning?

3) Begin Review of Draft Plan

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

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

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

and Evacuation Routes Potentially Affected By Hazard Areas

5. Hazards Analysis Methodology

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

6. Analyze Development Trends

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

7. Review Vulnerability Assessment Methodology and Potential Loss Estimates

8. Schedule and Agenda for next meeting

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

**Chicopee Hazard Mitigation Planning Committee
Meeting #2, March __, 2009, __ pm
Chicopee Town Offices
AGENDA**

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

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

**Chicopee Hazard Mitigation Planning Committee
Meeting #3
March __, 2009 __ pm
Chicopee Town Offices
AGENDA**

- 1. Finalize Revised Map of Critical Facilities**
- 2. Final Review of plan**
- 3. Affirm Action Plan of Hazard Mitigation Strategies**
- 4. Review Plan Adoption and Implementation**

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

Appendix F – Public Outreach

PRESS RELEASE

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

FOR IMMEDIATE RELEASE
December 14, 2007

Pre-Disaster Mitigation Plans Under Development

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

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

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

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

PRESS RELEASE

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

FOR IMMEDIATE RELEASE

June 30, 2008

Pre-Disaster Mitigation Plans Public Comment Period

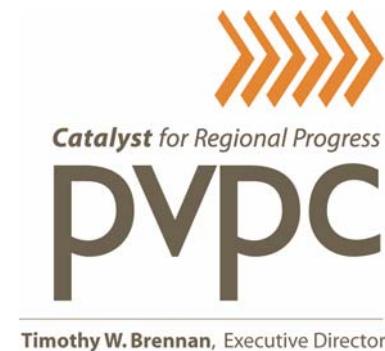
The Pioneer Valley Planning Commission, in conjunction with local Hazard Mitigation Planning Committees, has produced drafts of Pre-disaster Mitigation Plans for the communities of Cummington, Palmer, Southampton, Westfield and Westhampton. Residents, business owners and other concerned parties of the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

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

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

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

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



Timothy W. Brennan, Executive Director

PRESS RELEASE

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

FOR IMMEDIATE RELEASE
February 5, 2009

Pre-Disaster Mitigation Plans Public Comment Period

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

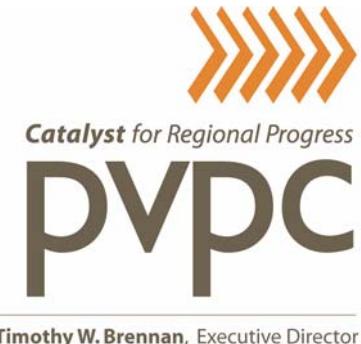
Starting this month pre-disaster mitigation plans will be developed for Amherst, Belchertown, Brimfield, **Chicopee**, Springfield, West Springfield, and Williamsburg, and will also be available for public comment as they are developed.

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

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

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

—30—



MEDIA RELEASE

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

FOR IMMEDIATE RELEASE
October 26, 2009

Pre-Disaster Mitigation Plans Public Comment Period

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

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

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

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

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

—30—
