

TOWN OF MIDDLEBURY NATURAL HAZARD PRE-DISASTER MITIGATION PLAN

**CENTRAL NAUGATUCK VALLEY
REGIONAL PLANNING AREA**

FEBRUARY 2009

MMI #2937-02

Prepared For:



**Council of Governments
Central Naugatuck Valley**

Under a grant from the Federal Emergency Management Agency (FEMA) through Connecticut Department of Environmental Protections (DEP)

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EXECUTIVE SUMMARY

Town of Middlebury Natural Hazard Pre-Disaster Mitigation Plan

1. The primary purpose of a natural hazard pre-disaster hazard mitigation plan (HMP) is to identify natural hazards and risks, existing capabilities, and activities that can be undertaken by a community or group of communities to prevent loss of life and reduce property damages associated with the identified hazards and also to make identified activities eligible for federal assistance.
2. The Town of Middlebury is drained by six major watersheds corresponding to Hop Brook Long Meadow Pond Brook, Eightmile River, the Nonnewaug River, the Little River, and Steele Brook. The entire Town eventually drains into the Housatonic River.
3. The Department of Public Works is the principal municipal department that responds to problems caused by natural hazards.
4. The Middlebury land use regulations have several inclusions that are a benefit to emergency response. Cul-de-sacs in new developments are discouraged; connectivity of roads is encouraged in Section 6.0 of the Subdivision Regulations and Section 9.12 of the Middlebury Road and Drainage Regulations; and utilities serving new developments must be installed underground wherever possible, according to Section 6.8 of the Middlebury Subdivision Regulations.
5. The Town considers its emergency response, public works facilities, school facilities, municipal facilities, childcare facilities, age-restricted facilities, home for the blind facilities, handicap assistantship facilities, convalescent facilities, companies dealing with hazardous chemicals, and its sewerage utility facilities as its critical facilities. Of these critical facilities, the Middlebury Fire Department, the Middlebury Police Department, the Middlebury Public Works, the Shepardson Community Center, and the Long Meadow Elementary School are considered to be the most important. Two of Middlebury's critical facilities are located near floodprone areas. The Fire Station on Tucker Hill Road is adjacent to the Goat Brook and Hop Brook floodplains, and the Department of Public Works, while not located adjacent to a mapped floodplain, is near the unnamed stream that causes flooding in that area (refer to Section 3.5).
6. Middlebury has three designated emergency shelters with generators that meet American Red Cross guidelines. They are the Shepardson Community Center, which can accommodate a maximum of 100 people; the Middlebury Fire House - 50 people; and the Long Meadow Elementary School - 100 people. During extended power outages, it is believed that only 10% to 20% of the affected population of Middlebury will relocate.

7. The Town has created the Emergency Management Department and, for long-term planning, the Town has a Local Emergency Preparedness Commissioner that forms temporary committees when the Town needs to accomplish a specific task related to emergency planning. The Town has also established the CodeRED Emergency Notification System in an effort to streamline emergency notifications to residents of the Town.
8. Water service in Middlebury is relatively recent, beginning in 1988 with a connection to the City of Waterbury supply. In the near future, the Heritage Village Water Company in the western part of town and the Connecticut Water Company's municipal system will be interconnected in the Town center.
9. The Public Works Department is a critical municipal department related to hazard mitigation because it maintains, repairs, and constructs stormwater systems and roadways for proper drainage and flood mitigation, as well as clearing snow and ice and maintaining access for emergency vehicles.
10. Flooding is a considerable natural hazard in the Town of Middlebury. Prior to floodplain regulations, homes were constructed within floodplains along Hop Brook, its tributaries, and Long Meadow Pond Brook. These areas experience the most significant overbank flooding in the town.
11. A total of 922 acres of land in Middlebury are located within the 100-year flood boundary. Flooding is generally concentrated in discrete areas of Town and is not widespread, with the exception of flooding along Hop Brook.
12. The Town of Middlebury has in place a number of measures to prevent flood damage. These include regulations and ordinances preventing encroachment and development near floodways.
13. The Town should consider outreach and education measures, including a checklist that cross-references the regulations under various Middlebury standards that may be applicable to proposed projects.
14. Two types of structural measures are recommended to improve overbank flooding - increasing the capacity of several identified culverts including the Hop Brook culvert and replacing the bridge over Long Meadow Pond on Long Meadow Road in order to mitigate flooding problems along the local roadway.
15. During hurricanes, tropical storms, and other wind storms, tree limbs and trees may fall, potentially damaging structures, utility lines, and vehicles. The Town of Middlebury Department of Public Works performs annual tree maintenance on any tree or tree limb which crosses the vertical imaginary plane of Town property.

16. The entire Town of Middlebury is susceptible to summer storms (including heavy rain, flash flooding, wind, hail, and lightning) and tornadoes, and due to its high elevation and heavily treed landscape particularly susceptible to damage from high winds.
17. Winter events and the hazards that result (wind, snow, and ice) have more widespread geographic extent than summer ones. Icing causes difficult driving conditions throughout the hillier sections of Town, those roadways in the northwest portion of Town, including White Deer Rock Road, Old Watertown Road, Charcoal Avenue, Breakneck Hill Road, Tranquility Road, and others. Drifting snow problem areas include Route 188 near the police station, and Route 64 near Christian Road and Abbott Farm Road.
18. The entire Town of Middlebury is susceptible to the small possibility of earthquakes. The Plan recommends that municipal departments have adequate backup facilities in case earthquake damage or other damage occurs to municipal buildings.
19. With 24 registered dams and potentially several other minor dams in the Town, dam failure can occur almost anywhere in The Town of Middlebury. Quassapaug and Little Tracy's Pond dam are the only two with significant hazard potential (Class B). The Long Meadow Pond Dam (undefined Class) is in poor condition and is in need of repairs. The Town should consider implementing occasional Town inspections of Class BB, A, AA, and unranked dams.
20. While the Town of Middlebury is considered a low-risk area for wildfires, the northern and southern portions of Town are considered most at risk. These areas present potential access problems for firefighting purposes in the event of a wildfire due to natural conditions including steep relief, heavily wooded forests, and the lack of water sources.
21. The Town of Middlebury should identify and develop sources of fire protection for the vicinity of Burr Hall Road and the north-central section of Middlebury including the north end of East Farms Road and locations along Artillery Road, North Farms Road, and Mirey Dam Road and explore all possible means of improving accessibility for areas which currently do not have sufficient firefighting access.
22. One general recommendation in the plan includes the education of the public about how to protect themselves and their property from natural hazards. The Local Emergency Planning Commission should be charged with the creation and/or dissemination of informational pamphlets and guides to public locations such as the library, post office, Shepardson Community Center, and town hall. One way to do this would be to add pages to the Town's website dedicated specifically to citizen education and preparation for natural hazard events.

1.0 INTRODUCTION

1.1 Background and Purpose

The term hazard refers to an extreme natural event that poses a risk to people, infrastructure, or resources. In the context of natural disasters, pre-disaster hazard mitigation is commonly defined as any sustained action that permanently reduces or eliminates long-term risk to people, property, and resources from natural hazards and their effects.

The primary purpose of a pre-disaster hazard mitigation plan (HMP) is to identify natural hazards and risks, existing capabilities, and activities that can be undertaken by a community or group of communities to prevent loss of life and reduce property damages associated with the identified hazards. This HMP is prepared specifically to identify hazards in the Town of Middlebury, Connecticut ("Middlebury" or "Town"). The HMP is relevant not only in emergency management situations, but also should be used within the Middlebury's land use, environmental, and capital improvement frameworks.

The Disaster Mitigation Act of 2000 (DMA), commonly known as the 2000 Stafford Act amendments, was approved by Congress and signed into law in October 2000, creating Public Law 106-390. The purposes of the DMA are to establish a national program for pre-disaster mitigation and streamline administration of disaster relief.

The DMA requires local communities to have a Federal Emergency Management Agency (FEMA)-approved mitigation plan in order to be eligible to receive post-disaster Hazard Mitigation Grant Program (HMGP) grants and Pre-Disaster Mitigation (PDM) program project grant funds. Once a community has a FEMA-approved hazard mitigation plan, the community is then eligible to apply for PDM project funds for mitigation activities.

The subject pre-disaster hazard mitigation plan was developed to be consistent with the requirements of the HMGP, PDM, and Flood Management Assistance (FMA) programs. These programs are briefly described below.

Pre-Disaster Mitigation (PDM) Program

The Pre-Disaster Mitigation program was authorized by Part 203 of the Robert T. Stafford Disaster Assistance and Emergency Relief Act (Stafford Act), 42 U.S.C. 5133. The PDM program provides funds to states, territories, tribal governments, communities, and universities for hazard mitigation planning and implementation of mitigation projects prior to disasters, providing an opportunity to reduce the nation's disaster losses through pre-disaster mitigation planning and the implementation of feasible, effective, and cost-efficient mitigation measures. Funding of pre-disaster plans and projects is meant to

Mitigation Funding

Note that starting in 2008, applications for hazard mitigation grant funding are administered under the Unified Hazard Mitigation Assistance program. More information on this and the following programs can be found at FEMA's website, <http://www.fema.gov/>

reduce overall risks to populations and facilities. PDM funds should be used primarily to support mitigation activities that address natural hazards. In addition to providing a vehicle for funding, the PDM program provides an opportunity to raise risk awareness within communities.

Hazard Mitigation Grant Program (HMGP)

The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. A key purpose of the HMGP is to ensure that any opportunities

to take critical mitigation measures to protect life and property from future disasters are not "lost" during the recovery and reconstruction process following a disaster.

Flood Mitigation Assistance (FMA) Program

The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). FEMA provides FMA funds to assist States and communities with implementing measures that reduce or eliminate the long-term risk of flood damage to buildings, homes, and other structures insurable under the NFIP. The long-term goal of FMA is to reduce or eliminate claims under the NFIP through mitigation activities. Three types of grants are available under FMA: Planning, Project, and Technical Assistance grants.

1.2 Hazard Mitigation Goals

The primary goal of this hazard mitigation plan is to ***reduce the loss of or damage to life, property, infrastructure, and natural, cultural and economic resources from natural disasters***. This includes the reduction of public and private damage costs. Limiting losses of and damage to life and property will also reduce the social, emotional, and economic disruption associated with a natural disaster.

Developing, adopting, and implementing this hazard mitigation plan is expected to:

- ❑ ***Increase access to and awareness of funding sources for hazard mitigation projects.*** Certain funding sources, such as the Pre-Disaster Mitigation Competitive Grant Program and the Hazard Mitigation Grant Program, will be available if the hazard mitigation plan is in place and approved.

- ❑ ***Identify mitigation initiatives to be implemented if and when funding becomes available.*** This HMP will identify a number of mitigation recommendations, which can then be prioritized and acted upon as funding allows.
- ❑ ***Connect hazard mitigation planning to other community planning efforts.*** This HMP can be used to guide Middlebury's development through inter-departmental and inter-municipal coordination.
- ❑ ***Improve the mechanisms for pre- and post-disaster decision making efforts.*** This plan emphasizes actions that can be taken now to reduce or prevent future disaster damages. If the actions identified in this plan are implemented, damage from future hazard events can be minimized, thereby easing recovery and reducing the cost of repairs and reconstruction.
- ❑ ***Improve the ability to implement post-disaster recovery projects*** through development of a list of mitigation alternatives ready to be implemented.
- ❑ ***Enhance and preserve natural resource systems.*** Natural resources, such as wetlands and floodplains, provide protection against disasters such as floods and hurricanes. Proper planning and protection of natural resources can provide hazard mitigation at substantially reduced costs.
- ❑ ***Educate residents and policy makers about natural hazard risk and vulnerability.*** Education is an important tool to ensure that people make informed decisions that complement the Town's ability to implement and maintain mitigation strategies.
- ❑ ***Complement future Community Rating System efforts.*** Implementation of certain mitigation measures may increase a community's rating, and thus the benefits that it derives from FEMA. Middlebury does not participate in the CRS at the present time.

1.3 Identification of Hazards and Document Overview

As stated in Section 1.1, the term *hazard* refers to an extreme natural event that poses a risk to people, infrastructure, or resources. Based on a review of the Connecticut Natural Hazard Mitigation Plan and correspondence with local officials, the following have been identified as natural hazards that are most likely to affect Middlebury:

- ☐ Inland Flooding
- ☐ Hurricanes and Tropical Storms
- ☐ Summer Storms (including lightening, heavy winds, hail, downbursts, and tornadoes)
- ☐ Winter Storms and Nor'easters
- ☐ Earthquakes
- ☐ Dam Failure
- ☐ Wildfires

This document has been prepared with the understanding that a single *hazard effect* may be caused by multiple *hazard events*. For example, flooding may occur as a result of frequent heavy rains, a hurricane, or a winter storm. Thus, Appended Tables 1 and 2 provide summaries of the hazard events and hazard effects that impact Middlebury, and include criteria for characterizing the locations impacted by the hazard, the frequency of occurrence of the hazards, and the magnitude or severity of the hazards.

Despite the causes, the effects of several hazards are persistent and demand high expenditures from the Town. In order to better identify current vulnerabilities and potential mitigation strategies associated with other hazards, each hazard has been individually discussed in a separate chapter.

This document begins with a general discussion of Middlebury's community profile, including the physical setting, demographics, development trends, governmental structure, and sheltering capacity. Next, each chapter of this Plan is broken down into six

or seven different parts. These are *Setting*; *Hazard Assessment*; *Historic Record*; *Existing Programs, Policies, and Mitigation Measures*; *Vulnerabilities and Risk Assessment*; and *Potential Mitigation Measures, Strategies, and Alternatives*, and if necessary, *a Summary of Recommendations*. These are described below.

- ❑ ***Setting*** addresses the general areas that are at risk from the hazard. General land uses are identified.
- ❑ ***Hazard Assessment*** describes the specifics of a given hazard, including general characteristics, and associated effects. Also defined are associated return intervals, probability and risk, and relative magnitude.
- ❑ ***Historic Record*** is a discussion of past occurrences of the hazard, and associated damages when available.
- ❑ ***Existing Programs, Policies, and Mitigation Measures*** gives an overview of the measures that the Town of Middlebury is currently undertaking to mitigate the given hazard. These may take the form of ordinances and codes, structural measures such as dams, or public outreach initiatives.
- ❑ ***Vulnerabilities and Risk Assessment*** focuses on the specific areas at risk to the hazard. Specific land uses in the given areas are identified. Critical buildings and infrastructure that would be affected by the hazard are identified.
- ❑ ***Potential Mitigation Measures, Strategies, and Alternatives*** identifies mitigation alternatives, including those that may be the least cost effective or inappropriate for Middlebury.

- ❑ ***Summary of Recommended Mitigation Measures, Strategies, and Alternatives***
provides a summary of the recommended courses of action for Middlebury that are included in the STAPLEE analysis described below.

This document concludes with a strategy for implementation of the Hazard Management Plan, including a schedule, a program for monitoring and updating the Plan, and a discussion of technical and financial resources.

1.4 Discussion of STAPLEE Ranking Method

To prioritize recommended mitigation measures, it is necessary to determine how effective each measure will be in reducing or preventing damage. A set of criteria commonly used by public administration officials and planners was applied to each proposed strategy. The method, called STAPLEE, stands for the "Social, Technical, Administrative, Political, Legal, Economic and Environmental" criteria for making planning decisions. The following questions were asked about the proposed mitigation strategies:

- ❑ **Social:** Is the proposed strategy socially acceptable to Middlebury? Is there equity issues involved that would mean that one segment of the Town could be treated unfairly?
- ❑ **Technical:** Will the proposed strategy work? Will it create more problems than it will solve?
- ❑ **Administrative:** Can Middlebury implement the strategy? Is there someone to coordinate and lead the effort?
- ❑ **Political:** Is the strategy politically acceptable? Is there public support both to implement and maintain the project?
- ❑ **Legal:** Is Middlebury authorized to implement the proposed strategy? Is there a clear legal basis or precedent for this activity?

- ❑ **Economic:** What are the costs and benefits of this strategy? Does the cost seem reasonable for the size of the problem and the likely benefits?
- ❑ **Environmental:** How will the strategy impact the environment? Will the strategy need environmental regulatory approvals?

Each proposed mitigation strategy presented in this plan was evaluated and assigned a score (Good = 3, Average = 2, Poor = 1) based on the above criteria. An evaluation matrix with the total scores from each strategy can be found in Appendix A. After each strategy is evaluated using the STAPLEE method, it is possible to prioritize the strategies according to the final score. The highest scoring is determined to be of more importance, economically, socially, environmentally and politically and, hence, prioritized over those with lower scoring.

1.5 Documentation of the Planning Process

The Town of Middlebury is a member of the Council of Governments of the Central Naugatuck Valley (COGCNV), the responsible regional planning body for Middlebury and twelve other member municipalities: Beacon Falls, Bethlehem, Cheshire, Naugatuck, Oxford, Prospect, Southbury, Thomaston, Waterbury, Watertown, Wolcott, and Woodbury. The municipalities of Cheshire, Oxford, Prospect, Waterbury, Watertown, Wolcott and Woodbury have existing mitigation plans, and hazard mitigation plans are being concurrently developed for the remaining municipalities.

Ms. Virginia Mason of the COGCNV coordinated the development of this Hazard Mitigation Plan. The COGCNV applied for the grant from FEMA through the Connecticut Department of Environmental Protection (DEP). The adoption of this plan in the Town of Middlebury will also be coordinated by the COGCNV.

The following individuals from the Town of Middlebury provided information, data, studies, reports, and observations; and were involved in the development of the Plan:

- ❑ Mr. Thomas P. Gormley, First Selectman
- ❑ Ms. Claudia Tata, Office of the First Selectman
- ❑ Ms. Jean Donegan, Planning and Zoning Commission
- ❑ Mr. Dan Norton, Department of Public Works Director
- ❑ Mr. Kenneth Long, Department of Public Works
- ❑ Mr. Paul Perrotti, Volunteer Fire Department Chief & Emergency Management
- ❑ Mr. Rich Giusti, Chief of Police
- ❑ Mr. Raymond Sullivan, MD, Health Director
- ❑ Mr. Robert Desmarais, Board of Selectmen
- ❑ Mr. James Roy, Police Department
- ❑ Mr. Jonathan Vaughan, Volunteer Fire Department
- ❑ Ms. Kim Connors, Volunteer Fire Department

An extensive data collection, evaluation, and outreach program was undertaken to compile information about existing hazards and mitigation in the Town, as well as to identify areas that should be prioritized for hazard mitigation. The following is a list of meetings that were held to develop this Hazard Mitigation Plan:

- ❑ ***Field inspections were performed on February 13, 2008.*** Observations were made by the project team of numerous flooding areas and other problem areas within the Town.
- ❑ ***A project kick-off meeting with Town officials was held February 20, 2008.*** Necessary documentation was collected, and problem areas within the Town were discussed.
- ❑ ***A second project meeting with Town officials was held March 3, 2008.*** Additional problem areas were discussed with the Director of the Department of Public Works.

- ❑ *A public information meeting was held April 7, 2008 at 6:30 PM.* Preliminary findings were presented and public comments solicited.
- ❑ *A third project meeting was held April 24, 2008.* Additional problem areas were discussed with members of the Local Emergency Planning Commission (LEPC) and residents.

Residents were invited to attend the public meeting via newspaper positing. The Middlebury public meeting was relatively well-attended. At least seven residents of Middlebury attended the meeting and provided feedback of their concerns. Similarly, eight municipal agencies and civic organizations were invited via a mailed copy of the press release that announced the public information meeting. These include the following:

- ❑ Tribury Chamber of Commerce (serving the Town of Middlebury)
- ❑ United Way of Greater Waterbury
- ❑ American Red Cross Waterbury Area
- ❑ Economic Development Commission
- ❑ Middlebury Health Department
- ❑ Middlebury Land Trust
- ❑ Planning & Zoning Commission
- ❑ Department of Public Works

Refer to Appendix B for copies of the newspaper announcement and letters to the agencies and organizations listed above.

Of the above listed organizations, representatives from the Town Department of Public Works and the Town Health Department were represented at the meeting. Residents in attendance were encouraged to contact the COG with any comments that should arise subsequent to the meeting.

It is important to note that COGCNV manages the Central Naugatuck Valley Emergency Planning Committee. This committee has begun coordinating emergency services in the region. Fire, Police, EMS, Red Cross, emergency management directors, and other departments participate in these efforts. In June 2004, over 120 responders participated in the region's first tabletop exercise on biological terrorism. Area health directors, hospitals, and other health care professionals also meet monthly with the Health and Medical Subcommittee to share information, protocols, and training. Thus, local knowledge and experience gained through the Emergency Planning Committee activities has been transferred by the COGCNV to the pre-disaster mitigation planning process.

Additional opportunities for the public to review the Plan will be implemented in advance of the public hearing to adopt this plan, tentatively scheduled for March 2009, contingent on receiving conditional approval from FEMA. The draft that is sent for FEMA review will be posted on the Town website (<http://www.middlebury-ct.gov/>) and the COGCNV website (<http://www.cogcnv.org/>) to provide opportunities for public review and comment. Such comments will be incorporated into the final draft when applicable. Upon receiving conditional approval from FEMA, the public hearing will be scheduled, at which time any remaining comments can be addressed. Notification of the opportunity to review the Plan on the above websites and the announcement of the public information meeting will be posted on the websites and placed in local newspapers.

If any final plan modifications result from the comment period leading up to and including the public hearing to adopt the plan, these will be submitted to FEMA as page revisions with a cover letter explaining the changes. It is not anticipated that any major modifications will occur at this phase of the project.

Appendix B contains copies of meeting minutes, field notes and observations, the public information meeting presentation, and other records that document the development of this Pre-Disaster Hazard Mitigation Plan.

2.0 COMMUNITY PROFILE

2.1 Physical Setting

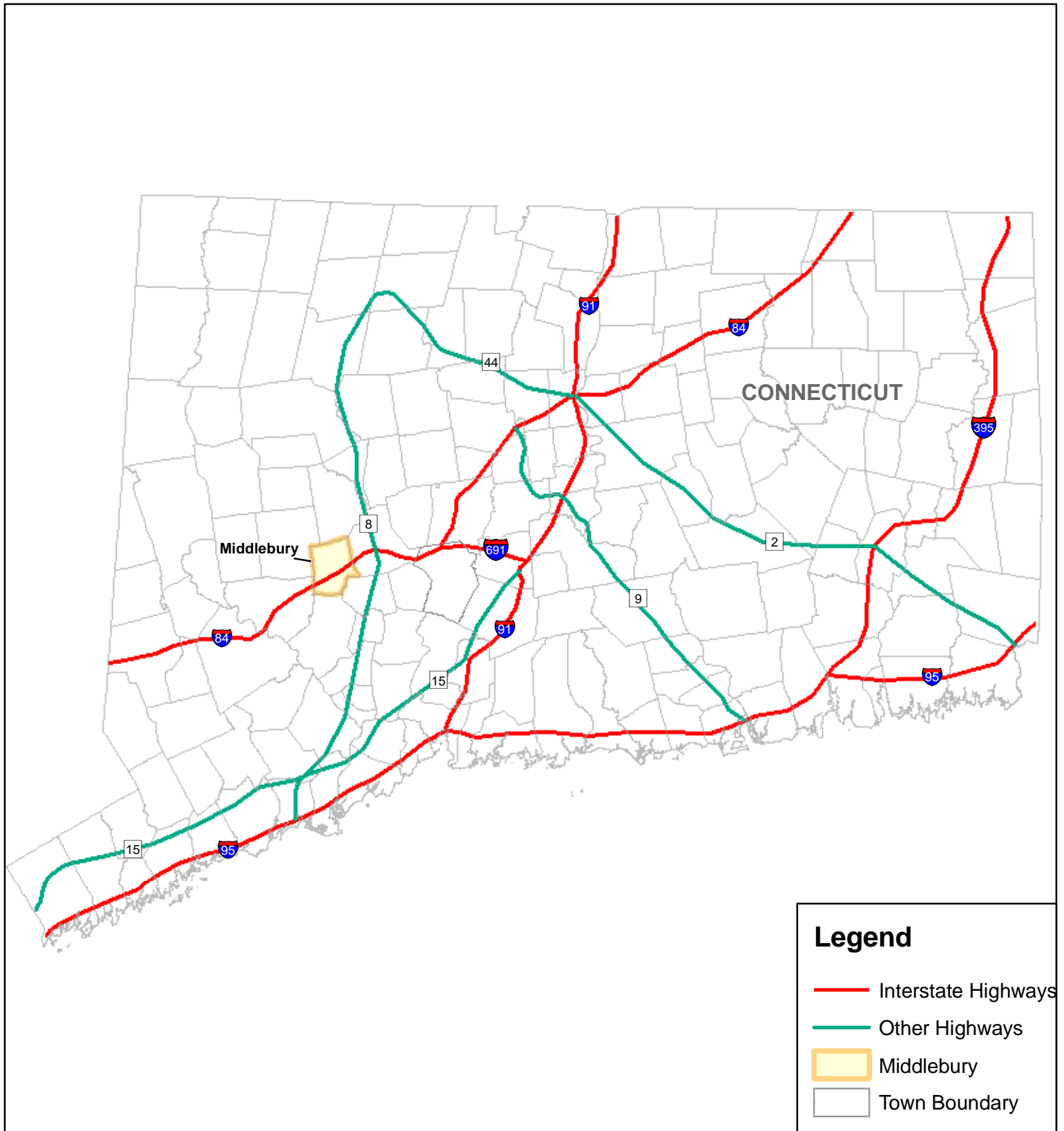
The Town of Middlebury is located in northern New Haven County at the intersection of Routes 64 and 188. It is bordered by the Town of Watertown to the north, The Town of Woodbury to the north and west, the Town of Southbury to the west, the Town of Oxford to the south, the Borough of Naugatuck to the east and south, and the City of Waterbury to the east. Refer to Figure 2-1 for a location map and Figure 2-2 for a region map.

Almost the entire east and northeastern section of Middlebury lies within the Hop Brook watershed, while some areas of Town are in the Steele Brook, Nonnewaug River, Eightmile Brook, Little River, and Long Meadow Pond Brook watersheds. Hop Brook, the Town's major watercourse, runs north-south before entering Hop Brook Lake and leaving Middlebury through the town of Waterbury and the Borough of Naugatuck.

Lake Quassapaug lies in the northwest section of Town. This section of Middlebury features many hills with steep relief near and extending into the southeastern portion of the Town of Woodbury. Eightmile Brook extends southward from Lake Quassapaug and follows the border between Middlebury and the Towns of Woodbury and Southbury. Long Meadow Pond is orientated northwest-southeast and extends into the Town of Oxford from Middlebury's southern town boundary.

The Town is comprised of suburban neighborhoods, rural country areas, and historic districts. Middlebury is also home to convalescent homes, a home for the blind, many day care centers, and a handicap assistantship home.

Figure 2-1: Middlebury Location Map



Source: "Roads", c1984 - 2008 Tele Atlas, Rel. 04/08.

"Town Boundary", DEP

For general planning purposes only. Delineations may not be exact.
June 2008

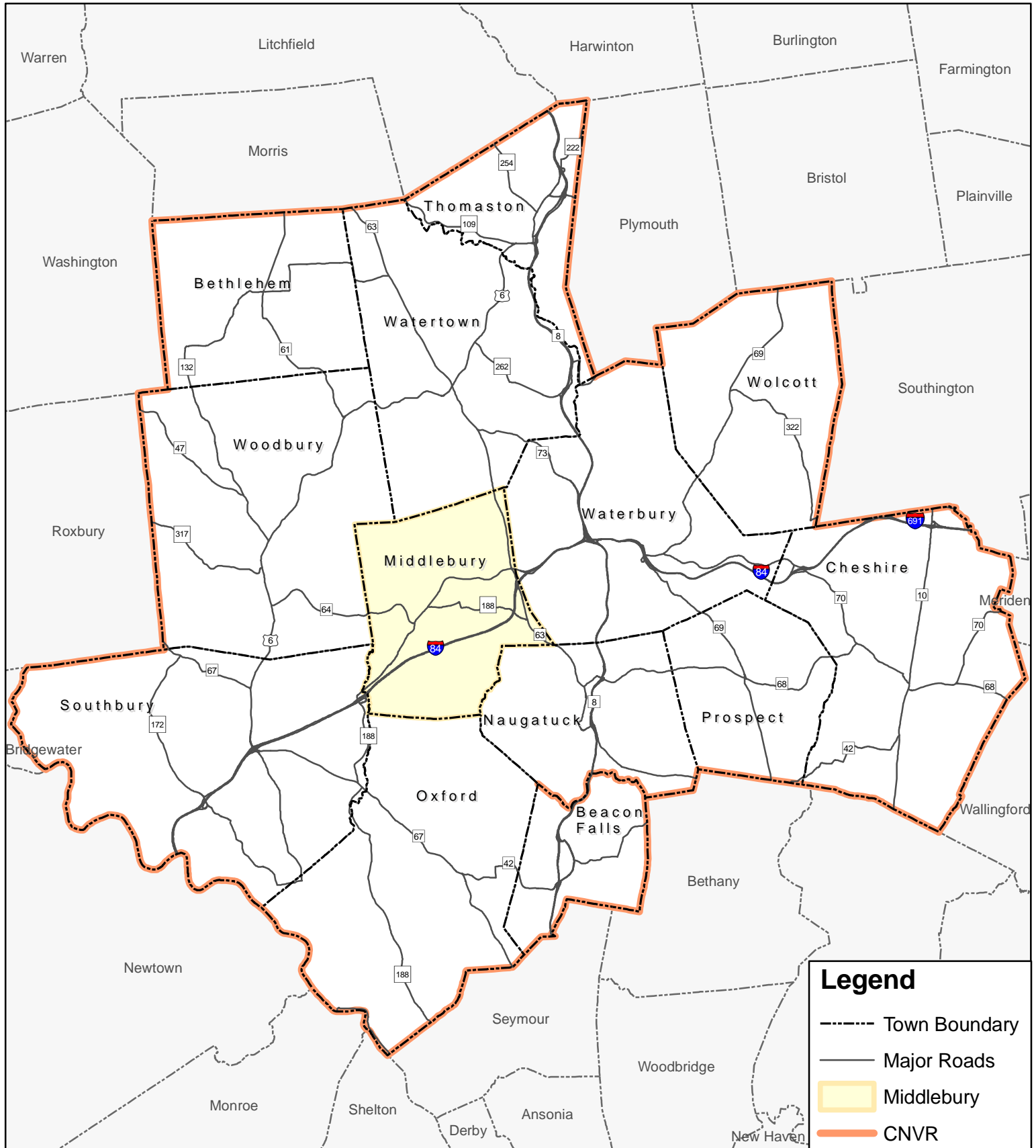


0 10 20 Miles



COUNCIL OF GOVERNMENTS
CENTRAL NAUGATUCK VALLEY

Figure 2-2: Middlebury in the CNVR



Source: "Roads", c1984 - 2008 Tele Atlas, Rel. 04/08.

"Town Boundary", DEP

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September 2008



0 2 4 Miles



COUNCIL OF GOVERNMENTS
CENTRAL NAUGATUCK VALLEY

2.2 Existing Land Use

Middlebury is characterized by hills and poor soils for septic systems, which together limit large-scale development in much of the Town. A limited commercial district is located in the center of town along Middlebury Road (Route 64). A concentration of municipal facilities is located southwest of the commercial district opposite Westover School. Outside of this town center, low density residential neighborhoods are interspersed with agricultural areas. An industrial area is located in the southwestern part of the town. The headquarters of Timex Corporation and Chemtura Corporation are located in Middlebury.

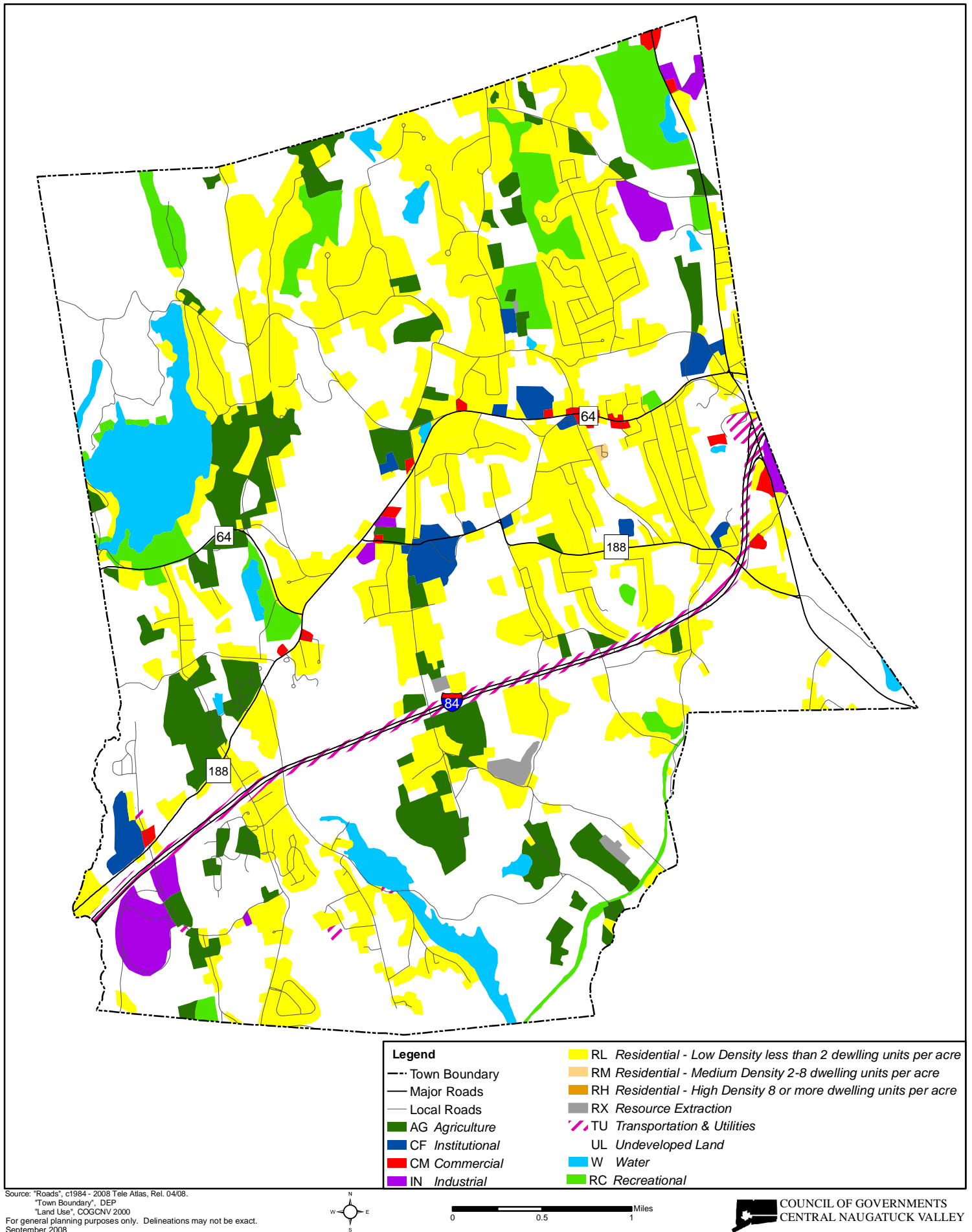
The Town of Middlebury encompasses 18.4 square miles. Table 2-1 provides a summary of land use in Middlebury by area. Refer to Figure 2-3 for a map of generalized land use provided by the COGCNV.

Table 2-1
2000 Land Use by Area

Land Use	Area (acres)	Percent
Single Family Residential	2,562	21.7%
Multi-Family Residential	6	0.1%
Office	339	2.9%
Retail	23	0.2%
Professional Office/Service	18	0.2%
General Business	47	0.4%
Industrial	43	0.4%
Utilities	40	0.3%
Private and Quasi-Public Institutional	593	5.0%
Public Institutional	125	1.1%
Public Parks	45	0.4%
Private Open Space	655	5.5%
Private Recreation	307	2.6%
Vacant	6,973	59.2%
Total	11,776	100%

Source: Town of Middlebury Plan of Conservation and Development, 2001

Figure 2-3: Middlebury Generalized Land Use



2.3 Geology

Geology is important to the occurrence and relative effects of natural hazards such as earthquakes. Thus, it is important to understand the geologic setting and variation of bedrock and surficial formations in Middlebury. The following discussion highlights Middlebury's geology at several scales.

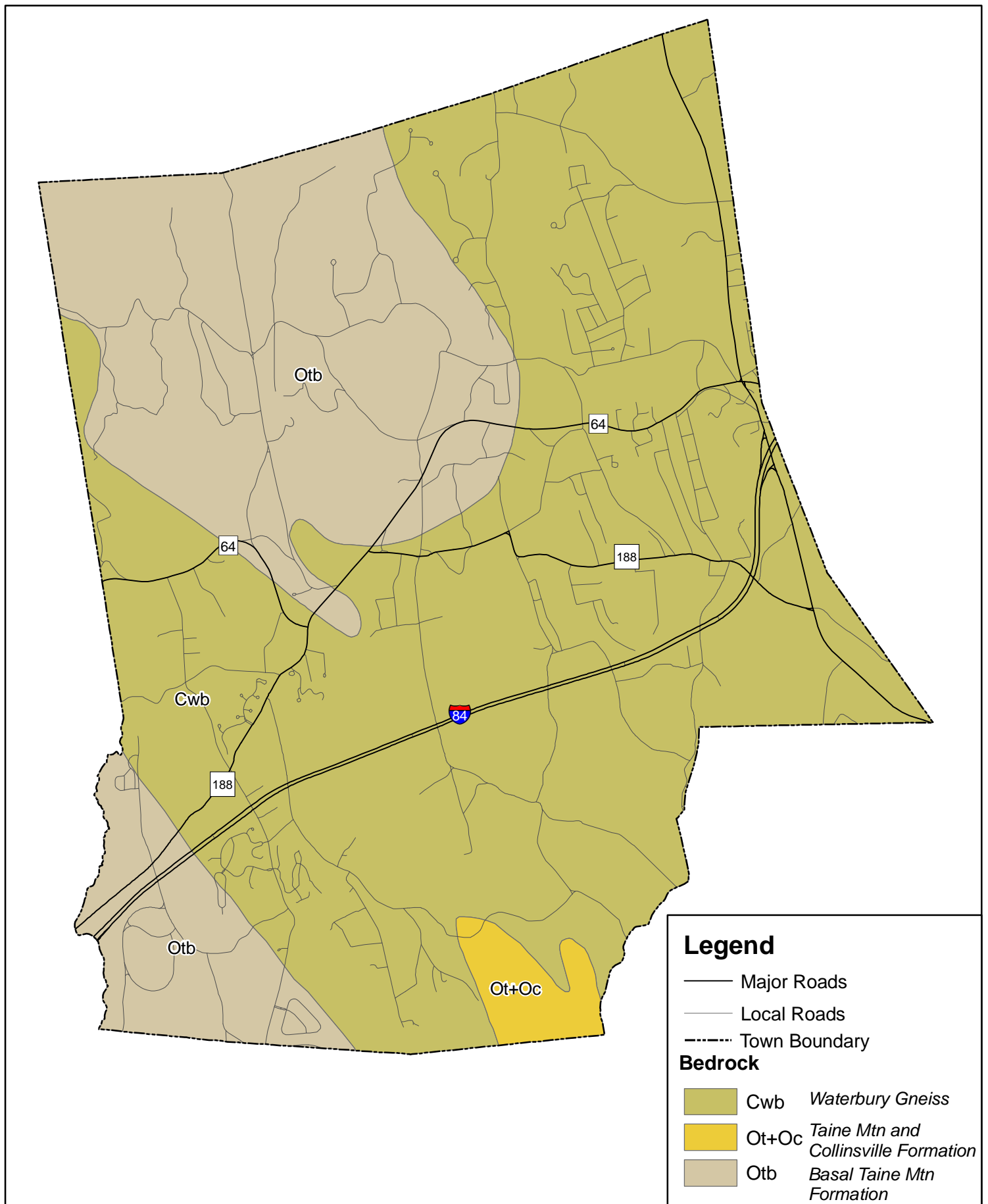
In terms of North American bedrock geology, the Town of Middlebury is comprised of three different bedrock geological formations. The Waterbury gneiss formation, the formation covering the largest area of Middlebury, is found throughout the central, eastern and northeastern sections of town. The basal member of the Taine Formation around the Waterbury dome is the second largest geologic formation and is found in the northwest and southwest sections of Town. The formation covering the smallest area in Town is the Taine Mountain/Collinsville formation in the extreme southeastern corner of Middlebury. Refer to Figure 2-4 for a depiction of the bedrock geology in the Town of Middlebury.

The bedrock beneath the Town of Middlebury is part of two terranes. The terranes include the Iapetos (oceanic) terrane/Connecticut valley synclinorium and the Proto-North American (continental)/Tactonic Allochthons (displaced Iapetos terrane). The latter is part of the above mentioned basal member of the Taine Mountain formation around the Waterbury dome. The former terrane is found within the two remaining formations mentioned in the above paragraph.

Bedrock Geology

Connecticut bedrock geology is comprised of several "terranes." Terranes are geologic regions that reflect the role of plate tectonics in Connecticut's natural history.

Figure 2-4: Middlebury Bedrock Geology



Source: "Roads", c1984 - 2008 Tele Atlas, Rel. 04/08.
 "Town Boundary", "Bedrock", DEP

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 September 2008



0 0.5 1 Miles



COUNCIL OF GOVERNMENTS
 CENTRAL NAUGATUCK VALLEY

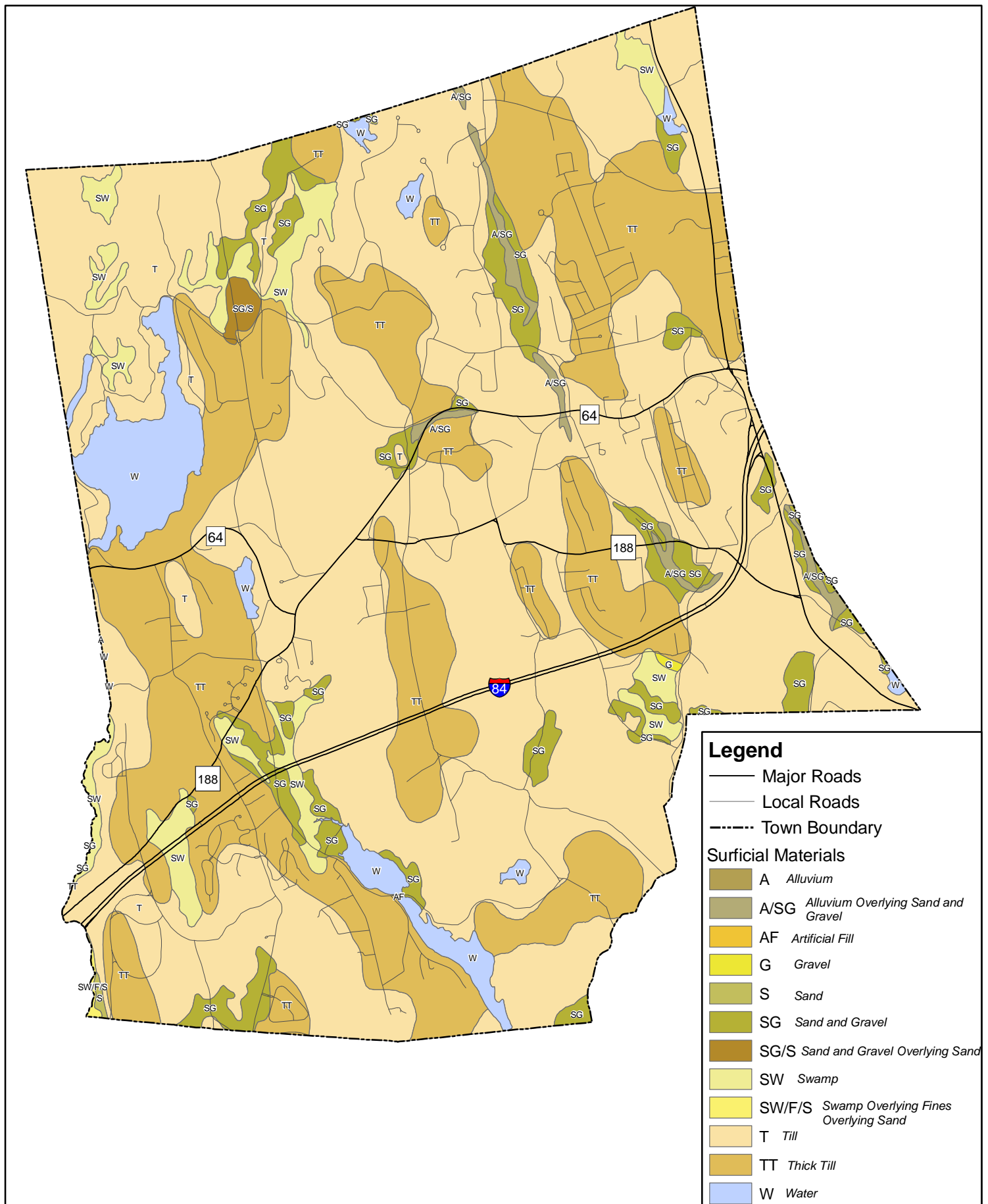
At least twice in the late Pleistocene, continental ice sheets moved across Connecticut. As a result, surficial geology of the Town is characteristic of the depositional environments that occurred during glacial and postglacial periods. Refer to Figure 2-5 for a depiction of surficial geology.

Almost the entire Town is covered by glacial till. Tills contain an unsorted mixture of clay, silt, sand, gravel, and boulders deposited by glaciers as a ground moraine. A smaller percentage of the Town consists primarily of stratified sand and gravel ("stratified drift") areas associated with watercourses. These deposits accumulated by glacial meltwater streams during the outwash period following the latest glacial recession. Stratified drift deposits are aligned along Hop Brook, Long Meadow Brook, and Shattuck Brook.

The amount of stratified drift present in the Town is important for two reasons:

- ❑ With regard to flooding, areas of stratified materials are generally coincident with floodplains. This is because these materials were deposited at lower elevations by glacial streams and these valleys later were inherited by the larger of our present-day streams and rivers. The Hop Brook corridor is a good example.
- ❑ The amount of stratified drift also has bearing on the relative intensity of earthquakes. Earthquakes will be discussed in Sections 8.0.

Figure 2-5: Middlebury Surficial Geology



2.4 Climate

Middlebury has an agreeable climate, characterized by moderate but distinct seasons. The average mean temperature is approximately 48 degrees Fahrenheit, with summer temperatures in the mid-80s and winter temperatures in the upper 20s to mid-30s. Extreme conditions raise summer temperatures to near 100 degrees and winter temperatures to below zero. Median snowfall is approximately 43 inches per year as averaged between the weather stations in Thomaston, Litchfield, Woodbury, and Waterbury (NCDC, 2007). Median annual precipitation is 44 inches, spread evenly over the course of a year.

The continued increase in precipitation only heightens the need for hazard mitigation planning, as the occurrence of floods may change in accordance with the greater precipitation.

By comparison, average annual state-wide precipitation based on more than 100 years of record is nearly the same, at 45 inches. However, average annual precipitation in Connecticut has been increasing by 0.95 inches per decade since the end of the 19th century (Miller et. al., 2002; NCDC, 2005).

Likewise, total annual precipitation in the Town has increased over time. The continued increase in precipitation only heightens the need for hazard mitigation planning, as the occurrence of floods may change in accordance with the greater precipitation.

2.5 Drainage Basins and Hydrology

The Town of Middlebury is drained by six major watersheds corresponding to Hop Brook, Long Meadow Pond Brook, Eightmile River, the Nonnewaug River, the Little River, and Steele Brook. These are described below. About 98% of the Town's land area is drained by three basins: Hop Brook, Long Meadow Pond Brook, and Eightmile River. The entire Town eventually drains into the Housatonic River, and the great majority of it drains eastward toward the Naugatuck River before entering the Housatonic. While

Middlebury is home to many lakes and ponds, its largest body of water is the 271-acre Lake Quassapaug.

Table 2-2
Drainage Basins

Drainage Basin	Area (sq. mi)	Percent of Town
Hop Brook	10.32	56.03%
Long Meadow Pond Brook	4.10	22.26%
Eightmile River	3.60	19.55%
Nonnewaug River	0.29	1.57%
Little River	0.10	0.54%
Steele Brook	0.01	0.05%
Total	18.42	100.0

Source: Drainage Basins, 2008 CT DEP GIS Data for Connecticut

Hop Brook

Hop Brook has by far the largest drainage basin in the Town of Middlebury, covering 10.32 square miles or 56% of the Town's land area. It originates in the northwestern part of Town, briefly flows to the northeast through the Town of Watertown, and continues to the southeast through the Middlebury before leading into the Naugatuck River in the Borough of Naugatuck.

In addition to a number of unnamed tributaries, there are several smaller named tributaries that flow into the Hop Brook watercourse during this stretch, including Goat Brook, Long Swamp Brook, and Welton Brook in the Town of Middlebury, and Pigeon Brook in the Borough of Naugatuck. The largest body of water that Hop Brook passes through is Hop Brook Lake, a flood control reservoir located on the border between Waterbury and Middlebury, just to the north of the Borough of Naugatuck. The Hop Brook drainage basin has a total area of 17.40 square miles of land located within the Towns of Naugatuck, Waterbury, Middlebury, Watertown and Woodbury.

Long Meadow Pond Brook

The Long Meadow Pond Brook drainage basin is the second-largest in the Town of Middlebury. The drainage basin covers 4.10 square miles of the Town or 22.3% of its total land area.

The headwaters of Long Meadow Pond Brook are located in Lake Elise in the western section of Middlebury. Originating at the lake, Long Meadow Pond Brook flows southward into Long Meadow Pond, a body of water with a surface area of approximately 100 acres. The Brook continues to meander eastward into the Town of Naugatuck, picking up a number of unnamed tributaries before entering the Naugatuck River. In total, the Long Meadow Pond Brook Watershed drains 8.47 square miles of land within the Towns of Naugatuck, Middlebury and Oxford.

Eightmile River

Eightmile River is the third-largest drainage basin in the Town of Middlebury. The drainage basin covers 3.60 square miles, or 19.5% of the Town's total land area.

The watercourse's headwaters are located in the 271-acre Lake Quassapaug located in the western section of Middlebury. South of Lake Quassapaug, Eightmile River enters Kelley Pond. Beginning just to the south of Kelley Pond, Eightmile River comprises the border with the Town of Southbury. Several tributaries that are located within the Town of Southbury enter Eightmile River during this stretch. An unnamed tributary enters the Brook in a wetland along Judd Road. Another unnamed tributary enters the Brook to the south near its crossing with Interstate 84. Walnut Hill Brook meets Eightmile River just upstream of Route 67. One final watercourse, Jeremy Brook, enters Eightmile River from the Southbury side where the section of the Brook comprises the Town of Southbury's eastern border.

After leaving Southbury and entering the Town of Oxford, Eightmile River is joined by a number of watercourses, including Sevenmile Brook, Sixmile Brook, and several unnamed tributaries, before its confluence with the Housatonic River in the Town of Oxford. In all, the Eightmile River basin drains 17.44 square miles across the Towns of Oxford, Southbury, Middlebury, and Woodbury.

Nonnewaug River

A very small 0.29 square mile section of land, or 1.6% of the total land area in the northwestern corner of the Town of Middlebury, is within the Nonnewaug River drainage basin. The Nonnewaug River flows from the Town of Bethlehem into the Town of Woodbury. After passing underneath Route 47 in Woodbury, the Nonnewaug River converges with the Weekepeemee River, forming the Pomperaug River and entering a new subregional drainage basin. In all, Nonnewaug River drainage basin drains 21.26 square miles of land in the Towns of Bethlehem, Watertown, Woodbury, and Middlebury.

Little River

The Little River drainage basin drains 0.10 square miles, or 0.5% of the Town of Middlebury on its southernmost border adjacent to the Town of Oxford. It originates in the western portion of the Town of Oxford and flows to the southeast. In all, the Little River watershed drains 15.50 square miles of land in the Towns of Seymour, Beacon Falls, Oxford, Middlebury and Naugatuck.

Steele Brook

A 0.01 square mile portion of the Town of Middlebury, or 0.05% of the Town's land area, flows into the Steele Brook drainage basin. The Steele Brook watercourse's headwaters are located in a small, unnamed pond along Route 63 in the Town of Watertown. It flows

to the southeast and is joined by a number of tributaries before eventually converging with the Naugatuck River in the City of Waterbury near the junction of Routes 8 and 73. The Steele Brook drainage basin covers 17.04 square miles in total in the Towns of Waterbury, Watertown, and Middlebury.

2.6 **Population and Demographic Setting**

The total CNV Region estimated 2005 population is 281,895 persons. The total land area is 309 square miles, for a regional population density of 912 persons per square mile. Middlebury has a population density of 402 individuals per square mile. By comparison, Waterbury has the highest population density in the region with 3,757 individuals per square mile; Bethlehem has the lowest population density in the region with 185 individuals per square mile (Table 2-3).

Table 2-3
Population Density by Municipality, Region and State, 2005

Municipality	Total Population	Land Area (square miles)	Population Density
Beacon Falls	5,700	9.77	583
Bethlehem	3,577	19.36	185
Cheshire	28,833	32.90	876
Middlebury	7,132	17.75	402
Naugatuck	31,872	16.39	1,945
Oxford	12,309	32.88	374
Prospect	9,264	14.32	647
Southbury	19,686	39.05	504
Thomaston	7,916	12.01	659
Waterbury	107,251	28.55	3,757
Watertown	22,329	29.15	766
Wolcott	16,269	20.43	796
Woodbury	9,757	36.46	268
CNV Region	281,895	309.02	912
Connecticut	3,495,753	4844.80	722

Source: United States Census Bureau, 2005 Population Estimates

Middlebury is 117th out of 169 municipalities in Connecticut in terms of population, with an estimated population of 7,132 in 2006. The town is the 91st most densely populated municipality in the state. The population of Middlebury increased 16% between 1960 and 1970, but growth slowed to 8% between 1970 and 1980, 3% between 1980 and 1990, and 5% between 1990 and 2000.

Growth from 2000-2006 was 11%. Based on analysis by the Council of Governments of the Central Naugatuck Valley, population growth in the region outside of Waterbury is estimated to be about 10% from 2005 to 2025, while the state of Connecticut is expected to grow about 5% during this same timeframe. According the Connecticut Economic Resource Center, the median sales price of owner-occupied housing in the Town of Middlebury in 2006 was \$330,000, which is higher than the statewide median sales price of \$275,000.

Middlebury has moderate populations of people who are elderly, small numbers of people that are linguistically isolated, and a moderate disabled population. These are depicted by census block on Figures 2-6, 2-7, and 2-8. The populations with these characteristics have numerous implications for hazard mitigation, as they may require special assistance or different means of notification before disasters occur. These will be addressed as needed in subsequent sections.

2.7 Governmental Structure

The Town of Middlebury is governed by a Selectman-Town Meeting form of government in which legislative responsibilities are shared by the Board of Selectmen and the Town Meeting. The First Selectman serves as the chief executive.

Figure 2-6: Middlebury Elderly Population

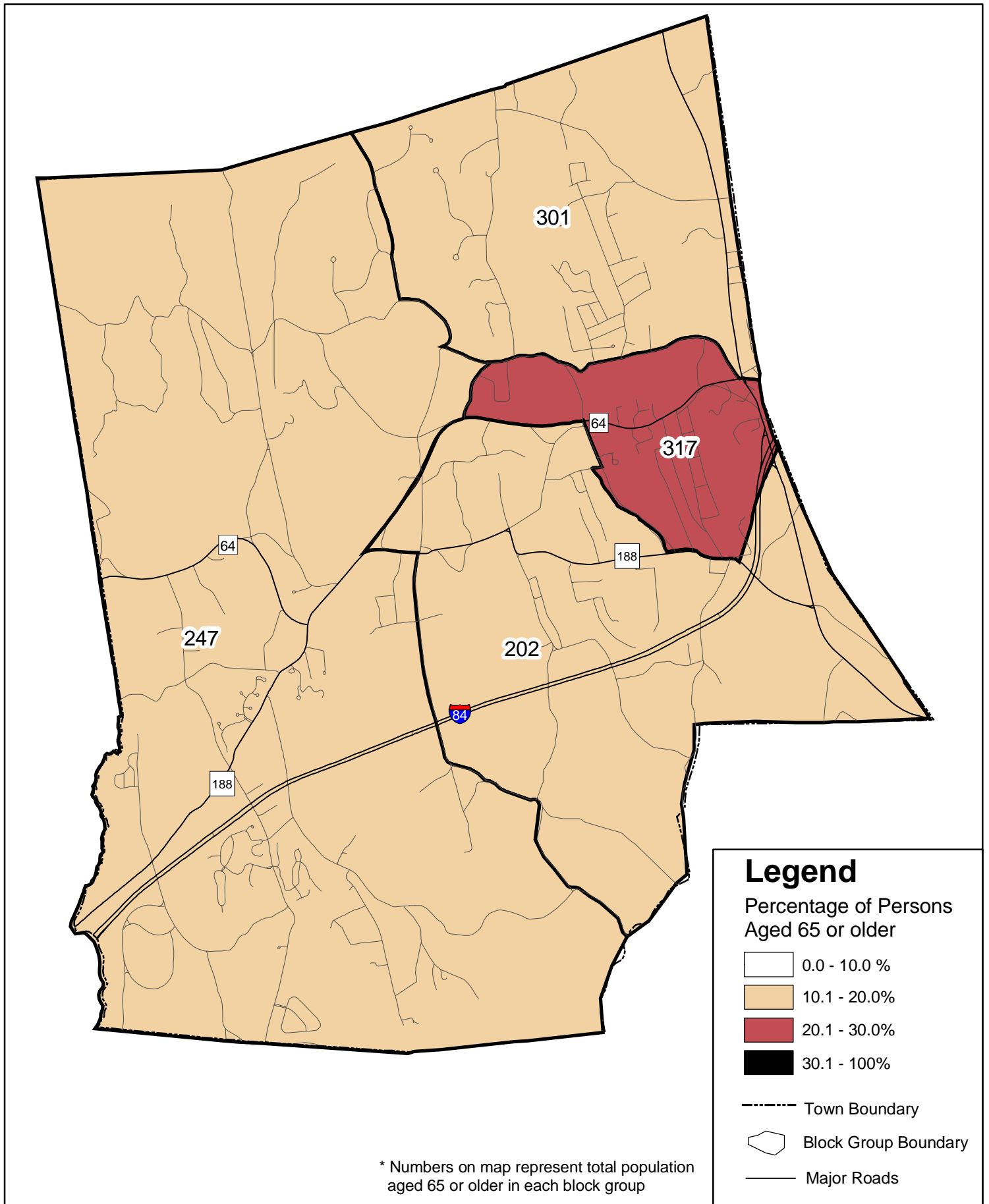
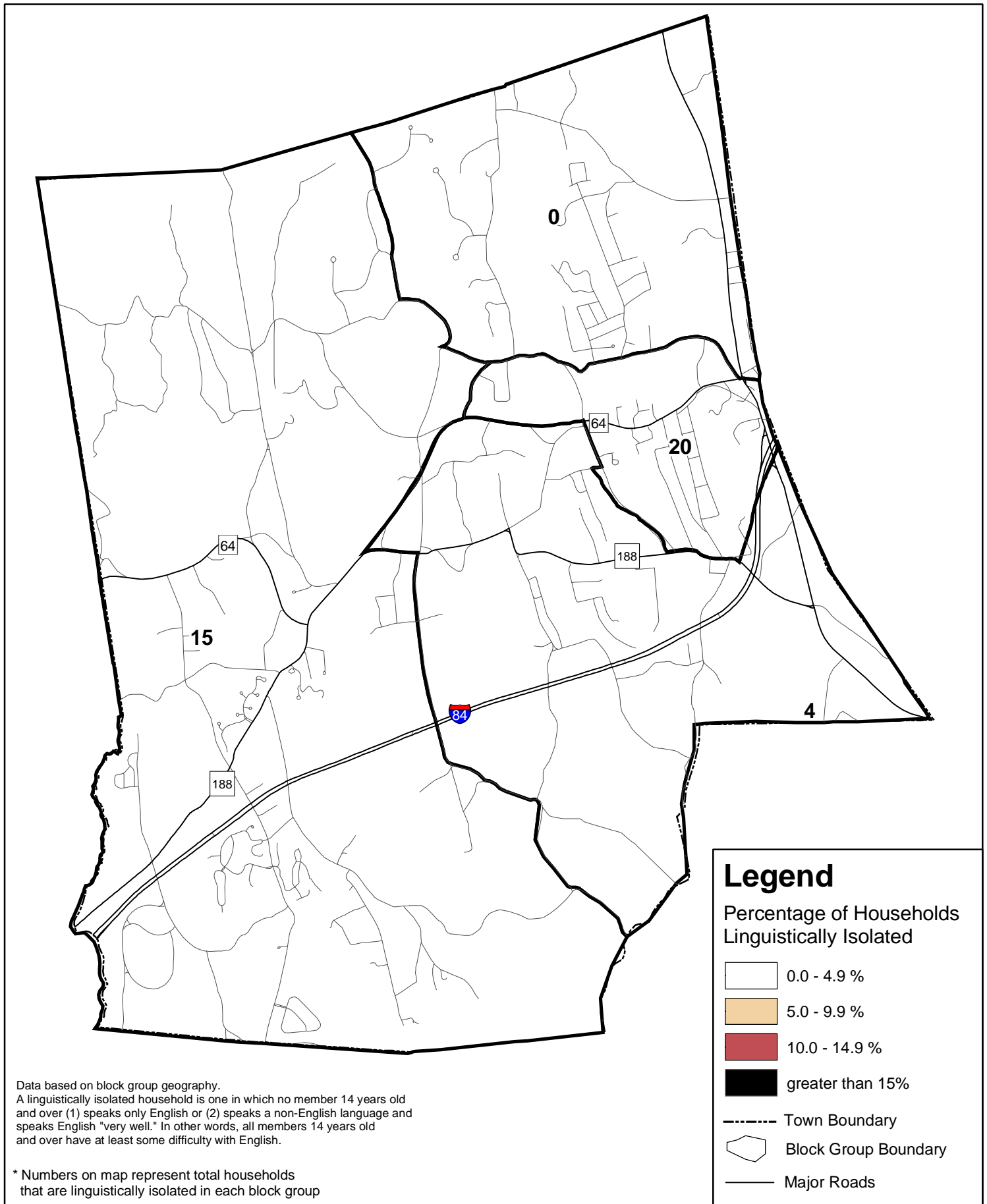


Figure 2-7: Middlebury Linguistically Isolated Households

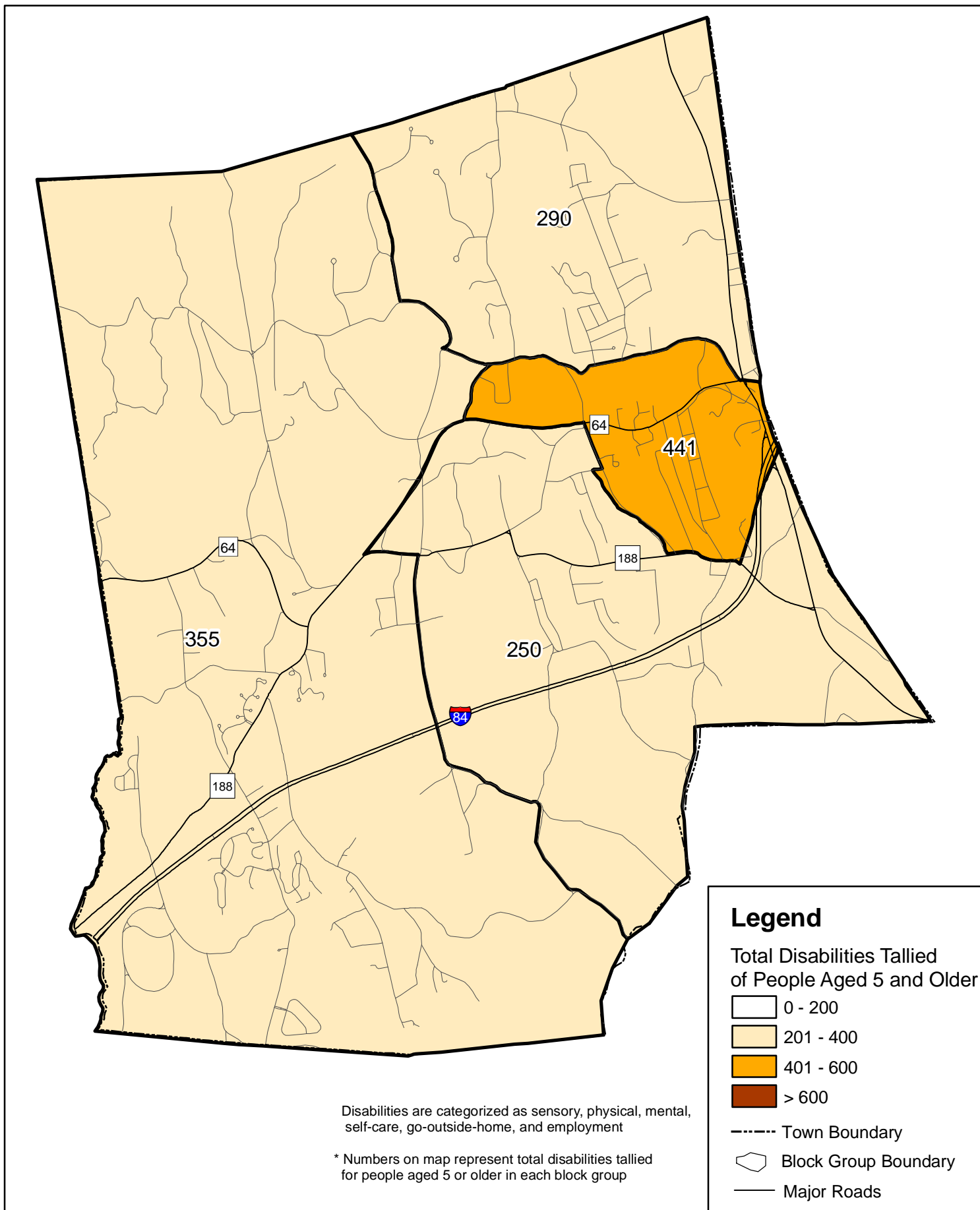


Data based on block group geography.
A linguistically isolated household is one in which no member 14 years old and over (1) speaks only English or (2) speaks a non-English language and speaks English "very well." In other words, all members 14 years old and over have at least some difficulty with English.

* Numbers on map represent total households that are linguistically isolated in each block group



Figure 2-8: Middlebury Disabilities Map



In addition to Board of Selectmen and the Town Meeting, there are boards, commissions and committees providing input and direction to town administrators. Also, town departments provide municipal services and day-to-day administration. Many of these commissions and departments play a role in hazard mitigation, including the Planning & Zoning Commission, the Conservation Commission, the Economic & Industrial Development Commission, the Land Preservation Commission, the Building Department, the Fire Commission, the Police Commission, the Public Works Committee, the Fire Department, the Police Department and the Highway Department.

The Department of Public Works is the principal municipal department that responds to problems caused by natural hazards. Complaints related to Town maintenance issues are routed to the Department of Public Works. These complaints are usually received via phone, fax, mail, or email and are recorded in a book. The complaints are investigated as necessary until remediation surrounding the individual complaint is concluded.

2.8 Development Trends

Middlebury was settled in 1702 and experienced a significant increase in population following the Revolutionary War. The Town was officially incorporated in 1807 and was comprised of parts of Southbury, Waterbury, and Woodbury. The Town's origins were largely agrarian with dairy farming serving as a fundamental component of the local economy even into the 20th century. Due to the hilly topography and lack of a source of hydropower, Middlebury did not become industrialized like many other towns in the region. Light industry present in the 1800s included wool and silk production.

In the late 1990s, the average number of housing units approved in Middlebury was about 42 per year. Based on the town's 2001 Plan of Conservation and Development, efforts are being made to preserve Middlebury's rural character and limit the impact of future development through land dedication, acquisition, and conservation programs.

Nevertheless, subdivisions and developments are proposed each year. Recent planned developments include:

- ❑ New houses are proposed off Park Road in the northern part of town. This area is west of a steep grade and reportedly experiences poor infiltration and nuisance flooding.
- ❑ A small development is planned near the intersection of Route 188 and Long Meadow Road. The number of homes is undetermined.
- ❑ A 50 home development is under construction off Benson Road.
- ❑ Another 50-home development, Avalon Homes, is in construction on Route 188 near the north end of Long Meadow Road.
- ❑ 28 to 30 homes are planned off Washington Drive in the southern part of Town.

Large residential developments are infrequent, although some sizeable developments have been completed or are underway:

- ❑ A 126-unit development on Christian Road near Southford Road was completed recently.
- ❑ A large cluster-type development of 326 units known as Ridgewood has been under construction for several years near the center of town; build-out through five phases is anticipated in the next few years.
- ❑ Another development of 135 homes has been approved for the area of Longmeadow Road near Washington Drive.
- ❑ A housing development of up to 250 homes is planned between Three Mile Hill Road and Route 63.
- ❑ A 250-300 unit condominium development was planned between Porter Avenue and Regan Road, near the floodplain of Hop Brook, but was reportedly denied due to concerns about flooding conditions along Hop Brook.

Cul-de-sacs in new developments are discouraged and connectivity of roads is encouraged in Section 6.0 of the *Middlebury Subdivision Regulations* and Section 9.12 of the *Middlebury Road and Drainage Regulations*. Subdivisions featuring cul-de-sacs offer a single access point for emergency services, lengthening emergency response times and rendering those residential areas vulnerable if access is cut off by flooding or downed tree limbs. The Town of Middlebury requires a 50-foot right of way for local residential streets with a hammerhead located at the end of dead end streets, and the number of homes at the end of dead end streets should be kept to a minimum.

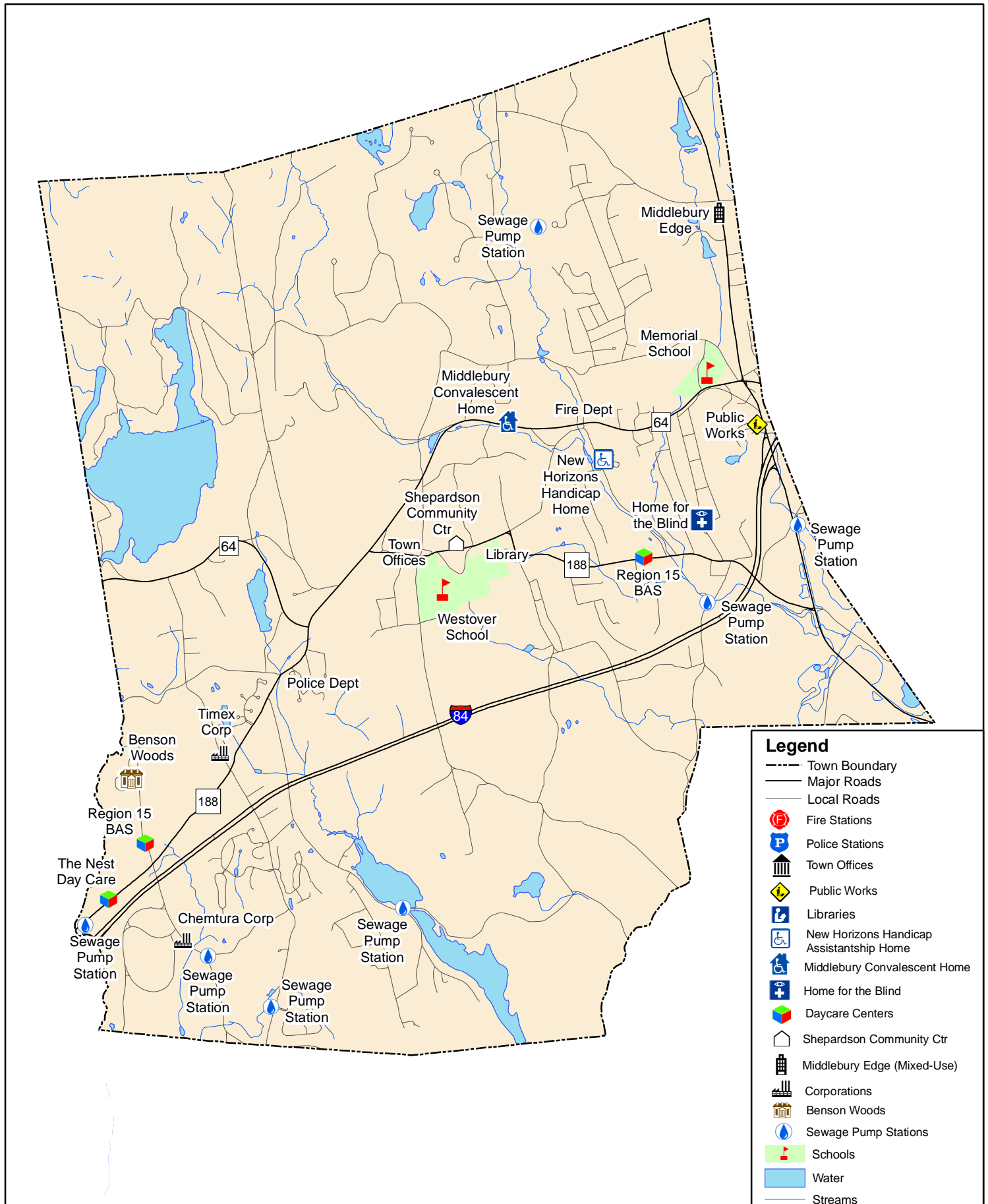
Utilities serving new developments must be installed underground wherever possible, according to Section 6.8 of the Middlebury Subdivision Regulations. Exceptions due to shallow bedrock are granted on a case-by-case basis.

2.9 Critical Facilities and Sheltering Capacity

The Town considers its emergency response, public works facilities, school facilities, municipal facilities, childcare facilities, age-restricted facilities, home for the blind facilities, handicap assistantship facilities, convalescent facilities, companies dealing with hazardous chemicals, and its sewerage utility facilities as its critical facilities. Of these critical facilities, the Middlebury Fire Department, the Middlebury Police Department, the Middlebury Public Works, the Shepardson Community Center, and the Long Meadow Elementary School are considered to be the most important as they are needed to ensure that emergencies are addressed while day-to-day management of Middlebury continues. In the event of a significant natural hazard occurring, the Westover School and the Memorial Middle School could be used as additional shelter facilities.

A map of critical facilities is shown in Figure 2-9, and the associated list of critical facilities is provided in Table 2-4. Shelters, transportation, communications, and utilities are described in more detail below the table.

Figure 2-9: Middlebury Critical Facilities



- Legend**
- Town Boundary
 - Major Roads
 - Local Roads
 - Fire Stations
 - Police Stations
 - Town Offices
 - Public Works
 - Libraries
 - New Horizons Handicap Assistantship Home
 - Middlebury Convalescent Home
 - Home for the Blind
 - Daycare Centers
 - Shepardson Community Ctr
 - Middlebury Edge (Mixed-Use)
 - Corporations
 - Benson Woods
 - Sewage Pump Stations
 - Schools
 - Water
 - Streams

Source: "Roads", c1984 - 2008 Tele Atlas, Rel. 04/08.
 "Town Boundary", "Hydrography", "Flood Zones", DEP
 "Facilities", Middlebury
 For general planning purposes only. Delineations may not be exact.
 October 2008



0 0.5 1 Miles

**Table 2-4
Critical Facilities in Middlebury**

Type	Name	Address	Located in Floodplain?
Mixed-Use Development (Childcare Facility)	Middlebury Edge	Straits Turnpike/Park Road Intersection	No
Day Care Facility	The Nest Day Care	984 Southford Road	No
Convalescent Home	Middlebury Convalescent Home	Middlebury Road	No
Handicap Assistantship Facility	New Horizons Handicap Assistantship Home	Nutmeg Road	No
Age-Restricted Housing	Benson Woods	North Benson Road	No
Home for the Blind	Home for the Blind	George Street near Yale Avenue	No
Police Department	Middlebury Police Department	Middlebury Road	No
Fire Department & Shelter	Middlebury Fire Department	65 Tucker Hill Road	Adjacent
Public Works Department	Middlebury Public Works	1 Service Road	No
Municipal & Shelter	Shepardson Community Center	1172 Whittemore Road	No
Municipal	Middlebury Town Hall Offices	1212 Whittemore Road	No
Municipal	Middlebury Public Library	65 Crest Road	No
School & Shelter	Long Meadow Elementary School	65 North Benson Road	No
School, Backup Shelter (Private)	Westover School	1237 Whittemore Road	No
School Offices	Region 15 Board of Education	286 Whittemore Road	No
School	Middlebury Elementary School	550 Whittemore Road	No
School, Backup Shelter (No Generator)	Memorial Middle School	Memorial Drive	No
Industry - Hazardous Chemicals	Timex Corporation HQ	Off of Christian Road	No
Industry - Hazardous Chemicals	Chemtura Corporation HQ	Off of Benson Road	No
Utility – Sewer	Sewage Pump Station 1	Shadduck Rd near Hop Br	Yes
Utility – Sewer	Sewage Pump Station 2	Long Meadow Road	Yes
Utility – Sewer	Sewage Pump Station 3	270 North Benson Road	Adjacent
Utility – Sewer	Sewage Pump Station 4	Southford Road	Yes
Utility – Sewer	Sewage Pump Station 5	Straits Turnpike	Adjacent
Utility – Sewer	Sewage Pump Station 6	Christian Lane – Triangle Hill Subdivision	No
Utility – Sewer	Sewage Pump Station 7	West end of Gleneagle Rd	No
Utility – Sewer	Sewage Pump Station 8	Somerset Drive	Adjacent
Utility – Sewer	Sewage Pump Station	1 Service Road	No
Utility – Sewer	Sewage Pump Station	1 Service Road	No
Utility – Water	Pumping Station	285 Kelly Road	No

Source: Council of Governments Central Naugatuck Valley and Town of Middlebury

Two of Middlebury's critical facilities are located near floodprone areas. The Fire Station on Tucker Hill Road is adjacent to the Goat Brook and Hop Brook floodplains, located to the south and east of the facility, respectively. The Department of Public Works is not located adjacent to a mapped floodplain, but its location south of Woodside Avenue and

near the unnamed stream that causes flooding in that area (refer to Section 3.5) is of concern. The Town must strive to keep these two critical facilities operational during the largest of flood events, which is precisely when they will be needed the most. In particular, the Fire Department facility risks isolation from other parts of town.

Shelters

Emergency shelters are considered to be an important subset of critical facilities, as they are needed most in emergency situations. Middlebury has three designated emergency shelters which are the Shepardson Community Center, the Middlebury Fire House, and the Long Meadow Elementary School:

- ❑ The Shepardson Community Center, located on Whittemore Road, has a generator and can accommodate a maximum of 100 people.
- ❑ The Middlebury Fire House, located on Tucker Hill Road can accommodate up to 50 people and is also equipped with a generator.
- ❑ Lastly, the Long Meadow Elementary School located on North Benson Road can accommodate a total of 100 people and is outfitted with a generator.

The Shepardson Community Center, the Middlebury Fire House, and the Long Meadow Elementary School buildings have been designated as public shelter facilities by meeting specific American Red Cross guidelines. Amenities and operating costs of the designated shelters including expenses for food, cooking equipment, emergency power services, bedding, etc., are the responsibilities of the community and generally are not paid for by the American Red Cross.

Westover School, located at 1237 Whittemore Road, houses up to 200 overnight students during the school year and can operate as a shelter if needed. However, its effectiveness as a shelter is greater during the summer than during the school year. The school's 1920s wood-frame construction makes it susceptible to rapidly-spreading fires, so the

Middlebury Fire Department is well prepared for fighting any fires that may occur at the school. The other backup shelter, the Memorial Middle School, is located on Memorial Drive. This facility does not have a generator, but can shelter up to 100 people.

In case of an extended power outage, it is anticipated that 10-20% of the population would relocate, although not all of those relocating would necessarily utilize the shelter facilities. Many communities only intend to use these facilities on a temporary basis for providing shelter until hazards such as hurricanes diminish. Regionally-located mass care facilities operated and paid for by the American Red Cross may be available during recovery operations when additional sheltering services are necessary.

Transportation

The Town of Middlebury does not have any hospitals or medical centers. Instead, residents use the nearby facilities in the City of Danbury and the City of Waterbury. As a means of accessing these facilities, the Town has convenient access on Interstate 84 West to Danbury and East to Waterbury.

Evacuation routes are regionally defined by the Regional Evacuation Plan. No local evacuation plan exists. Interstate 84 and State Routes 63, 64, and 188 are the primary evacuation routes. Secondary evacuation routes include Watertown Road and Old Watertown Road (to Watertown), Christian Road (to Oxford), and Long Meadow Road to South Street (to Naugatuck). Interstate 84, which runs east-west through the southern half of the Town, provides access to the City of Waterbury and the City of Danbury. During an evacuation-necessary emergency, Interstate 84 would presumably be the most effective means of evacuating Middlebury.

Communications

The Town of Middlebury has established the CodeRED Emergency Notification System in an effort to streamline emergency notifications to residents of the Town. The Fire Department and ambulance service currently operates on high band and they have no communication dead spots. The Police currently operate on a lower band, and it experiences some communications dead spots near the intersection of Route 64 and Route 63. There is limited cellular service in that area of Town due to topography. The Town is currently looking into an upgrade to put all emergency services on the same radio band.

The Town has also created the Emergency Management Department and, for long-term planning, the Town has a Local Emergency Preparedness Commission that meets regularly with agendas related to emergency planning.

Water Utilities

Water service is a critical component of hazard mitigation, especially in regards to fighting wildfires. It is also necessary for everyday residential, commercial, and industrial use. Water service in Middlebury is relatively recent and is currently expanding. The municipal water system on the eastern side of the Town was initiated in 1988 by the developer that constructed the Crossroads East commercial property on Route 63. Water for this initial system was provided by the City of Waterbury, which is an arrangement that continues. The water main was extended from an existing water main on Country Club Road in Waterbury. Subsequent extensions brought the main to Woodside Avenue and then the Kelly Road and Three Mile Hill area to the north.

Through grants from the State, the Town coordinated the construction of a water storage tank and expanded the system in phases to a point where, as of 2005, the system was comprised of over 10 miles of water mains serving over 200 customers with water and

fire protection. The water system is operated and maintained by the Connecticut Water Company under a long term agreement with the Town. The water serving the east section of town is supplied by the Naugatuck Division of the Connecticut Water Company.

The municipal water system on the western side of town is comprised of approximately four miles of water mains. Approximately 2.5 miles of the system is owned and operated by the Heritage Village Water Company and the remaining 1.5 miles of the system was constructed by the Town and operated and maintained by the Connecticut Water Company under an agreement with the Town. The water serving the western section of town is supplied by The Heritage Village Water Company.

In the near future, the Heritage Village Water Company system and the Connecticut Water Company's municipal system will be interconnected in the Town center, providing reliable water service and pressures suitable for firefighting to municipal buildings, including the shelter at Shepardson community center.

Wastewater Utilities

Approximately one-third of Middlebury's land area is sewerred, including the sites of major corporate and commercial developments along Routes 63, 64, and 188. Sewage is routed via ten pumping stations to a treatment facility located in the Borough of Naugatuck. The Town of Middlebury currently contributes approximately 10% of the facility's operating budget. The ten pumping stations are considered critical facilities, because the failure of any one of them could impair the ability of the Town of move sewage to Naugatuck.

Some of the sewer pumping stations are located in or adjacent to floodplains, as these stations are necessarily located at low elevations where streams are crossed. The Town

has not experienced flooding at these pumping stations, but if it were to occur, response would be appropriate to bring the stations back into working order.

Public Works Department

The Public Works Department is a critical municipal department related to hazard mitigation because it maintains, repairs, and constructs stormwater systems and roadways. The Department is responsible for maintaining stormwater systems for proper drainage and flood mitigation, as well as clearing snow and ice and maintaining access for emergency vehicles.

Likewise, the Public Works Department believes that establishment of working inter-municipal agreements with other public works departments in nearby communities would allow for sharing of resources when disasters affect one community more than others. This Plan therefore recommends that these types of agreements be pursued.

Potential Impacts from Natural Hazards

Critical facilities are generally not impacted by flooding in the Town of Middlebury, although it is noted that the public works facility on Service Road, the fire station on Tucker Hill Road, and some of the sewer pumping stations are adjacent to watercourses that experience flooding, and therefore it is important for the Town of continually monitor conditions nearby and mitigate for any factors that could exacerbate conditions along those watercourses. In the case of the fire station, the watercourse (Hop Brook) has a record of flooding problems. In the case of the public works facility, the adjacent watercourse already causes nuisance flooding on the intersecting street (Woodside Avenue). Refer to Section 3.5 for information about flooding in these areas.

None of the critical facilities are any more susceptible to wind, summer storms, winter storms, or earthquakes than the rest of the Town. The following sections will discuss each natural hazard in detail and include a description of populations at-risk.

3.0 INLAND FLOODING

3.1 Setting

According to FEMA, most municipalities in the United States have at least one clearly recognizable flood-prone area around a river, stream, or large body of water. These areas are outlined as Special Flood Hazard Areas (SFHA) and delineated as part of the National Flood Insurance Program (NFIP). Flood-prone areas are addressed through a combination of floodplain management criteria, ordinances, and community assistance programs sponsored by the NFIP and individual municipalities.

Many communities also have localized flooding areas outside the SFHA. These floods tend to be shallower and chronically reoccur in the same area due to a combination of factors. Such factors include ponding, poor drainage, inadequate storm sewers, clogged culverts or catch basins, sheet flow, obstructed drainageways, sewer backup, or overbank flooding from small streams.

Flooding is a considerable natural hazard in the Town of Middlebury. Hop Brook passes through one of the most vital section of Town. Approximately 98% of the Town's land area is drained by Hop Brook, Long Meadow Pond Brook, and Eightmile Brook. The remainder of the town is drained by, the Nonnewaug River, Little River, and Steele Brook. A thorough discussion of these drainage areas is included in Section 2.5.

Prior to floodplain regulations, homes were constructed within floodplains along Hop Brook and its tributaries and Long Meadow Pond Brook. These areas experience the most significant overbank flooding in the town. Localized nuisance flooding along tributaries and, more commonly, along roadways resulting from inadequate drainage and other factors is also a flooding issue that the Town regularly faces. The overall frequency

of occurrence of flooding in Middlebury is considered to be likely (Refer to Appended Table 2).

3.2 **Hazard Assessment**

Flooding represents the most common and costly natural hazard in Connecticut. The state typically experiences floods in the early spring due to snowmelt and in the late summer/early autumn due to frontal systems and tropical storms, although localized flooding *caused* by thunderstorm activity can be significant. Flooding can occur as a result of other natural hazards, including hurricanes, summer storms, and winter storms. Flooding can also occur as a result of dam failure, which is discussed in Section 8.0, and may also cause landslides and slumps in affected areas.

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of floodplain management and to determine the need for insurance.

Floodplains are lands along watercourses that are subject to periodic flooding; ***floodways*** are those areas within the floodplains that convey floodwaters. Floodways are subject to water being carried at relatively high velocities and forces. The ***floodway fringe*** contains those areas of the 100-year floodplain that are outside the floodway and are subject to inundation but do not convey the floodwaters.

This flood has a one percent chance of being equaled or exceeded each year. The risk of experiencing a flood event of this magnitude or greater is increased when periods longer than one year are considered. For example, FEMA notes that a structure located within a 100-year flood zone has a 26% chance of suffering flood damage during the term of a 30-year mortgage. Similarly, a 500-year flood has a 0.2 percent chance of occurring in a given year. The 500-year floodplain indicates areas of moderate flood hazard.

Flooding presents several safety hazards to people and property. Floodwaters cause massive damage to the lower levels of buildings, destroying business records, furniture, and other sentimental papers and artifacts. In addition, floodwaters can prevent

emergency and commercial egress by blocking streets, deteriorating municipal drainage systems, and diverting municipal staff and resources.

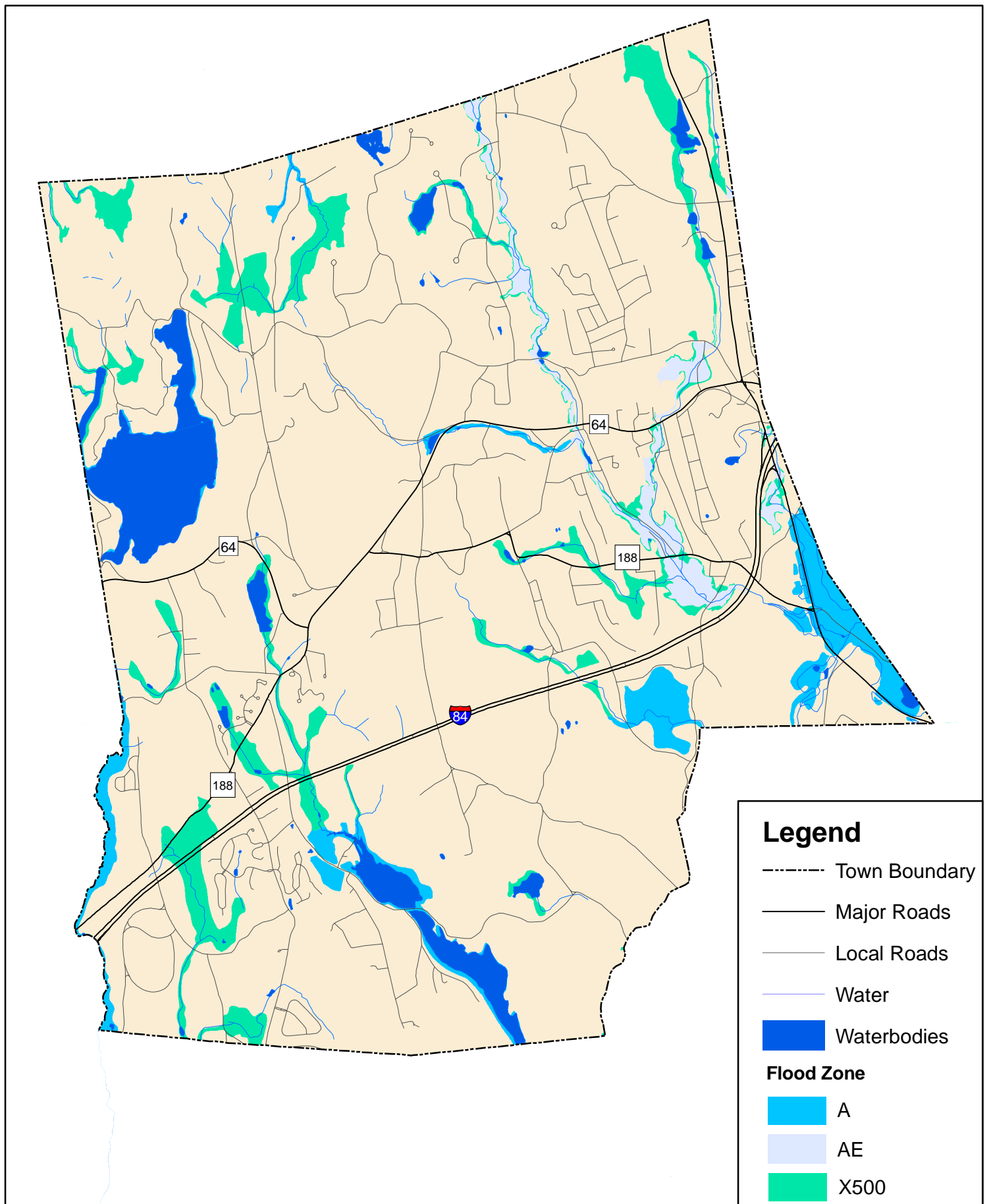
Furthermore, damp conditions trigger the growth of mold and mildew in flooded buildings, contributing to allergies, asthma, and respiratory infections. Snakes and rodents are forced out of their natural habitat and into closer contact with people, and ponded water following a flood presents a breeding ground for mosquitoes. Gasoline, pesticides, and other aqueous pollutants can be carried into areas and buildings by flood waters and soak into soil, building components, and furniture.

SFHAs in Middlebury are delineated on Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies (FIS). An initial Flood Hazard Boundary Map was identified on September 6, 1974. The FIRM delineates areas within Middlebury that are vulnerable to flooding and were published on October 16, 1979. The FIS was originally published on April 16, 1979, and neither the FIS nor the FIRMs have been updated. Refer to Figure 3-1 for the areas of Middlebury susceptible to flooding based on FEMA flood zones. Table 3-1 describes the various zones depicted on the FIRM panels for Middlebury.

Table 3-1
FIRM Zone Descriptions

Zone	Description
A	An area inundated by 100-year flooding, for which no base flood elevations (BFEs) have been determined.
AE	An area inundated by 100-year flooding, for which BFEs have been determined.
Area Not Included	An area that is located within a community or county that is not mapped on any published FIRM.
X	An area that is determined to be outside the 100- and 500-year floodplains.
X500	An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding.

Figure 3-1: FEMA Flood Zones in Middlebury



In some areas of Middlebury, flooding occurs from heavy rains with a much higher frequency than those mapped by FEMA. This nuisance flooding occurs from heavy rains, and often in different areas than those depicted on the FIRM panels. These frequent flooding events occur in areas with insufficient drainage; where conditions may cause flashy, localized flooding; and where poor maintenance may exacerbate drainage problems. These areas are discussed in Sections 3.3 and 3.5.

During large storms, the recurrence interval level of a flood discharge on a tributary tends to be greater than the recurrence interval level of the flood discharge on the main channel downstream. In other words, a 500-year flood event on a tributary may only contribute to a 50-year flood event downstream. This is due to the distribution of rainfall and the greater hydraulic capacity of the downstream channel to convey floodwaters. Dams and other flood control structures can also reduce the magnitude of peak flood flows.

The recurrence interval level of a precipitation event also generally differs from the recurrence interval level of the associated flood. For example, in 2004, heavy rains led to flooding of Watertown Road, and, later, to a roadway wash-out. Watertown Road, which links Watertown and Middlebury, was impassable following the wash-out. Flood events can also be mitigated or exacerbated by in-channel and soil conditions, such as low or high flows, the presence of frozen ground, or a deep or shallow water table, as can be seen in the following historic record.

3.3 *Historic Record*

In every season of the year throughout its recorded history, the Town of Middlebury has experienced various degrees of flooding. Melting snow combined with early spring rains have caused frequent spring flooding. Numerous flood events have occurred in late summer to early autumn resulting from storms of tropical origin moving northeast along the Atlantic coast. Winter floods result from the occasional thaw, particularly during years of heavy snow and periods of rainfall on frozen ground. Other flood events have

been caused by excessive rainfalls upon saturated soils, yielding greater than normal runoff.

Notable historic floods occurred in February 1807, May 1854, October 1869, January 1874, March 1876, September 1882, February 1886, January 1891, and March 1896. Major floods also occurred in Middlebury in March 1936, January and September 1938, January 1949, and August and October 1955.

- ❑ In terms of damage to the Town of Middlebury, the most severe of these was the September 1938 flood. This flood was a 50-year event on the Quinnipiac River in the Town of Wallingford.
- ❑ The flood of record at the USGS gauge on the Pomperaug River in the Town of Southbury, to the southwest, was recorded on August 19, 1955, when the instantaneous discharge reached 29,400 cubic feet per second with a stage of 21.8 feet. The August 1955 flood resulted in the total loss of 36 lives and caused over \$193 million dollars in physical damages in the region.

According to the NCDC Storm Events Database, there have been seven urban/small stream flooding events, 23 flash flood, and 32 flooding events in New Haven County since August of 1993. The following are descriptions of additional, more recent examples of floods in and around the Town of Middlebury as described in the NCDC Storm Events Database, and based on correspondence with municipal officials.

- ❑ August 21, 1994: Torrential rainfall (one to five inches) carried on in New Haven County for a three hour period producing an extensively damaging flash flood. Over the preceding ten days, three to five inches of rain had fallen on the region. Extensive damage occurred to road systems and bridges due to runoff from the region's small streams. Damage from the flash flood event totaled \$2.4 million.

- ❑ April 16, 1996: Heavy rain and strong southeast winds moved across New Haven County as rainfall continued for a period of twelve hours. The twelve hour event produced a range of total rainfall amounts between 2.83 inches (reported in the Town of Oxford) to 6.10 inches (reported in the Town of East Haven). A total of 547 homes and 28 businesses were damaged throughout the storm. The total uninsured flood damage was approximately \$1.5 million according to preliminary damage assessments by the Connecticut Office of Emergency Management and the Federal Emergency Management Agency.
- ❑ September 16, 1999: Torrential rainfall preceding the remnants of Tropical Storm Floyd caused widespread urban, small stream, and river flooding. In New Haven County, rainfall amounts ranged from 2.54 inches at Menungatuck to 6.18 inches at Ansonia. Serious wide-spread flooding of low-lying and poor drainage areas resulted in the closure of many roads and basement flooding across Fairfield, New Haven, and Middlesex Counties.
- ❑ April 23, 2006: Road closures, evacuations, injuries and deaths were reported as a result of a significantly large scale rain event of approximately 3.5 inches of rainfall falling on the northwestern part of New Haven County. Watertown Road was washed out in Middlebury, and Regan Road and Old Regan Road were flooded in central Middlebury. To the southwest, small creeks in the Town of Southbury flooded.
- ❑ Flooding along Regan Road and Old Regan Road reportedly occurred in June 2006 and April 2007, with the latter occurrence the result of a powerful spring nor'easter.

3.4 Existing Programs, Policies, and Mitigation Measures

The Town of Middlebury has in place a number of measures to prevent flood damage. These include regulations, codes, and ordinances preventing encroachment and development near floodways.

The Town of Middlebury uses the 100-year flood lines from the FEMA FIRM for determining special flood hazard areas. Regulations require that all structures in flood hazard areas have their lowest floor be above established flood elevations. Site plan standards require that all proposals be consistent with the need to minimize flood damage, that public facilities and utilities be located and constructed to minimize flood damage, and that adequate drainage is provided.

Rather than prohibiting development in floodplains, the Town of Middlebury seeks to strictly control it. Section 5.14 of the Middlebury Plan of Conservation and Development (March 2001), "Wetlands and Floodplains," states that Middlebury has regulations that limit construction in floodplains. According to this section, "Development within 100-year floodplains is inherently dangerous and therefore strictly regulated." The Plan also promotes creation of greenbelts, stating that "the development of greenbelt systems along floodplains also provides an opportunity for the preservation of open space."

Specific regulations, codes, and ordinances that apply to flood hazard mitigation in conjunction with and in addition to NFIP regulations include:

❑ ***Flood Plain District*** (Section 53 of Middlebury Zoning Regulations). This section states that *"In the Flood Plain District, no structure within the Town should be constructed, reconstructed, enlarged, extended, moved or structurally altered, no land use shall be established and no land shall be filled, graded or excavated until the Planning and Zoning Commission has approved a plan for the proposed structure, land use or alteration of land contour."* Additionally:

⇒ ***Section 53.3*** (General Standards) sets for standards for anchoring; use of flood-resistant materials; siting and placement of systems such as water, wastewater, electrical, heating, and cooling; maintaining flood carrying capacities of streams; outdoor storage; and installation of manufactured homes.

- ⇒ **Section 53.4** (Specific Standards) provides for elevation of new construction and substantial improvements at least two feet above the base flood elevation, and requires dry floodproofing of the parts of structures below the base flood elevation.
- ⇒ **Section 53.5** (Floodway Standards) prohibits development that cumulatively increases the base flood elevation by more than one foot.

- ❑ **Setbacks and Buffer Areas** are addressed in numerous sections of the Middlebury Zoning Regulations. Section 64.2.1-64.2.2 specifies that wherever necessary, the Town will protect floodplains or water recharge areas. Thus, the Zoning Commission may require greater setbacks.

- ❑ **Soil Erosion and Sedimentation Control** (Section 68.2 of Middlebury Zoning Regulations) states that *"any proposal for development that will cumulatively create a disturbed area more than one-half acre in area on land being developed must have a Certified Erosion and Sediment Control Plan."*

- ❑ **Storm Drainage** (Section 7 of Middlebury Road and Drainage Regulations) outlines the Town's requirements to manage stormwater, which includes the collection and disposal thereof in an attempt to:
 - ⇒ design drainage systems which take into account effects upon downstream systems;
 - ⇒ coordinate with general drainage requirements for the use and development of the abutting land;
 - ⇒ avoid diversion of drainage from one watershed or watercourse to another is to be avoided;
 - ⇒ minimize all adverse effects of all work to the stream or watercourse which is being affected;

- ⇒ discharge all storm water into sufficient streams or rivers or into Town or State drainage systems with sufficient capacity to carry the discharge; and
- ⇒ locate and size drainage facilities in order to minimize danger to life and property.

This section also calls for the protection and improvement of the natural drainage system and the prevention of flooding and soil erosion.

- ❑ ***Drainage Standards*** (Section 7 of Middlebury Subdivision Regulations). This section states that *"The storm drainage system shall provide for drainage from the entire area of the subdivision and shall take into account land outside the subdivision that normally drains across the area of the subdivision, as well as the effects of the subdivision upon downstream drainage systems."* Additionally, the drainage system shall provide for the following:

- ⇒ Adequate drainage of proposed streets,
- ⇒ Interception of existing channeled drainage coming from any adjoining streets,
- ⇒ Protection of locations necessary for on-site sewage disposal and water supply facilities,
- ⇒ Prevention of flooding and soil erosion, and protection of wetlands and watercourses, and
- ⇒ On-site detention where feasible, in order that runoff from the developed subdivision not exceed the rate of runoff before subdivision.

- ❑ ***Wetlands and Watercourses*** (Middlebury Inland Wetlands and Watercourses Regulations). These regulations cover actions within and surrounding wetlands and watercourses throughout the Town of Middlebury. Although flooding is not specifically addressed, many of the requirements of the regulations are believed to be preventive of flooding.

The Town of Middlebury Zoning Enforcement Officer serves as the NFIP administrator and oversees the enforcement of NFIP regulations. The Middlebury Public Works Department is in charge of the maintenance of the Town's drainage systems, and performs clearing of public streets, bridges, culverts, and other structures as needed. Drainage and other flooding related complaints are typically initially reported to the Middlebury Police Department at all hours. The Police Department then informs the Department of Public Works during normal business time. The Department of Public Works responds to the complaints and subsequently informs the Engineering Department of the problems in order to plan maintenance and upgrades to infrastructure prior to extensive precipitation events.

Emergency Services

The Town's Police and Fire Departments regularly monitor Hop Brook and combine forces to provide advanced notice to residents in the floodplain surrounding the watercourse of potential flooding problems. Additionally, the Town can access the Automated Flood Warning System to monitor precipitation totals. The Connecticut DEP installed the Automated Flood Warning System in 1982 to monitor rainfall totals as a mitigation effort for flooding throughout the state.

The National Weather Service issues a flood watch or a flash flood watch for an area when conditions in or near the area are favorable for a flood or a flash flood, respectively. A flash flood watch or flood watch does not necessarily mean that flooding will occur. The National Weather

Service issues a flood warning or a flash flood warning for an area when parts of the area are either currently flooding, highly likely to flood, or when flooding is imminent.

The Town of Middlebury can access the ***National Weather Service*** website at <http://weather.noaa.gov/> to obtain the latest flood watches and warnings before and during precipitation events.

As explained in Section 2.9, the Town of Middlebury has instituted the CodeRED™ Emergency Notification System. This system allows the Town to telephone all or targeted areas of the town in case of an emergency situation that requires immediate action. The system is capable of dialing 60,000 phone numbers per hour. It then delivers a recorded message to a person or answering machine, making three attempts to connect to each number. It can also send text messages and e-mails.

The Town of Middlebury also provides many informational pamphlets free of charge related to citizen preparedness for natural hazard events. These pamphlets include *"Preparing Makes Sense. Get Ready Now"* by the U.S. Department of Homeland Security and *"Disaster Preparedness Coloring Book"* by FEMA and distributed by Connecticut DEHMS. These pamphlets are available at the Shepardson Community Center.

In summary, the Town of Middlebury primarily attempts to mitigate flood damage and flood hazards by restricting and controlling building activities in flood-prone areas. This process is carried out primarily through administration of the Zoning Regulations and to a lesser extent, through the Subdivision Regulations. All watercourses are to be encroached minimally or not at all to maintain the existing flood carrying capacity. Regulations in place rely primarily on the FEMA-defined 100-year flood elevations to determine flood areas.

3.5 Vulnerabilities and Risk Assessment

This section discusses specific areas at risk to flooding within the Town. Major land use classes and critical facilities within these areas are identified. According to the FEMA Flood Insurance Rate Maps, 922 acres of land in Middlebury are located within the 100-year flood boundary. Additionally, indirect and nuisance flooding occurs near streams and rivers throughout Middlebury due to inadequate drainage and other factors. Specific

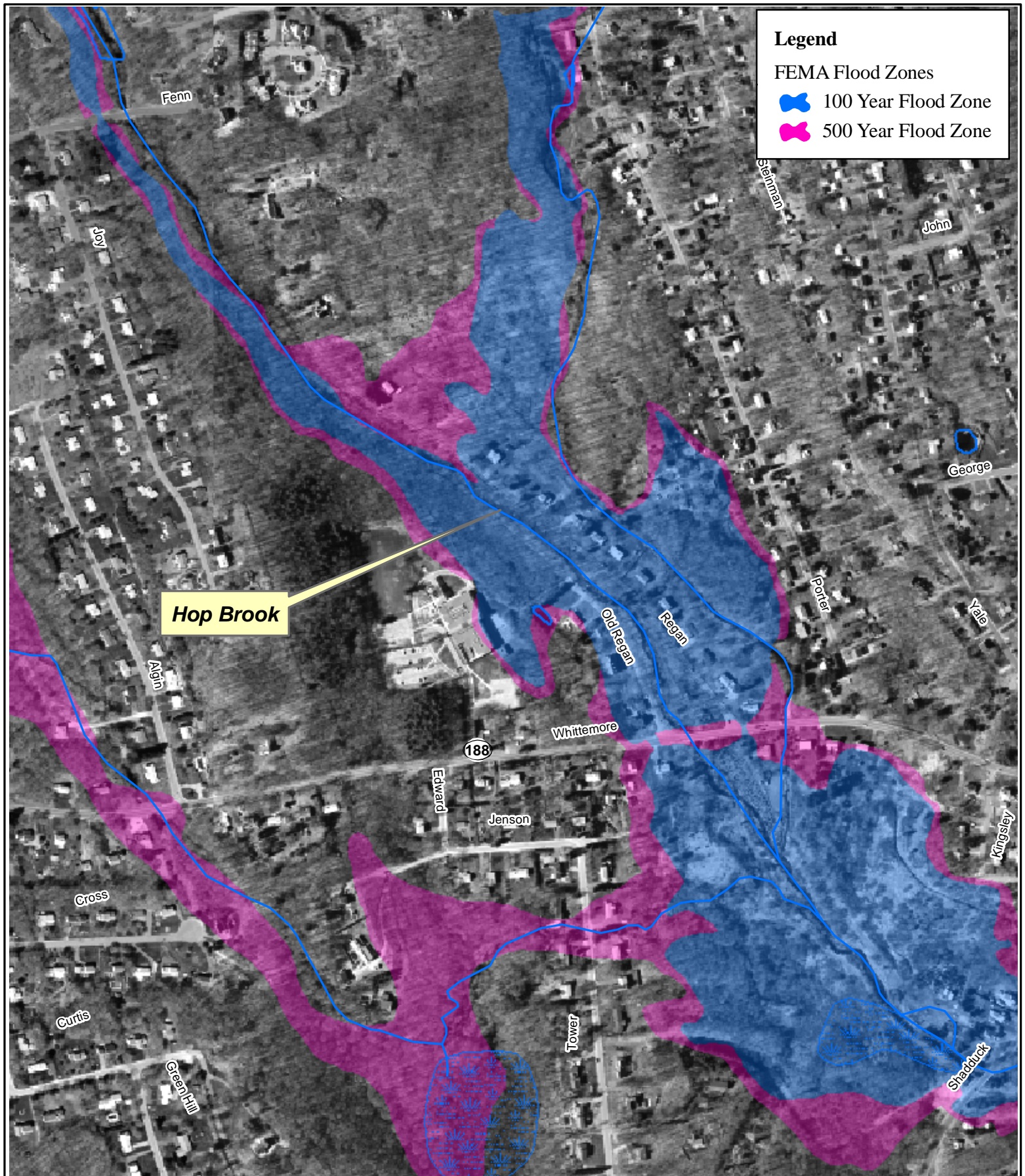
areas susceptible to flooding were identified by Town personnel and observed by Milone & MacBroom, Inc. staff during field inspections as described in Section 1.5.

Based on correspondence with the State of Connecticut NFIP Coordinator, one repetitive loss property is located in the Town of Middlebury. The property at 26 Narcissus Road is located just downstream of the Long Meadow Road bridge, on the western side of Long Meadow Pond. The most recent claims under NFIP were reportedly in 1982 and 1987, indicating that flooding has either not been problematic in the last 20 years, or the owner has not submitted claims.

Flooding in Middlebury is generally concentrated in discrete areas of Town and is not widespread, with the exception of flooding along Hop Brook. Most flooding events occur due to large amounts of rainfall in conjunction with snowmelt and due to undersized road culverts and/or storm drains, as noted below.



Hop Brook and Tributaries

- ❑ Regan Road and Old Regan Road at Hop Brook and Long Swamp Brook – Old Regan Road, Regan Road, and the approximately 15 homes located on the two streets can become flooded during large scale precipitation events. Refer to Figure 3-2 for a depiction of this area. Hop Brook, which lies between the two roadways, is the primary contributing water body during inundation events. However, Long Swamp Brook lies on the east side of Reagan Road and is also a contributor. Residents of these two roads report that storms have appeared to intensify in the last eight years. Floods have occurred in April 2006, June 2006, and April 2007. They also report that the stream is aggrading, and that it was dredged in the 1980s. The residents would like to see it dredged again. Some of the homes (including 420 Regan Road) have streams in the front (Hop Brook) and the back (Long Swamp Brook), and they both flood.



Legend

FEMA Flood Zones

-  100 Year Flood Zone
-  500 Year Flood Zone

Hop Brook



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and Environmental Science

Hop Brook Corridor & Reagan Road Study Area

MMI#: 2937-02
MXD: H:\Fig3-2.mxd
SOURCE: 2004 CLEAR



**Middlebury Natural Hazard
Pre-Disaster Mitigation Plan**

LOCATION:

Middlebury, CT

Map By: SJB
Date: Oct. 2008
Scale: 1:6,000

SHEET:

Figure 3-2

- ❑ Ravenwood Drive – Hop Brook, which flows southerly beneath Ravenwood Drive, contributes to nuisance flooding on Ravenwood Drive during heavy rain events.
- ❑ Shadduck Road – The road sometimes becomes inundated near the sewer pumping station after a heavy rainfall. However, the pump station does not become inundated.
- ❑ Porter Avenue and Steinmann Avenue – Both roadways are prone to nuisance flooding due to the overbanking of Long Swamp Brook which runs adjacent to and crosses the two streets. A culvert which runs beneath Middlebury Road at the north end of Steinmann Avenue, conveying Long Swamp Brook, is undersized and is in need of upgrading and replacement. Homes on both roadways are affected by flooding.
- ❑ Charcoal Avenue – The portion of Charcoal Avenue that is adjacent to Artillery Road regularly becomes inundated during significant rain events. Goat Brook contributes to the roadway flooding that takes place at this location.
- ❑ Cemetery Road – A small, unnamed watercourse near the roadway sometimes causes nuisance flooding. Water runs down the hill near the intersection of Cemetery Road and Middlebury Road. Three culverts at this location are undersized and are insufficient for the flow following heavy rains. Also affected in the area is a gas station, which experiences both building and parking lot flooding during sustained rain events.
- ❑ Watertown Road – A washout of Watertown Road at Hop Brook occurred in spring 2006. Middlebury attempted to submit to FEMA for reimbursement as a co-applicant with the City of Waterbury's application, in hopes of receiving grant money to rebuild the roadway. However, funding from FEMA to repair the roadway could not be obtained. Middlebury documented the episode with extensive photography.

Following the occurrence, Middlebury plated the roadway immediately following the occurrence on the weekend and then began repairs the following Monday. Although the roadway has been repaired, Middlebury remains concerned about Hop Brook causing further damage.

Other Areas

- ❑ Long Meadow Road at Long Meadow Pond – A Federal grant has been awarded for the replacement of the bridge located on Long Meadow Road, crossing Long Meadow Pond in the southern part of town. According to Town officials and a hydrology report developed by Wengell, McDonald & Costello, Inc. in 2006, the bridge is in "poor condition" and was most recently repaired in 1971. The bridge is in need of timely attention in order to make improvements. The pond's water level is at or near the elevation of the bridge, especially during large scale rain events. As a result, the bridge and both ends are prone to inundation during large-scale events.

As stated above, a repetitive loss property is located at 26 Narcissus Road, just downstream of the Long Meadow Road bridge on the western side of Long Meadow Pond. Given the 20-year interval of time since the last flood claim under NFIP, it is believed that flooding at this particular property is either no longer a concern, or that the owner no longer submits claims.

The Long Meadow Pond dam reportedly needs repair as well. Refer to Section 8.0 for a discussion related to the dam.

- ❑ Triangle Boulevard – The Triangle Boulevard area is impacted by runoff from the adjacent Oxford Airport to the south. Water from a small stream jumps a culvert, flows onto the road, and floods at least two homes to the north while making its way to the nearby stream channel. The Town has added a catch basin to help collect

water, but it doesn't work well if the outlet is submerged. The nuisance flooding is particularly problematic along the easternmost section of the roadway.

- ❑ Judd Hill Road – Kelly Pond, which straddles both the Town of Southbury and Middlebury, floods a portion of Judd Hill Road in Middlebury during significant rain events.
- ❑ Woodside Avenue – Flooding is a problem along the roadway in the eastern part of town due to an undersized culvert. The undersized culvert creates a backwater condition which causes property flooding and basement flooding of residences along the roadway.

Critical Facilities

Two of Middlebury's critical facilities are located in floodprone areas. The Fire Station on Tucker Hill Road is adjacent to the Goat Brook and Hop Brook floodplains, located to the south and east of the facility, respectively. The Department of Public Works is not located adjacent to a mapped floodplain, but its location south of Woodside Avenue and near the unnamed stream that causes flooding in that area, is of concern. The Town must strive to keep these two critical facilities operational during the largest of flood events, which is precisely when they will be needed the most. In particular, the Fire Department facility risks isolation from other parts of Town.

3.6 Potential Mitigation Measures, Strategies, and Alternatives

A number of measures can be taken to reduce the impact of a local or nuisance flood event. These include measures that prevent increases in flood losses by managing new development, measures that reduce the exposure of existing development to flood risk, and measures to preserve and restore natural resources. These are listed below under the

categories of *prevention, property protection, structural projects, public education and awareness, natural resource protection, and emergency services.*

3.6.1 Prevention

Prevention of damage from flood losses often takes the form of floodplain regulations and redevelopment policies, as noted in Section 3.4. These are usually administered by building, zoning, planning, and/or code enforcement officers through capital improvement programs and through zoning, subdivision, and wetland ordinances.

It is important to promote coordination among the various departments that are responsible for different aspects of flood mitigation. Coordination and cooperation among departments should be reviewed every few years as specific responsibilities and staff changes.

Municipal departments should identify areas for acquisition to maintain flood protection. Acquisition of heavily damaged structures after a flood may be an economical and practical means to accomplish this. Policies can also include the design and location of utilities to areas outside of flood hazard areas, and the placement of utilities underground.

Planning and Zoning: Zoning ordinances should regulate development in flood hazard areas. Flood hazard areas should reflect a balance of development and natural areas.

Floodplain Development Regulations: Development regulations encompass subdivision regulations, building codes, and floodplain ordinances.

Site plan and new subdivision regulations should include the following:

- ❑ Requirements that every lot have a buildable area above the flood level;

- ❑ Construction and location standards for the infrastructure built by the developer, including roads, sidewalks, utility lines, storm sewers, and drainage ways; and
- ❑ A requirement that developers dedicate open space and flood flow, drainage, and maintenance easements.

Building codes should ensure that the foundation of structures will withstand flood forces and that all portions of the building subject to damage are above or otherwise protected from flooding.

Floodplain ordinances should at minimum follow the requirements of the National Flood Insurance Program for subdivision and building codes. These could be included in the ordinances for zoning and building codes, or could be addressed in a separate ordinance.

According to the FEMA, communities are encouraged to use different, more accurate base maps to expand upon the FIRMs published by FEMA. This is because many FIRMs were originally created using United States Geological Survey quadrangle maps with 10-foot contour intervals, but most municipalities today have contour maps of one or two-foot intervals that show more recently constructed roads, bridges, and other anthropologic features. Another approach is to record high-water marks and establish those areas inundated by a recent severe flood to be the new regulatory floodplain.

Adoption of a different floodplain map is allowed under NFIP regulations as long as the new map covers a larger floodplain than the FIRM. Reductions in floodplain area can only be accomplished through revised FEMA-sponsored engineering studies or Letters of Map Change (LOMC). It should be noted that the community's map will not affect the current FIRM or alter the SFHA used for setting insurance rates or making map determinations; it can only be used by the community to regulate floodplain areas. The FEMA Region I office has more information on this topic; contact information can be found in Section 12.

Stormwater Management Policies: Development and redevelopment policies to address the prevention of flood losses must include effective stormwater management policies. Developers should be required to build detention and retention facilities where appropriate. Infiltration can be enhanced to reduce runoff volume, including the use of swales, infiltration trenches, vegetative filter strips, and permeable paving blocks. Generally, post-development stormwater should not leave a site at a rate higher than under pre-development conditions.

Standard engineering practice is to avoid the use of detention measures if the project site is located in the lower one-third of the overall watershed. The effects of detention are least effective and even detrimental if used at such locations because of the delaying effect of the peak discharge from the site that typically results when detention measures are used. By detaining stormwater in close proximity of the stream in the lower reaches of the overall watershed, the peak discharge from the site will occur later in the storm event, which will more closely coincide with the peak discharge of the stream, thus adding more flow during the peak discharge during any given storm event. Due to its geography, Middlebury contains a range of upper to middle parts of several watersheds. Developers should be required to demonstrate whether detention or retention will be the best management practice for stormwater at specific sites in regards to the position of each project site in the surrounding watershed.

Drainage System Maintenance: An effective drainage system must be continually maintained prior to, during, and following precipitation events in order to maintain efficiency and functionality. Maintenance should include programs to clean out blockages caused by overgrowth and debris. Culverts should be monitored, and repaired and improved when necessary. The use of Geographic Information System (GIS) technology can greatly aid the identification and location of problem areas.

Education and Awareness: Other prevention techniques include the promotion of awareness of natural hazards among citizens, property owners, developers, and local

officials. Technical assistance for local officials, including workshops, can be helpful in preparation for dealing with the massive upheaval that can accompany a severe flooding event. Research efforts to improve knowledge, develop standards, and identify and map hazard areas will better prepare a community to identify relevant hazard mitigation efforts.

The Town of Middlebury Conservation Commission administers the wetland regulations, and the Town of Middlebury Planning and Zoning Commission administers the Zoning and Subdivision regulations. The regulations restrict development in floodplains, wetlands, and other flood prone areas. The Zoning Enforcement Officer and Wetlands Enforcement Officer are charged with ensuring that development follows the floodplain management regulations and inland wetlands regulations, respectively.

Based on the above guidelines and the existing roles of the Conservation Commission, Planning and Zoning Commission, and the two enforcement officers, one specific preventive measure is recommended. A checklist should be developed that cross-references the bylaws, regulations, and codes related to flood damage prevention that may be applicable to a proposed project. This will streamline the permitting process and ensure maximum education of a developer or applicant. This could be provided to an applicant at any Town department. An example is included as Appended Table 3.

3.6.2 Property Protection

Steps should be taken to protect existing public and private properties. Non-structural measures for public property protection include acquisition and relocation of properties at risk for flooding, purchase of flood insurance, and relocating valuable belongings above flood levels to reduce the amount of damage caused during a flood event.

Structural flood protection techniques applicable to property protection include the construction of barriers, dry floodproofing, and wet floodproofing techniques. Barriers include levees, floodwalls, and berms, and are useful in areas subject to shallow flooding. These structural projects are discussed in Section 3.6.6 below.

Dry floodproofing refers to the act of making areas below the flood level water-tight.

Wet floodproofing refers to intentionally letting floodwater into a building to equalize interior and exterior water pressures.

For dry floodproofing, walls may be coated with compound or plastic sheathing. Openings such as windows and vents should be either permanently closed or covered with removable shields. Flood protection should only be two to three feet above the top of the foundation because building walls and floors cannot withstand the pressure of deeper water.

Wet floodproofing should only be used as a last resort. Furniture and electrical appliances should be moved away from advancing floodwaters.

All of the above *property protection* mitigation measures may be useful for Town of Middlebury residents to prevent damage from inland and nuisance flooding. The Town should consider outreach and education in these areas.

It is likely that some homeowners on Regan Road, Old Regan Road, Ravenwood Drive, Porter Avenue, Steinmann Avenue, and Woodside Avenue could benefit from wet floodproofing, dry floodproofing, or elevation of structures. If FEMA funds are to be pursued for any of these types of mitigation, a cost-benefit analysis for each home will help determine whether wet floodproofing, dry floodproofing, or elevation of the structure is most appropriate.

3.6.3 Emergency Services

A natural hazard pre-disaster mitigation plan addresses actions that can be taken before a disaster event. In this context, emergency services that would be appropriate mitigation measures for inland flooding include:

- ❑ Forecasting systems to provide information on the time of occurrence and magnitude of flooding;
- ❑ A system to issue flood warnings to the community and responsible officials;
- ❑ Emergency protective measures, such as an Emergency Operations Plan outlining procedures for the mobilization and position of staff, equipment, and resources to facilitate evacuations and emergency flood-water control; and
- ❑ Implementing an emergency notification system that combines database and GIS mapping technologies to deliver outbound emergency notifications to geographic areas; or specific groups of people, such as emergency responder teams.

Based on the above guidelines, a number of specific proposals for improved *emergency services* are recommended to prevent damage from inland and nuisance flooding. These are common to all hazards in this plan, and are listed in Section 10.1.

As noted above, two of Middlebury's critical facilities are located in floodprone areas. The Fire Station on Tucker Hill Road is adjacent to the Goat Brook and Hop Brook floodplains, and the Department of Public Works is located near an unnamed stream that causes flooding in that area. The Town must strive to keep these two critical facilities operational during the largest of flood events, which is precisely when they will be needed the most. Flood mitigation projects that reduce peak flows along Goat Brook, Hop Brook, and the stream near Woodside Avenue should be prioritized.

3.6.4 Public Education and Awareness

The objective of public education is to provide an understanding of the nature of flood risk, and the means by which that risk can be mitigated on an individual basis. Public information materials should encourage individuals to be aware of flood mitigation techniques, including discouraging the public from changing channel and detention basins in their yards, and dumping in or otherwise altering watercourses and storage basins. Individuals should be made aware of drainage system maintenance programs and other methods of mitigation. The public should also understand what to expect when a hazard event occurs, and the procedures and time frames necessary for evacuation.

Based on the above guidelines, a number of specific proposals for improved *emergency services* are recommended to prevent damage from inland and nuisance flooding. These are common to all hazards in this plan, and are listed in Section 10.1.

3.6.5 Natural Resource Protection

Floodplains can provide a number of natural resources and benefits, including storage of flood waters, open space and recreation, water quality protection, erosion control, and preservation of natural habitats. Retaining the natural resources and functions of floodplains can not only reduce the frequency and

consequences of flooding, but also minimize stormwater management and non-point pollution problems. Through natural resource planning, these objectives can be achieved at substantially reduced overall costs.

Measures for preserving floodplain functions and resources typically include:

- ❑ Adoption of floodplain regulations to control or prohibit development that will alter natural resources;
- ❑ Development and redevelopment policies focused on resource

Projects that improve the natural condition of areas or to restore diminished or destroyed resources can re-establish an environment in which the functions and values of these resources are again optimized. Administrative measures which assist such projects include the development of land reuse policies focused on a resource restoration and review of community programs to identify opportunities for floodplain restoration.

Based on the above guidelines, the following general *natural resource protection* mitigation measures are recommended to help prevent damage from inland and nuisance flooding:

- ❑ Pursue the acquisition of additional open space properties.
- ❑ Selectively pursue conservation objectives listed in the Plan of Conservation and Development or more recent planning studies and documents.
- ❑ Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands and floodplains.

3.6.6 Structural Projects

Structural projects include the construction of new structures or modification of existing structures (e.g. floodproofing) to lessen the impact of a flood event. Stormwater controls such as drainage systems, detention dams and reservoirs, and culverts should be employed to lessen floodwater runoff. On-site detention can provide temporary storage of stormwater runoff. Barriers such as levees, floodwalls, and dikes physically control the hazard to protect certain areas from floodwaters. Channel alterations can be made to confine more water to the channel and accelerate flood flows. Care should be taken when using these techniques to ensure that problems are not exacerbated in other areas of the impacted watersheds. Individuals can protect private property by raising structures, and constructing walls and levees around structures.

Based on the above guidelines, the following specific *structural* mitigation measures are recommended to prevent damage from flooding:

- ❑ Increase the capacity of the Hop Brook culvert where it flows under Watertown Road to prevent future washouts like the one that occurred in 2006.
- ❑ Increase the conveyance capacities of the culverts for the unnamed stream under the intersection of Cemetery Road and Middlebury Road, the culvert beneath Middlebury Road at the end of Steinmann Avenue associated with Long Swamp Brook, and the culvert associated with stream running along and beneath Woodside Avenue.
- ❑ Replace the bridge over Long Meadow Pond on Long Meadow Road in order to mitigate for flooding problems along the local roadway.

3.7 ***Summary of Recommended Mitigation Measures, Strategies, and Alternatives***

The proposed mitigation strategies for addressing flooding are listed below.

Prevention

- ❑ Streamline the permitting process and ensure maximum education of a developer or applicant. Develop a checklist that cross-references the ordinances, regulations, and codes related to flood damage prevention that may be applicable to a proposed project. This list could be provided to an applicant at any Town department.
- ❑ Consider performing a Town-wide inventory of drainage pipes as part of the next Stormwater Management Plan update to help identify undersized and failing portions of the drainage system.
- ❑ Consider joining FEMA's Community Rating System.
- ❑ Continue to require Flood Hazard Area Permits for activities within SFHAs.
- ❑ Consider requiring buildings constructed in flood prone areas to be protected to the highest recorded flood level, regardless of being within a defined SFHA.

- ❑ After Map Mod has been completed, consider restudying local flood prone areas and produce new local-level regulatory floodplain maps using more exacting study techniques, including using more accurate contour information to map flood elevations provided with the FIRM.
- ❑ Given the importance of maintaining the viability of the Fire Station and Department of Public Works during disasters, flood mitigation projects that reduce peak flows along Goat Brook, Hop Brook, and the stream near Woodside Avenue should be prioritized.

Property & Natural Resource Protection

- ❑ Pursue the acquisition of additional municipal open space properties inside SFHAs and set those aside as greenways, parks, or other non-residential, non-commercial or non-industrial use.
- ❑ Selectively pursue conservation recommendations listed in the Plan of Conservation and Development and other studies and documents.
- ❑ Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains.
- ❑ Work with homeowners on Regan Road, Old Regan Road, Ravenwood Drive, Porter Avenue, Steinmann Avenue, and Woodside Avenue to pursue wet floodproofing, dry floodproofing, or elevation of structures. If FEMA funds are to be pursued, a cost-benefit analysis for each home will help determine whether wet floodproofing, dry floodproofing, or elevation of the structure is most appropriate.

Structural Projects

- ❑ Increase the capacity of the Hop Brook culvert where it flows under Watertown Road to prevent future washouts like the one that occurred in 2006.
- ❑ Increase the conveyance capacities of the culverts for the unnamed stream under the intersection of Cemetery Road and Middlebury Road, the culvert beneath Middlebury

Road at the end of Steinmann Avenue associated with Long Swamp Brook, and the culvert associated with stream running along and beneath Woodside Avenue.

- ❑ Replace the bridge over Long Meadow Pond on Long Meadow Road in order to mitigate for flooding problems along the local roadway.

In addition, mitigation strategies important to all hazards are described in Section 10.1.

4.0 HURRICANES

4.1 Setting

Hazards associated with tropical storms and hurricanes include winds, heavy rains, and flooding. While only concentrated areas of Middlebury are susceptible to flooding damage caused by hurricanes, wind damage can occur over widespread areas throughout the Town. Hurricanes therefore have the potential to affect any area within the Town of Middlebury. A hurricane striking the Town of Middlebury is considered a possible event each year that could cause critical damage to the Town and its infrastructure (please refer to Appended Table 1).

4.2 Hazard Assessment

Hurricanes are a class of tropical cyclones which are defined by the National Weather Service as non-frontal, low pressure large scale systems that develop over tropical or subtropical water and have definite organized circulations. Tropical cyclones are categorized based on the speed of the sustained (1-minute average) surface wind near the center of the storm. These categories are: Tropical Depression (winds less than 39 mph), Tropical Storm (winds 39-74 mph, inclusive) and Hurricanes (winds at least 74 mph).

The geographic areas affected by tropical cyclones are called tropical cyclone basins. The Atlantic tropical cyclone basin is one of six in the world and includes much of the North Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico. The official Atlantic hurricane season begins on June 1 and extends through November 30 of each year, although occasionally hurricanes occur outside this period.

Inland Connecticut is vulnerable to hurricanes despite moderate hurricane occurrences when compared with other areas within the Atlantic Tropical Cyclone basin. Since

hurricanes tend to weaken within 12 hours of landfall, inland areas are less susceptible to hurricane wind damages than coastal areas in Connecticut; however, the heaviest rainfall often occurs inland. Therefore, inland areas are vulnerable to inland flooding during a hurricane.

A hurricane Watch is an advisory for a specific area stating that a hurricane poses a threat to coastal and inland areas. Individuals should keep tuned to local television and radio for updates. A hurricane Warning is then issued when the dangerous effects of a hurricane are expected in the area within 24 hours.

The Saffir / Simpson Scale

The Saffir / Simpson Hurricane Scale, which has been adopted by the National Hurricane Center, categorizes hurricanes based upon their intensity, and relates this intensity to damage potential. The Scale uses the sustained surface winds (1-minute average) near the center of the system to classify hurricanes into one of five categories. The Saffir / Simpson scale is provided below.

A ***Hurricane Watch*** is an advisory for a specific area stating that a hurricane poses a threat to coastal and inland areas. Individuals should keep tuned to local television and radio for updates.

A ***Hurricane Warning*** is then issued the dangerous effects of a hurricane are expected in the area.

❑ **Category 1:** Winds 74-95 mph (64-82 kt or 119-153 km/hr). Storm surge generally 4-5 ft above normal. No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Some damage to poorly constructed signs, coastal road flooding, and minor pier damage.

⇒ Hurricane Diane was a Category 1 hurricane when it made landfall in North Carolina in 1955, and weakened to a tropical storm before reaching the Connecticut shoreline.

- ⇒ Hurricane Agnes of 1971 was a Category 1 hurricane when it hit Connecticut.
- ⇒ Hurricanes Allison of 1995 and Danny of 1997 were Category 1 hurricanes at peak intensity.

- ❑ **Category 2:** Winds 96-110 mph (83-95 kt or 154-177 km/hr). Storm surge generally 6-8 feet above normal. Some roofing material, door, and window damage of buildings. Considerable damage to shrubbery and trees with some trees blown down. Considerable damage to mobile homes, poorly constructed signs, and piers. Coastal and low-lying escape routes flood two to four hours before arrival of the hurricane center. Small craft in unprotected anchorages break moorings.

- ⇒ Hurricane Bonnie of 1998 was a Category 2 hurricane when it hit the North Carolina coast.
- ⇒ Hurricane Georges of 1998 was a Category 2 hurricane when it hit the Florida Keys and the Mississippi Gulf Coast.
- ⇒ Hurricane Bob was a Category 2 hurricane when it made landfall in southern New England and New York in August of 1991.
- ⇒ Hurricane Ike was a strong Category 2 hurricane when it struck Galveston and Houston in September 2008.

- ❑ **Category 3:** Winds 111-130 mph (96-113 kt or 178-209 km/hr). Storm surge generally 9-12 ft above normal. Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures. Damage to shrubbery and trees with foliage blown off trees and large trees blown down. Mobile homes and poorly constructed signs are destroyed. Low-lying escape routes are cut by rising water three to five hours before arrival of the center of the hurricane. Flooding near the coast destroys smaller structures with larger structures damaged by battering from floating debris. Terrain continuously lower than five feet above mean sea level may be flooded inland eight miles (13 km) or more. Evacuation of low-lying residences within several blocks of the shoreline may be required.

- ⇒ The Great New England Hurricane of 1938 was a Category 3 hurricane when it hit New York and southern New England.
- ⇒ The Great Atlantic Hurricane of 1944 was a Category 3 hurricane when it made landfall in North Carolina, Virginia, New York, and southern New England.
- ⇒ Hurricane Carol of 1954 was a Category 3 hurricane when it struck Connecticut, New York, and Rhode Island.
- ⇒ Hurricane Connie of 1955 was a Category 3 hurricane when it made landfall in North Carolina.
- ⇒ Hurricane Gloria of 1985 was a Category 3 hurricane when it made landfall in North Carolina and New York, and weakened to a Category 2 hurricane before reaching Connecticut.
- ⇒ Hurricanes Roxanne of 1995 and Fran of 1996 were Category 3 hurricanes at landfall on the Yucatan Peninsula of Mexico and in North Carolina, respectively.
- ⇒ Hurricane Katrina of August 2005 was a Category 3 hurricane when it struck Louisiana and Mississippi.
- ⇒ Hurricane Rita of September 2005 reached Category 3 when it struck Louisiana.
- ⇒ Hurricane Wilma of October 2005 was a Category 3 hurricane when it made landfall in southwestern Florida.

- ❑ **Category 4:** Winds 131-155 mph (114-135 kt or 210-249 km/hr). Storm surge generally 13-18 ft above normal. More extensive curtainwall failures with some complete roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows. Low-lying escape routes may be cut by rising water three to five hours before arrival of the center of the hurricane. Major damage to lower floors of structures near the shore. Terrain lower than 10 ft above sea level may be flooded requiring massive evacuation of residential areas as far inland as six miles (10 km).

- ⇒ Hurricane Donna of 1960 was a Category 4 hurricane when it made landfall in southwestern Florida, and weakened to a Category 2 hurricane when it reached Connecticut.
 - ⇒ Hurricane Luis of 1995 was a Category 4 hurricane while moving over the Leeward Islands.
 - ⇒ Hurricanes Felix and Opal of 1995 also reached Category 4 status at peak intensity.
- **Category 5:** Winds greater than 155 mph (135 kt or 249 km/hr). Storm surge generally greater than 18 ft above normal. Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage. Low-lying escape routes are cut by rising water three to five hours before arrival of the center of the hurricane. Major damage to lower floors of all structures located less than 15 ft above sea level and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5-10 miles (8-16 km) of the shoreline may be required.
- ⇒ Hurricane Andrew was a Category 5 hurricane when it made landfall in southeastern Florida in 1992.
 - ⇒ Hurricane Mitch of 1998 was a Category 5 hurricane at peak intensity over the western Caribbean.
 - ⇒ Hurricane Gilbert of 1988 was a Category 5 hurricane at peak intensity and is one of the strongest Atlantic tropical cyclones of record.

Table 4-1 lists the hurricane characteristics mentioned above as a function of category, as well as the expected central pressure.

Table 4-1
Hurricane Characteristics

Category	CENTRAL PRESSURE		WIND SPEED		SURGE Feet	Damage Potential
	Millibars	Inches	MPH	Knots		
1	>980	>28.9	74-95	64-83	4-5	Minimal
2	965-979	28.5-28.9	96-110	84-96	6-8	Moderate
3	945-964	27.9-28.5	111-130	97-113	9-12	Extensive
4	920-944	27.2-27.9	131-155	114-135	13-18	Extreme
5	<920	<27.2	>155	>135	>18	Catastrophic

The Saffir / Simpson Hurricane Scale assumes an average, uniform coastline for the continental United States and was intended as a general guide for use by public safety officials during hurricane emergencies. It does not reflect the effects of varying localized bathymetry, coastline configuration, astronomical tides, barriers or other factors that may modify storm surge heights at the local level during a single hurricane event. For inland communities such as the Town of Middlebury, the coastline assumption is not applicable.

According to Connecticut's 2007 Natural Hazard Mitigation Plan Update, a moderate Category 2 hurricane is expected to strike Connecticut once every ten years, whereas a Category 3 or Category 4 hurricane is expected before the year 2040. These frequencies are based partly on the historic record, described in the next section.

4.3 Historic Record

Through research efforts by NOAA's National Climate Center in cooperation with the National Hurricane Center, records of tropical cyclone occurrences within the Atlantic Cyclone Basin have been compiled from 1851 to present. These records are compiled in NOAA's Hurricane database (HURDAT), which contains historical data in the process of being reanalyzed to current scientific standards, as well as the most current hurricane data. During HURDAT's period of record, 29 hurricanes and 67 tropical storms have passed within a 150 mile radius of Newport, Rhode Island.

Since 1900, eight direct hits and two hurricanes that did not make landfall (but passed close to the shoreline) were recorded along the Connecticut coast, of which there were four Category 3, two Category 2, and two Category 1 hurricanes (two of the ten struck Connecticut before the Saffir / Simpson scale was developed). Of the four Category 3 hurricanes, two occurred in September and two occurred in August.

The most devastating hurricane to strike Connecticut, and believed to be the strongest hurricane to hit New England in recorded history, was believed to be a Category 3 hurricane. Dubbed the "Long Island Express of September 21, 1938", this name was derived from the unusually high forward speed of the hurricane, estimated to be 70 mph. The hurricane made landfall at Long Island, New York and moved quickly northward over Connecticut into northern New England.

The majority of damage was caused from storm surge and wind damage. Surges of 10 to 12 feet were recorded along portions of the Long Island and Connecticut Coast, and heavy winds flattened forests, destroyed nearly 5,000 cottages, farms, and homes, and damaged an estimated 15,000 more throughout New York and southern New England. Overall, the storm left an estimated 700 dead and caused physical damages in excess of 300 million 1938 United States dollars (USD).

The "Great Atlantic Hurricane" hit the Connecticut coast in September 1944. This Category 3 hurricane brought rainfall in excess of six inches to most of the state and rainfall in excess of eight to ten inches in Fairfield County. Most of the wind damage from this storm occurred in southeastern Connecticut. Injuries and storm damage were lower in this hurricane than in 1938 because of increased warning time and the fewer structures located in vulnerable areas due to the lack of rebuilding after the 1938 storm.

Another Category 3 hurricane, Hurricane Carol, struck in August of 1954 shortly after high tide and produced storm surges of 10 to 15 feet in southeastern Connecticut.

Rainfall amounts of six inches were recorded in New London, and wind gusts peaked at over 100 mph. Near the coast, the combination of strong winds and storm surge damaged or destroyed thousands of buildings, and the winds toppled trees that left most of the eastern part of the state without power. Overall damages were estimated at \$461 million (1954 USD), and 60 people died as a direct result of the hurricane. Western Connecticut was largely unaffected by Hurricane Carol due to the compact nature of the storm.

The following year, back-to-back hurricanes Connie and Diane caused torrential rains and record-breaking floods in Connecticut. Hurricane Connie was a declining tropical storm when it hit Connecticut in August of 1955, producing heavy rainfall of four to six inches across the state. The saturated soil conditions exacerbated the flooding caused by Diane five days later, a Category 1 hurricane and the wettest tropical cyclone on record for the Northeast. Diane produced 14 inches of rain in a 30-hour period, causing destructive flooding conditions along nearly every major river system in the state. The Mad and Still Rivers in Winsted, the Naugatuck River, the Farmington River, and the Quinebaug River in northeastern Connecticut caused the most damage. The flood waters caused over 100 deaths, left 86,000 unemployed, and an estimated \$200 million in damages (1955 USD). For comparison, the total property taxes levied by all Connecticut municipalities in 1954 amounted to \$194.1 million.

More recently, flooding and winds associated with hurricanes have caused extensive shoreline erosion and related damage. In September of 1985, hurricane Gloria passed over the coastline as a Category 2 hurricane. The hurricane struck at low tide, resulting in low to moderate storm surges along the coast. The storm produced up to six inches of rain and heavy winds which damaged structures and uprooted trees. Over 500,000 people suffered significant power outages.

Hurricane Bob, a Category 2 hurricane making landfall in 1991, caused storm surge damage along the Connecticut coast, but was more extensively felt in Rhode Island and Massachusetts. Heavy winds were felt across eastern Connecticut with gusts up to 100

mph recorded, and the storm was responsible for six deaths in the state. Total damage in southern New England was approximately \$1.5 billion (1991 USD).

The most recent tropical cyclone to impact Connecticut was tropical storm Floyd in 1999. Floyd is the storm of record in the Connecticut Natural Hazard Mitigation Plan and is discussed in more detail in Section 3.3. Tropical Storm Floyd caused power outages throughout New England and at least one death in Connecticut.

4.4 Existing Programs, Policies, and Mitigation Measures

Existing mitigation measures appropriate for inland flooding have been discussed in Section 3.0. These include ordinances, codes, and regulations that have been enacted to minimize flood damage.

Wind loading requirements are addressed through the state building code. The Connecticut Building Code was amended in 2005 and adopted with an effective date of December 31, 2005. The new code specifies the design wind speed for construction in all the Connecticut municipalities, with the addition of split zones for some towns. For example, for towns along the Merritt Parkway such as Fairfield and Trumbull, wind speed criteria are different north and south of the Parkway in relation to the distance from the shoreline. Effective December 31, 2005, the design wind speed for Middlebury is 95 miles per hour. The Town of Middlebury has adopted the Connecticut Building Code as its building code.

Tree limbs and trees may fall during heavy wind events, potentially damaging structures, utility lines, and vehicles. The Town of Middlebury Department of Public Works performs annual tree maintenance on any tree or tree limb which crosses the vertical imaginary plane of Town property. These trees are considered the ownership of the Town and, if there is a threat presented, then the Town will either maintain the threat or remove it altogether. Those residents who reach the DPW by telephone or in person with

concerns are given priority on a first-call/first-come basis and a "condition rating" is given to each case in an effort to prioritize all situations. The Town is sufficiently suited for debris removal maintaining proper equipment such as different claws and a tub grinder. Once processed, the debris is disposed of at different specified locations throughout Middlebury.

Connecticut Light & Power also performs tree maintenance, but landowners are responsible for conducting tree maintenance on private property. The Town attempts to close roads at convenient intersections rather than at the location of the downed tree or branch. Additionally, all utilities in new subdivisions must be placed underground, unless the Planning and Zoning Commission determines that underground installation is inappropriate or unfeasible due to shallow-to-bedrock soils.

As explained in Section 2.9, the Town of Middlebury has three designated emergency shelters which are the Shepardson Community Center, the Middlebury Fire House, and the Long Meadow Elementary School. In addition, the Middlebury Police Department has a generator and can serve as an additional shelter during emergencies. However, the Police Department does not have the capacity that each of the three other designated shelters have individually. Other locations such as the Memorial Middle School are viewed as back-up shelters. These back-up shelters have sufficient capacity to accommodate evacuees. As hurricanes generally pass an area within a day's time, additional shelters can be set up following the storm as needed for long-term evacuees.

During a disaster, the Town will notify residents of emergency information on a neighborhood basis using its CodeRED™ Emergency Notification System. The system has the ability to deliver recorded messages to person or an answering machine, making three attempts to connect to any telephone number when making calls. Due to the infancy of the system in the Town, education on the benefits and operation of the system residents' perspectives is needed. It is recommended that public resources such as the Town's website should be utilized at any point possible in order to educate the public.

Prior to a hurricane, the Town ensures that warning/notification systems and communication equipment is working properly and prepares for the possible evacuation of susceptible areas.

4.5 Vulnerabilities and Risk Assessment

It is generally believed that New England is long overdue for another major hurricane strike. Recall that according to the 2007 Connecticut Natural Hazard Mitigation Plan Update, a moderate Category 2 storm is expected to strike the state once per decade. The Town of Middlebury is less vulnerable to hurricane damage than coastal towns in Connecticut because it does not need to deal with the effects of storm surge.

The Town of Middlebury is vulnerable to hurricane damage from wind and flooding, and from any tornadoes accompanying the storm. Areas of known and potential flooding problems are discussed in Section 3.0, and tornadoes will be discussed in Section 5.0. Hurricane-force winds can easily destroy poorly constructed buildings and mobile homes. Debris such as signs, roofing material, and small items left outside become flying missiles in hurricanes. Extensive damage to trees, towers, aboveground and underground utility lines (from uprooted trees), and fallen poles cause considerable disruption for residents. Streets may be flooded or blocked by fallen branches, poles, or trees, preventing egress. Downed power lines can also start electrical fires, so adequate fire protection is important.

As the residents and businesses of the State of Connecticut become more dependent on the internet and mobile communications, the impact of hurricanes on commerce will continue to increase. A major hurricane has the potential of causing complete disruption of power and communications for up to several weeks, rendering electronic devices and those that rely on utility towers and lines inoperative. According to the Connecticut DEP, this is a significant risk which cannot be quantitatively estimated.

As the Town of Middlebury is not affected by storm surge, hurricane sheltering needs have not been calculated by the Army Corps of Engineers for the Town. The Town of Middlebury determines sheltering need based upon areas damaged within the Town. Under limited emergency conditions, a high percentage of evacuees will seek shelter with friends or relatives rather than go to established shelters. During extended power outages, it is believed that only 10% to 20% of the affected population of Middlebury will relocate.

4.6 Potential Mitigation Measures, Strategies, and Alternatives

Many potential mitigation measures for hurricanes include those appropriate for flooding. These were presented in Section 3.6. However, hurricane mitigation measures must also address the effects of heavy winds that are inherently caused by hurricanes. Mitigation for wind damage is therefore emphasized in the subsections below.

4.6.1 Prevention

Although hurricanes and tropical storms cannot be prevented, a number of methods are available to continue preventing damage from the storms, and perhaps to mitigate damage. The following actions have been identified as potential preventive measures:

- ❑ Continue Town-wide tree limb inspection and maintenance programs to ensure that the potential for downed power lines is diminished. This is especially important along primary evacuation routes which include Interstate 84, Route 64, Route 63, and Route 188. Secondary priority includes Watertown Road and Old Watertown Road (routes to Watertown), Christian Road (route to Oxford), and Long Meadow Road to South Street (route to Naugatuck) for tree limb maintenance.

- ❑ Continue to perform maintenance/removal on all trees which cross the imaginary vertical line extending above the property line of Town-owned property.
- ❑ Increase tree limb maintenance and inspections frequency prior to hurricane/tropical storm season.
- ❑ Continue location of utilities underground in new developments or as related to redevelopment.

4.6.2 Property Protection

Potential mitigation measures include designs for hazard-resistant construction and retrofitting techniques. These may take the form of increased wind and flood resistance for structures, as well as the use of storm shutters over exposed glass and the inclusion of hurricane straps to hold roofs to buildings. Compliance with the amended Connecticut Building Code for wind speeds is necessary. Literature should be made available by the Building Department to developers during the permitting process regarding these design standards.

4.6.3 Public Education and Awareness

The public should be made aware of evacuation routes and available shelters. A number of specific proposals for improved *public education* are recommended to prevent damage and loss of life during hurricanes. These are common to all hazards in this plan, and are listed in Section 10.1.

4.6.4 Emergency Services

The Emergency Operation Plan of the Town of Middlebury includes guidelines and specifications for communication of hurricane warnings and watches, as well as for a call for evacuation. The public needs to be made aware in advance of a hurricane event of

evacuation routes and the locations of public shelters. In addition, the Town of Middlebury should prepare those back-up shelters for evacuation and sheltering needs which centers around outfitting these facilities with generators. The Town should continue to review the Emergency Operations Plan for the Town and update when necessary, and review its mutual aid agreements and update as necessary to ensure help is available as needed.

Finally, due to its recent implementation, the Town should focus on educating residents about the CodeRED™ Emergency Notification System through resources readily available to residents, such as the Town website and information posted in Shepardson Community Center.

4.6.5 Structural Projects

Structural projects for wind damage mitigation are not possible.

4.7 Summary of Recommended Mitigation Measures, Strategies, and Alternatives

Recommendations for mitigation of hurricane and tropical storm winds include the following:

- ❑ Continue inspections of trees on all Town property near power lines, Town right-of-ways, and private properties.
- ❑ Increase tree limb maintenance and inspections frequency prior to hurricane/tropical storm season. This is especially important along primary evacuation routes which include Interstate 84, Route 64, Route 63, and Route 188.
- ❑ Secondary priority for tree limb maintenance includes Watertown Road and Old Watertown Road (routes to Watertown), Christian Road (route to Oxford), and Long Meadow Road to South Street (route to Naugatuck).

- ❑ Continue to require that utilities be placed underground in new developments in all possible cases and pursue funding to place them underground in existing developed areas where they are not.
- ❑ Review all evacuation plans to ensure timely migration of people seeking shelter in all areas of Town.
- ❑ Seek to outfit back-up shelters with generators in an effort to make them available for when a large-scale evacuation is needed.

In addition, important recommendations that apply to all hazards are listed in Section 10.1.

5.0 SUMMER STORMS & TORNADOES

5.1 Setting

Like hurricanes and winter storms, summer storms and tornadoes have the potential to affect any area within the Town of Middlebury. Furthermore, because these types of storms and the hazards that result (flash flooding, wind, hail, and lightning) might have limited geographic extent, it is possible for a summer storm to harm one area within the Town without harming another. The entire Town of Middlebury is therefore susceptible to summer storms (including heavy rain, flash flooding, wind, hail, and lightning) and tornadoes.

Based on the historic record, it is considered highly likely that a summer storm that includes lightning will impact the Town of Middlebury each year, although lightning strikes have a limited effect. Strong winds and hail are considered likely to occur during such storms but also generally have limited effects. A tornado is considered a possible event in New Haven County each year that could cause significant damage to a small area (refer to Appended Table 2).

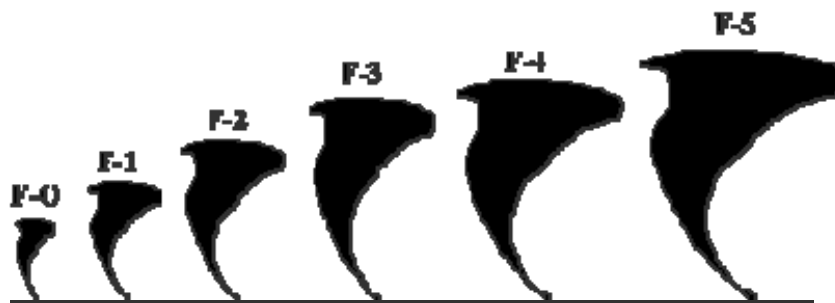
5.2 Hazard Assessment

Heavy wind (including tornadoes and downbursts), lightning, heavy rain, hail, and flash floods are the primary hazards associated with summer storms. Flooding caused by heavy rainfall was covered in Section 3.0 of this plan and will not be discussed in detail here.

Tornadoes

Tornadoes are spawned by certain thunderstorms. NOAA defines a tornado as "a violently rotating column of air extending from a thunderstorm to the ground." The Fujita scale was accepted as the official classification system for tornado damage for many years following its publication in 1971. The Fujita scale rated the intensity of a tornado by examining the damage caused by the tornado after it has passed over a man-made structure. The scale ranked tornadoes using the now-familiar notation of F0 through F6, increasing with wind speed and intensity. The following graphic of the Fujita scale is provided by FEMA. A description of the scale follows in Table 5-1.

Fujita Tornado Scale



**Table 5-1
Fujita Scale**

F-Scale Number	Intensity	Wind Speed	Type of Damage Done
F0	Gale tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
F1	Moderate tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.

Table 5-1 (Continued)
Fujita Scale

F-Scale Number	Intensity	Wind Speed	Type of Damage Done
F3	Severe tornado	158-206 mph	Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted
F4	Devastating tornado	207-260 mph	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated
F5	Incredible tornado	261-318 mph	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 mph	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 winds that would surround the F6 winds. Missiles, such as cars and refrigerators, would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies.

According to NOAA, weak tornadoes (F0 and F1) account for approximately 69% of all tornadoes. Strong tornadoes (F2 and F3) account for approximately 29% of all tornadoes. Violent tornadoes (F4 and above) are rare but extremely destructive, and account for only 2% of all tornadoes.

The Enhanced Fujita Scale was released by NOAA for implementation on February 1, 2007. According to the NOAA web site, the Enhanced Fujita Scale was developed in response to a number of weaknesses to the Fujita Scale that were apparent over the years, including the subjectivity of the original scale based on damage, the use of the worst damage to classify the tornado, the fact that structures have different construction depending on location within the United States, and an overestimation of wind speeds for F3 and greater.

The Enhanced Fujita scale is still a set of wind estimates based on damage. Its uses three-second gusts estimated at the point of damage based on a judgment of eight levels of damage to 28 specific indicators. Table 5-2 relates the Fujita and enhanced Fujita scales.

**Table 5-2
Enhanced Fujita Scale**

Fujita Scale			Derived EF Scale		Operational EF Scale	
<i>F Number</i>	<i>Fastest 1/4-mile (mph)</i>	<i>3 Second Gust (mph)</i>	<i>EF Number</i>	<i>3 Second Gust (mph)</i>	<i>EF Number</i>	<i>3 Second Gust (mph)</i>
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

The historic record of tornadoes is discussed in Section 5.3. The pattern of occurrence in Connecticut is expected to remain unchanged according to the Connecticut Natural Hazards Mitigation Plan (2007). The highest relative risk for tornadoes in the state are Litchfield and Hartford Counties, followed by New Haven, Fairfield, Tolland, Middlesex, Windham, and finally New London County. By virtue of its location in New Haven County, the Town of Middlebury is therefore at a relatively higher risk of tornadoes compared to the rest of the state.

Lightning

Lightning is a circuit of electricity that occurs between the positive and negative charges within the atmosphere or between the atmosphere and the ground. In the initial stages of development, air acts as an insulator between the positive and negative charges.

However, when the potential between the positive and negative charges becomes too great, a discharge of electricity (lightning) occurs.

In-cloud lightning occurs between the positive charges near the top of the cloud and the negative charges near the bottom. Cloud to cloud lightning occurs between the positive charges near the top of the cloud and the negative charges near the bottom of a second cloud. Cloud to ground lightning is the most dangerous. In summertime, most cloud to ground lightning occurs between the negative charges near the bottom of the cloud and positive charges on the ground.

According to NOAA's National Weather Service, lightning reportedly kills an average of 80 people per year in the United States, in addition to an average of 300 lightning injuries per year. Most lightning deaths and injuries occur outdoors with 45% of lightning casualties occurring in open fields and ballparks, 23% under trees, and 14% involving water activities. Only 15 lightning-related fatalities occurred in Connecticut between 1959 and 2005, and only one occurred between 1998 and 2007. Most recently, on June 8, 2008, lightning struck a pavilion at Hammonasset Beach in Madison, Connecticut, injuring five and killing one.

Thunderstorms occur 18 to 35 days each year in Connecticut. According to a report by meteorologist Joe Furey on Fox 61 News, 2008 was an abnormal year for thunderstorms, with 20 days of thunderstorm activity occurring by the end of July. In general, thunderstorms in Connecticut are more frequent in the western and northern parts of the state, and less frequent in the southern and eastern parts. Although lightning is usually associated with thunderstorms, it can occur on almost any day. The likelihood of lightning strikes in the Middlebury area is very high during any given thunderstorm, although no single area of the Town is at higher risk of lightning strikes.

Downbursts

A downburst is a severe localized wind blasting down from a thunderstorm. They are more common than tornadoes in Connecticut. These "straight line" winds are distinguishable from tornadic activity by the pattern of destruction and debris.

Depending on the size and location of these events, the destruction to property may be significant.

It is difficult to find statistical data regarding frequency of downburst activity. However, downburst activity is, on occasion, mistaken for tornado activity in Connecticut, indicating that it is a relatively uncommon yet persistent hazard. The risk to the Town of Middlebury is believed to be low to moderate for any given year.

Downbursts may be categorized as ***microbursts*** (affecting an area less than 2.5 miles in diameter) or ***macrobursts*** (affecting an area at least 2.5 miles in diameter).

Hail

Hailstones are chunks of ice that grow as updrafts in thunderstorms keep them in the atmosphere. Most hailstones are smaller in diameter than a dime, but stones weighing more than a pound have been recorded. While crops are the major victims of hail, it is also a hazard to vehicles and property.

Hailstorms typically occur in at least one part of Connecticut each year during a severe thunderstorm. As with thunderstorms, hailstorms are more frequent in the northwest and western portions of the state, and less frequent in the southern and eastern portions. Overall, the risk of at least one hailstorm occurring in the Town of Middlebury is moderate in any given year.

5.3 Historic Record

The National Climatic Data Center (NCDC) lists 13 tornado events in New Haven County since 1950. This includes one F4 rated tornado, two F3 rated tornadoes, three F2 rated tornadoes, three F1 rated tornadoes, two F0 rated tornadoes, and two undefined

tornadoes. Property damages from tornados in the County totaled approximately 280 million dollars. Table 5-3 lists the tornado events for New Haven County.

**Table 5-3
Tornado Events in New Haven County Since 1950**

Date	Fujita Tornado Scale	Property Damage	Wind Speed
October 24, 1955	F2	\$3,000	113 – 157 mph
August 29, 1959	F-	\$0	Unknown
May 24, 1962	F3	\$2,500,000	158 – 206 mph
July 29, 1971	F3	\$250,000	158 – 206 mph
September 18, 1973	F2	\$0	113 – 157 mph
July 28, 1982	F1	\$3,000	73 – 112 mph
July 10, 1989	F2	\$25,000,000	113 – 157 mph
July 10, 1989	F4	\$250,000,000	207 – 260 mph
May 29, 1995	F-	\$10,000	Unknown
May 29, 1995	F1	\$50,000	73 – 112 mph
July 23, 1995	F0	\$0	40 – 72 mph
July 3, 1996	F1	\$2,000,000	73 – 112 mph
May 31, 2002	F0	\$0	40 – 72 mph

A limited selection of summer storm damage in and around the Town of Middlebury, taken from the NCDC Storm Events database, is listed below:

- ❑ October 21, 1995 – A squall line generated thunderstorms that downed several trees and power lines throughout New Haven County. Vehicles were also damaged by the falling trees.
- ❑ July 15, 1997 – Severe thunderstorms produced high winds, hail, and heavy rain throughout New Haven County. High winds downed trees and power lines in the neighboring Town of Southbury, and lightning struck one house in that Town.
- ❑ May 29, 1998 – Severe thunderstorms produced high winds that downed trees onto power lines between Middlebury and Wolcott.
- ❑ June 30, 1998 – During the afternoon and evening, severe thunderstorms produced high winds including three weak tornadoes, large hail, and frequent lightning across the state.

- ❑ July 24, 1999 – A severe thunderstorm moved east across Northern New Haven County, producing high winds which resulted in downed trees and power lines throughout the area.
- ❑ September 16, 1999 – In addition to the flooding damages described in Section 3.3, the remnants of Tropical Storm Floyd also produced wind gusts up to 60 miles per hour in New Haven County. The high winds caused widespread downing of trees and power lines. Significant power outages were reported.
- ❑ June 27, 2000 – Severe thunderstorms brought about high winds which downed tree limbs in the adjacent Town of Southbury.
- ❑ June 26, 2002 – As a severe thunderstorm moved northeast and the Town of Middlebury Police reported dime-sized hail.
- ❑ August 21, 2004 – Trees were downed in many of Middlebury's surrounding towns as a result of thunderstorms accompanied by 50 mph wind gusts.
- ❑ July 28, 2006 – Severe thunderstorms produced high winds up to 50 mph that downed many trees and power lines across the state.
- ❑ August 3, 2006 – A cluster of severe thunderstorms moved east across the area. High winds downed trees and power lines.
- ❑ June 5, 2007 – Hail accumulation of up to one inch deep was reported and car windshields were damaged throughout the area. Hail up to 1.75 inches in diameter and damaging winds accompanied the severe thunderstorms. The Connecticut DOT plowed the roadways to clear hail accumulation.
- ❑ July 19, 2007 – Trees and power lines were downed in the neighboring Town of Southbury. Severe weather, including flooding rains, occurred throughout the area.
- ❑ July 19, 2008 – Many trees were downed throughout the neighboring Town of Southbury as a result of numerous thunderstorms which developed across the area.

5.4 Existing Programs, Policies, and Mitigation Measures

Warning is the primary method of existing mitigation for tornadoes and thunderstorm-related hazards. Tables 5-4 and 5-5 list the National Oceanic and Atmospheric

Administration (NOAA) Watches and Warnings, respectively, as pertaining to actions to be taken by emergency management personnel in connection with summer storms and tornadoes.

**Table 5-4
NOAA Weather Watches**

Weather Condition	Meaning	Actions
Severe Thunderstorm	Severe thunderstorms are possible in your area.	Notify personnel, and watch for severe weather.
Tornado	Tornadoes are possible in your area.	Notify personnel, and be prepared to move quickly if a warning is issued.
Flash Flood	It is possible that rains will cause flash flooding in your area.	Notify personnel to watch for street or river flooding.

**Table 5-5
NOAA Weather Warnings**

Weather Condition	Meaning	Actions
Severe Thunderstorm	Severe thunderstorms are occurring or are imminent in your area.	Notify personnel and watch for severe conditions or damage (i.e. downed power lines and trees. Take appropriate actions listed in town emergency plans.
Tornado	Tornadoes are occurring or are imminent in your area.	Notify personnel, watch for severe weather and ensure personnel are protected. Take appropriate actions listed in emergency plans.
Flash Flood	Flash flooding is occurring or imminent in your area.	Watch local rivers and streams. Be prepared to evacuate low-lying areas. Take appropriate actions listed in emergency plans.

Aside from warnings, several other methods of mitigation for wind damage are employed in the Town of Middlebury. Continued location of utilities underground is an important method of reducing wind damage to utilities and the resulting loss of services. The Connecticut Building Codes include guidelines for Wind Load Criteria that are specific to

each municipality, as explained in Section 4.0. In addition, specific mitigation measures address debris removal and tree trimming.

A ***severe thunderstorm watch*** is issued by the National Weather Service when the weather conditions are such that a severe thunderstorm (damaging winds 58 miles per hour or more, or hail three-fourths of an inch in diameter or greater) is likely to develop.

A ***severe thunderstorm warning*** is issued when a severe thunderstorm has been sighted or indicated by weather radar.

In the Town of Middlebury, the Town is responsible for tree

branch removal and maintenance of any tree which crosses through the imaginary plane extending vertically from the Town's property line. Homeowners and local utilities are responsible for tree branch removal and maintenance on private properties. In addition, all new developments in the Town must place utilities underground wherever possible.

Municipal responsibilities relative to tornado mitigation and preparedness include:

- ☐ Developing and disseminating emergency public information and instructions concerning tornado safety.
- ☐ Providing sources of guidance regarding in-home protection and evacuation procedures, and locations of public shelters.
- ☐ Designate appropriate shelter space in the community that could potentially withstand tornado impact.
- ☐ Periodically test and exercise tornado response plans.
- ☐ Put emergency personnel on standby at tornado 'watch' stage.

5.5 **Vulnerabilities and Risk Assessment**

The central and southern portions of the United States are at higher risk for lightning and thunderstorms than is the northeast. However, more deaths from lightning occur on the East Coast than elsewhere, according to FEMA. Lightning-related fatalities have declined in recent years due to increased education and awareness.

Most thunderstorm damage is caused by straight-line winds exceeding 100 mph. Straight-line winds occur as the first gust of a thunderstorm or from the downburst from a thunderstorm, and have no associated rotation. The Town of Middlebury is particularly susceptible to damage from high winds due to its high elevation and heavily treed landscape.

Heavy winds can take down trees near power lines, leading to the start and spread of fires. Such fires can be extremely dangerous during the summer months during dry and drought conditions. Most downed powerlines in Middlebury are detected quickly and any associated fires are quickly extinguished. However, it is important to have adequate water supply for the possibility of a spreading fire to ensure this level of safety is maintained.

5.6 Potential Mitigation Measures, Strategies, and Alternatives

Both the FEMA and the NOAA websites contain valuable information regarding preparing for and protecting oneself during a tornado, as well as information on a number of other natural hazards. Available information from FEMA includes:

More information is available at:

FEMA – <http://www.fema.gov/library/>
NOAA – <http://www.nssl.noaa.gov/NWSTornado/>

- ☐ Design and construction guidance for community shelters.
- ☐ Recommendations to better protect from tornado damage for your business, community, and home. This includes construction and design guidelines for business and homes, as well as guidelines for creating and identifying shelters.
- ☐ Ways to better protect property from wind damage.
- ☐ Ways to protect property from flooding damage.
- ☐ Construction of safe rooms within homes.

NOAA information includes a discussion of family preparedness procedures and the best physical locations during a storm event. Although tornadoes pose a legitimate threat to public safety, their occurrence is considered too infrequent to justify the construction of tornado shelters. Residents should be encouraged to purchase a NOAA weather radio containing an alarm feature.

Middlebury's implementation of the CodeRED™ Emergency Notification System is beneficial in warning residents of an impending tornado. A community warning system that relies on radios and television would be less effective at warning residents during the night when the majority of the community is asleep. This fact was evidenced most recently by the severe storm which struck Lake County, Florida on February 2, 2007. This powerful storm that included several tornadoes struck at about 3:15 AM. According to National Public Radio, local broadcast stations had difficulty warning residents due to the lack of listeners and viewers and encouraged those awake to telephone warnings into the affected area.

Specific mitigation steps that can be taken to prevent property damage and protect property are given below.

Prevention

- ☐ Continue or increase tree limb inspection programs to ensure that the potential for downed power lines is minimized.
- ☐ Continue to place utilities underground.
- ☐ Continue to encourage utilities and private homeowners to conduct tree limb inspection and maintenance.

Property Protection

- ☐ Require compliance with the amended Connecticut Building Code for wind speeds.
- ☐ Provide for the Building Department to make literature available during the permitting process regarding appropriate design standards.

5.7 Summary of Recommended Mitigation Measures, Strategies, and Alternatives

The following actions are recommended to mitigate for winds, hail, tornadoes, and downbursts:

- ☐ Continue tree limb maintenance and inspections.
- ☐ Continue outreach regarding dangerous trees on private property.
- ☐ Continue to require that utilities be placed underground in new developments and pursue funding to place them underground in existing developed areas where they are not.
- ☐ Continue to require compliance with the amended Connecticut Building Code for wind speeds.
- ☐ Provide for the Building Department or the Planning or Zoning Commissions to make literature available during the permitting process regarding appropriate design standards.

In addition, important recommendations that apply to all hazards are listed in Section 10.1.

6.0 WINTER STORMS

6.1 Setting

Similar to summer storms and tornadoes, winter storms have the potential to affect any area of the Town of Middlebury. However, unlike summer storms, winter events and the hazards that result (wind, snow, and ice) have more widespread geographic extent. The entire Town of Middlebury is susceptible to winter storms. In general, winter storms are considered highly likely to occur each year (major storms are less frequent), and the hazards that result (nor'easter winds, snow, and blizzard conditions) can potentially have a significant effect over a large area of the Town (refer to Appended Tables 1 and 2).

6.2 Hazard Assessment

This section focuses on those effects commonly associated with winter storms, including those from blizzards, ice storms, heavy snow, freezing rain and extreme cold. Most deaths from winter storms are indirectly related to the storm,

According to the *National Weather Service*, approximately 70% of winter deaths related to snow and ice occur in automobiles, and approximately 25% of deaths occur from people being caught in the cold. In relation to deaths from exposure to cold, 50% are people over 60 years old, 75% are male, and 20% occur

such as from traffic accidents on icy roads and hypothermia from prolonged exposure to cold. Damage to trees and tree limbs and the resultant downing of utility cables are a common effect of these types of events. Secondary effects include loss of power and heat.

The classic winter storm in New England is the nor'easter, which is caused by a warm moist, low pressure system moving up from the south colliding with a cold, dry high pressure system moving down from the north. The nor'easter derives its name from the northeast winds typically accompanying such storms, and such storms tend to produce a

large amount of precipitation. Severe winter storms can produce an array of hazardous weather conditions, including heavy snow, blizzards, freezing rain and ice pellets, and extreme cold. The National Weather Service defines a blizzard as having winds over 35 mph with snow and blowing snow that reduces visibility to less than one-quarter mile for at least three hours.

Connecticut experiences at least one severe winter storm every five years, although a variety of small and medium snow and ice storms occur nearly every winter. The likelihood of a nor'easter occurring in any given winter is therefore considered high, and the likelihood of other winter storms occurring in any given winter is very high.

The Northeast Snowfall Impact Scale (NESIS) was developed by Paul Kocin and Louis Uccellini (Kocin and Uccellini, 2004) and is used by NOAA to characterize and rank high-impact Northeast snowstorms. These storms have wide areas of snowfall with accumulations of ten inches and above. 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 giving an indication of a storm's societal impacts.

NESIS values are calculated within a geographical information system (GIS). 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. Table 6-1 presents the NESIS categories, their corresponding NESIS values, and a descriptive adjective.

Table 6-1
NESIS Categories

Category	NESIS Value	Description
1	1—2.499	Notable
2	2.5—3.99	Significant
3	4—5.99	Major
4	6—9.99	Crippling
5	10.0+	Extreme

6.3 Historic Record

Seven major winter nor'easters have occurred in Connecticut during the past 30 years (in 1979, 1983, 1988, 1992, 1996, 2003, and 2006). The 1992 nor'easter, in particular, caused the third-highest tides ever recorded in Long Island Sound and damaged 6,000 coastal homes. Inland areas received up to four feet of snow. Winter Storm Ginger in 1996 caused up to 27 inches of snow 24 hours and shut down the State of Connecticut for an entire day. The nor'easter which occurred on February 12 and 13, 2006 resulted in 18 to 24 inches of snow across Connecticut and was rated on NESIS as a Category 3 "Major" storm across the northeast. This storm ranked 20th out of 33 major winter storms ranked by NESIS for the northeastern United States since 1956, and produced 21 inches of snow in Seymour and 23 inches of snow in Waterbury.

The most damaging winter storms are not always nor'easters. According to the NCDC, there have been 135 snow and ice events in the State of Connecticut between 1993 and March 2008, causing over \$18 million in damages. Notably, heavy snow in December 1996 caused \$6 million in property damage. Snow removal and power restoration for a winter storm event spanning March 31 and April 1, 1997 cost \$1 million. On March 5, 2001, heavy snow caused \$5 million in damages, followed by another heavy snow event four days later that caused an additional \$2 million in damages. The last documented

winter storm event that qualified as a blizzard was Winter Storm Ginger in January of 1996. These events were recorded for various counties throughout the state.

Catastrophic ice storms are less frequent in Connecticut than the rest of New England due to the close proximity of the warmer waters of the Atlantic Ocean and Long Island Sound. The most severe ice storm in Connecticut on record was Ice Storm Felix on December 18, 1973. This storm resulted in two deaths and widespread power outages throughout the state. An ice storm in November of 2002 that hit Litchfield and western Hartford Counties resulted in \$2.5 million dollars in public sector damages.

Additional examples of recent winter storms to affect New Haven County, taken from the NCDC database, include:

- ❑ March 13 to 14, 1993 – A powerful storm caused blizzard conditions and up to 21 inches of snow in Litchfield County, with less snowfall occurring in New Haven County. 40,000 power outages and \$550,000 in property damage was reported throughout Connecticut.
- ❑ December 23, 1994 – An unusual snow-less late December storm caused gale force winds across the state. The high winds caused widespread power outages affecting up to 130,000 customers statewide. Numerous trees and limbs were blown down, damaging property, vehicles, and power lines to a total of five million dollars in damages. Peak wind gusts of up to 64 miles per hour were reported.
- ❑ January 12, 1995 – Light snow and sleet changed to light freezing rain, coating highways with ice. Up to 200 accidents occurred on state highways.
- ❑ April 9, 1996 – A late winter storm produced heavy wet snow across most of southern Connecticut. The weight of the snow caused numerous trees and powerlines to fall. Snowfall amounts ranged from three to 14 inches across New Haven County.
- ❑ April 1, 1997 – A low pressure system produced morning rain and afternoon wet snow during the afternoon. Strong gusty winds up to 40 mph combined with the wet snow to cause powerlines and trees to fall.

- ❑ December 29, 1997 – A low pressure system produced sustained winds of 30 to 40 mph with gusts up to 59 knots, with damage to trees and power lines reported in the Town of Ansonia and the Borough of Naugatuck.
- ❑ January 15, 1998 – An ice storm caused widespread and numerous traffic accidents across northern New Haven County, with at least one-half inch of ice accumulating on trees and powerlines. Several roads were closed due to severe icing.
- ❑ March 15, 1999 – Light rain changed to wet snow that became heavy overnight, downing numerous tree limbs and powerlines across the region. Snowfall amounts in New Haven County ranged from eight to 11 inches.
- ❑ January 25, 2000 – A winter storm produced up to two inches of snow per hour in northern New Haven County, which changed into sleet and freezing rain as the storm progressed. Snowfall was measured at 6.3 inches in the Town of Beacon Falls and seven inches in the City of Waterbury, and the snow was accompanied by wind gusts up to 45 mph.
- ❑ December 12, 2000 – High winds produced peak wind gusts of up to 58 mph in northern New Haven County, downing many trees onto houses, cars, powerlines, and streets and causing significant property damage and power outages in the Borough of Naugatuck and the City of Waterbury.
- ❑ December 30, 2000 – Heavy snow at rates of one to two inches per hour mixed with high winds to produce near blizzard conditions. 12 inches of snow was reported at the Borough of Naugatuck.
- ❑ February 5, 2001 – A winter storm produced bands of heavy wet snow across New Haven County, with amounts ranging from ten to 20 inches reported. The heavy snow caused numerous fallen tree limbs that snapped powerlines, power outages, and caused many traffic accidents.
- ❑ November 27, 2002 – Bands of heavy snow passed over northern New Haven County, producing seven inches of snow in the Town of Beacon Falls and nine inches in the City of Waterbury.
- ❑ December 5, 2003 – A winter storm produced occasionally heavy snow with accumulations of up to 13 inches in the Town of Oxford. Wind gusts of at least 35

mph combined with the snow to create "white-out" conditions that caused major widespread impacts to mass transit across the entire region.

- ❑ January 28, 2004 – A winter storm produced six inches of snow in the Borough of Naugatuck and eight inches of snow in the City of Waterbury.
- ❑ February 25, 2005 – A winter storm produced snow amounts of five to 10 inches across the state. Approximately six inches were reported as snow accumulation in the area of Middlebury.
- ❑ March 8, 2005 – A strong arctic cold front intensified as it swept across Connecticut, causing rain to change to snow and temperatures to fall from the 40s to the 20s, and produced northwest winds up to 55 mph. Near blizzard conditions occurred for a short time, with snowfall amounts ranging from three to six inches. The sudden drop in temperature resulted in a "flash-freeze" across roads that resulted in hundreds of vehicle accidents.
- ❑ March 12, 2005 – A band of heavy snow oriented from south to north across New Haven County produced snowfall rates in excess of two inches per hour. Snowfall amounts ranged from five to nine inches and totaled at least six inches in the Town of Middlebury.
- ❑ March 24, 2005 – A late winter storm produced six inches of snow in the Town of Beacon Falls.
- ❑ December 9, 2005 – A winter storm produced six to 12 inches of snow across Connecticut. Ten inches were reported in Towns surrounding Middlebury.
- ❑ January 9, 2008 – Gusty winter winds caused a partial collapse of a building under construction in the Town of Oxford.

6.4 Existing Programs, Policies, and Mitigation Measures

Existing programs applicable to flooding and wind are the same as those discussed in Sections 3.0 and 4.0. Programs that are specific to winter storms are generally those related to preparing plows, sand and salt trucks; tree-trimming to protect power lines; and other associated snow removal and response preparations.

It is almost a guarantee that winter storms will occur annually in Connecticut. In response, it is important for municipalities to budget fiscal resources towards snow management. The Town ensures that all warning/notification and communications systems are ready before a storm, and ensures that appropriate equipment and supplies, especially snow removal equipment, are in place and in good working order. The Town also prepares for the possible evacuation and sheltering of some populations which could be impacted by the upcoming storm (especially the elderly and special needs persons).

The Town of Middlebury Department of Public Works runs plowing operations. The Connecticut Department of Transportation plows Interstate 84, Route 64, Route 188, and Route 63. The DPW staff utilizes the fleet of eight trucks which run eight separate routes throughout Town. The staff continues to plow until their route is finished. Upon completion, they return to the DPW building and assess further work. Hills and intersections throughout Middlebury are given more attention than other sections of the roadways. Additionally, the northwest section of Town, which is higher in elevation and has a substantial relief, garners more attention compared to the lesser relief and lower elevation found in the southeastern section of Town.

The Town should continue to discourage the creation of permanent dead-end streets whenever a feasible connection to a through street can be created. This policy presents residents and emergency personnel with two means of egress into neighborhoods. In turn, this ensures that residents will not be cut off from critical facilities during times of need.

6.5 Vulnerabilities and Risk Assessment

As mentioned for summer storms, the heavily treed landscape in close proximity to densely populated residential areas in the Town of Middlebury poses problems in relation to blizzard condition damage. Tree limbs and some building structures may not be suited

to withstand high wind and snow loads. Ice can damage or collapse power lines, render steep gradients impassable for motorists, undermine foundations, and cause "flood" damage from ice freezing water pipes in basements.

In addition, winter storms present additional problems for motorists all over the state. As the population of Connecticut and its dependence on transportation continues to increase, the vulnerability of the state to winter storms also increases. There is a high propensity for traffic accidents during heavy snow and even light icing events. Roads may become impassable, inhibiting the ability of emergency equipment to reach trouble spots and the accessibility to medical and shelter facilities. Stranded motorists, especially senior and/or handicapped citizens, are at particularly high risk of injury or death during a blizzard. After a storm, snow piled on the sides of roadways can inhibit line of sight and reflect a blinding amount of sunlight, making driving difficult. When coupled with slippery road conditions, poor sightlines and heavy glare create dangerous driving conditions.

A few areas in the Town of Middlebury have been identified by Town personnel as having problems with ice during the winter months. Icing causes difficult driving conditions throughout the hillier sections of Town, those roadways in the northwest portion of Town, including White Deer Rock Road, Old Watertown Road, Charcoal Avenue, Breakneck Hill Road, Tranquility Road, and others. These roadways are not easily traveled upon when ice accumulates.

Drifting snow is not as large a problem in Middlebury as other communities, but it still occurs. Problem areas include Route 188 near the police station, and Route 64 near Christian Road and Abbott Farm Road. Drifting snow is mitigated through plowing efforts by the Middlebury Department of Public Works.

6.6 Potential Mitigation Measures, Strategies, and Alternatives

Potential mitigation measures for flooding caused by nor'easters include those presented in Section 3.6. Winter storm mitigation measures must also address blizzard, snow, and ice hazards. These are emphasized below. Note that structural projects are generally not applicable to hazard mitigation for wind, blizzard, snow, and ice hazards.

6.6.1 Prevention

Cold air, wind, snow, and ice cannot be prevented from impacting any particular area. Thus, mitigation should be focused on property protection and emergency services (discussed below) and prevention of damage caused by breakage of tree limbs.

Previous recommendations for tree limb inspections and maintenance in Sections 4.0 and 5.0 are thus applicable to winter storm hazards, as well. As mentioned previously, utilities in Middlebury should continue to be placed underground where possible. This can occur in connection with new development and also in connection with redevelopment work. Underground utilities cannot be damaged by heavy snow, ice, and winter winds.

6.6.2 Property Protection

Property can be protected during winter storms through the use of shutters, storm doors, and storm windows. Where flat roofs are used on structures, snow removal is important as the heavy load from collecting snow may exceed the bearing capacity of the structure. Heating coils may be used to remove snow from flat roofs, and pipes should be adequately insulated to protect against freezing and bursting. All of these recommendations should apply to new construction, although they may also be applied to

existing buildings during renovations. Finally, as recommended in previous sections, compliance with the amended Connecticut Building Code for wind speeds is necessary.

6.6.3 Public Education and Awareness

The public is typically more aware of the hazardous effects of snow, ice, and cold weather than they are with regard to other hazards discussed in this plan. Nevertheless, people are still stranded in automobiles, get caught outside their homes in adverse weather conditions, and suffer heart failure while shoveling during each winter in Connecticut. Public education should therefore focus on safety tips and reminders to individuals about how to prepare for cold and icy weather, including stocking homes, preparing vehicles, and taking care of themselves during winter storms.

6.6.4 Emergency Services

Emergency services personnel and departments such as Police and Fire should identify areas which may be difficult to access during winter storm events and devise contingency plans to continue servicing those areas during moderate storms. The creation of through streets with new developments increases the amount of egress for residents and emergency personnel into neighborhoods.

Available shelters should also be advertised and their locations known to the public prior to a storm event. Finally, mutual aid agreements with surrounding municipalities should be reviewed and updated as necessary to ensure help will be available when needed.

6.7 Summary of Recommended Mitigation Measures, Strategies, and Alternatives

Most of the recommendations in Sections 3.6 and 4.6 for mitigating flooding are suitable for mitigation of flooding caused by winter storms. These are not repeated in this

subsection. The following recommendations are applicable to other aspects of winter storms such as winds, snow, and ice:

- ☐ Continue tree limb maintenance and inspections.
- ☐ Continue to require that utilities be placed underground in new developments.
- ☐ Pursue funding to place them underground in existing developed areas.
- ☐ Review and post evacuation plans to ensure timely migration of people seeking shelter in all areas of the Town of Middlebury.
- ☐ Post a list of Town sheltering facilities and snow plowing prioritization in the Town Hall and on the Town's website so residents can best plan how to access critical facilities during a winter storm event.
- ☐ Continue to encourage two modes of egress into every neighborhood by the creation of through streets.

In addition, important recommendations that apply to all hazards are listed in Section 10.1.

7.0 EARTHQUAKES

7.1 Setting

The entire Town of Middlebury is susceptible to earthquakes. However, even though earthquakes have the potential to occur anywhere both in the Town and in the northeastern United States, the effects may be felt differently in some areas based on the type of geology. In general, earthquakes are considered a hazard that is possible to occur, but that may cause significant effects to a large area of the Town (refer to Appended Table 1).

7.2 Hazard Assessment

An earthquake is a sudden rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and often cause landslides, flash floods, fires, avalanches, and tsunamis. Earthquakes can occur at any time without warning.

The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. The magnitude and intensity of an earthquake is determined by the use of the Richter scale and the Mercalli scale, respectively.

The Richter scale defines the magnitude of an earthquake. Magnitude is related to the amount of seismic energy released at the hypocenter of the earthquake. It is based on the amplitude of earthquake waves recorded on instruments which have a common calibration. The magnitude of an earthquake is thus represented by a single, instrumentally determined value recorded by a seismograph, which record the varying amplitude of ground oscillations.

The magnitude of an earthquake is determined from the logarithm of the amplitude of recorded waves. Being logarithmic, each whole number increase in magnitude represents a tenfold increase in measured strength.

Earthquakes with a magnitude of about 2.0 or less are usually called micro-earthquakes, and are generally only recorded locally. Earthquakes with magnitudes of 4.5 or greater are strong enough to be recorded by seismographs all over the world.

The effect of an earthquake on the Earth's surface is called the intensity. The Modified Mercalli Intensity Scale consists of a series of key responses such as people awakening, movement of furniture, damage to chimneys, and total destruction. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It is an arbitrary ranking based on observed effects.

The following is an abbreviated description of the 12 levels of Modified Mercalli intensity from the USGS.

- I. Not felt except by a very few under especially favorable conditions.
- II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
- III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration similar to the passing of a truck. Duration estimated.
- IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
- V. Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned. Pendulum clocks may stop.
- VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
- VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
- VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
- IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
- X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rail bent.
- XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
- XII. Damage total. Lines of sight and level are destroyed. Object thrown in the air.

Unlike seismic activity in California, earthquakes in Connecticut are not associated with specific known faults. Instead, earthquakes with epicenters in Connecticut are referred to as being intra-plate activity. Bedrock in Connecticut – and New England in general – is

highly capable of transmitting seismic energy; thus, the area impacted by an earthquake in Connecticut can be four to 40 times greater than that of California. In addition, population density is up to 3.5 times greater in Connecticut than in California, potentially putting a greater number of people at risk.

The built environment in Connecticut includes old, non-reinforced masonry that is not seismically designed. Those who live or work in non-reinforced masonry buildings, especially those built on filled land or unstable soils are at the highest risk for injury due to the occurrence of an earthquake.

7.3 **Historic Record**

According to the USGS Earthquake Hazards Program, Connecticut is a region of very minor seismic activity. This assessment is based on lack of historical and instrumental reports of strong earthquakes. However, earthquakes do occur in this region. The New England states regularly register seismic events.

According to the Northeast Region Emergency Consortium, there were 137 recorded earthquakes in Connecticut between 1568 and 1989. The most severe earthquake in Connecticut's history occurred at East Haddam on May 16, 1791. Stone walls and chimneys were toppled during this quake. Additional instances of seismic activity occurring in and around Connecticut includes is provided below, based on information provided in USGS documents, the Connecticut Natural Hazards Mitigation Plan (2007), other municipal hazard mitigation plans, and newspaper articles.

- ❑ A devastating earthquake near Three Rivers, Quebec on February 5, 1663 caused moderate damage in parts of Connecticut.
- ❑ Strong earthquakes in Massachusetts in November 1727 and November 1755 were felt strongly in Connecticut.

- ❑ In April 1837, a moderate tremor occurred at Hartford, causing alarm but little damage.
- ❑ In August 1840, another moderate tremor with its epicenter 10 to 20 miles north of New Haven shook Hartford buildings but caused little damage.
- ❑ In October 1845, an Intensity V earthquake occurred in Bridgeport. An Intensity V earthquake would be approximately 4.3 on the Richter scale.
- ❑ On June 30, 1858, New Haven and Derby were shaken by a moderate tremor.
- ❑ On July 28, 1875, an early morning tremor caused Intensity V damage throughout Connecticut and Massachusetts.
- ❑ The second strongest earthquake to impact Connecticut occurred near Hartford on November 14, 1925. No significant damage was reported.
- ❑ The Timiskaming, Ontario earthquake of November 1935 caused minor damage as far south as Cornwall, Connecticut. This earthquake affected one million square miles of Canada and the United States.
- ❑ An earthquake near Massena, New York in September 1944 produced mild effects in Hartford, Marion, New Haven, and Meriden, Connecticut.
- ❑ An Intensity V earthquake was reported in Stamford in March of 1953, causing shaking but no damage.
- ❑ On November 3, 1968, another Intensity V earthquake in southern Connecticut caused minor damage in Madison and Chester.
- ❑ Recent earthquake activity has been recorded near New Haven in 1988, 1989, and 1990 (2.0, 2.8, and 2.8 in magnitude, respectively), in Greenwich in 1991 (3.0 magnitude), and on Long Island in East Hampton, New York in 1992.
- ❑ The most recent earthquake to occur in Connecticut occurred on March 11, 2008. It was a 2.0 magnitude with its epicenter three miles northwest of the center of Chester.

7.4 Existing Programs, Policies, and Mitigation Measures

The Connecticut Building Codes include design criteria for buildings specific to municipality, as adopted by the Building Officials and Code Administrators (BOCA).

These include the seismic coefficients for building design in the Town of Middlebury. The Town has adopted these codes for new construction and they are enforced by the Town Building Inspector.

Due to the infrequent nature of damaging earthquakes, land use policies in the Town of Middlebury do not specifically address earthquake hazards. However, the Subdivision Regulations of the Town of Middlebury (Section 4.3.21) require that locations of exposed rocks and slopes in excess of twenty-five percent (25%) must be shown on all Construction Plans. Section 9.12.7 of the Road and Drainage Regulations requires that the minimum grade for any street shall be at least 1.0%. The maximum grade shall not exceed 8% for an arterial road and a collector street, 10% for a residential street, and 3% for a turnaround. When necessary, steeper grades may be approved by the Board of Selectmen in situations where the steeper grade is in the best interest to the Town.

Likewise, Sections 7.4, 52.6.3, and 64.2.1 through 64.2.2 of the Middlebury Zoning Regulations cover buffered and setback areas. Section 7.4 states that no buildings or other structure shall extend within less than the minimum set back distances of any street line, rear property line, other property line or Resident District boundary line as specified in the district, subject exceptions and additional limitations. Section 52.6.3 covers buffered areas, which include all setback areas. Buffered areas must be designed to be consistent and compatible with land uses. These regulations can help protect structures from damaging one another or infrastructure if an earthquake should occur.

7.5 Vulnerabilities and Risk Assessment

According to the USGS, Connecticut is at a low risk for experiencing a damaging earthquake. The USGS has determined that the State of Connecticut has a 10% chance that at some point in a 50-year period an earthquake would cause peak acceleration (ground shaking) values of 4% to 8% of the force of gravity. To appreciate why these

values of ground shaking are expressed as a percentage of the force of gravity, note that it requires more than 100% of the force of gravity to throw objects up in the air.

In terms of felt effects and damage, ground motion at the level of several percent of gravity corresponds to the threshold of damage to buildings and houses (an earthquake intensity of approximately V). For comparison, reports of "dishes, windows and doors disturbed" corresponds to an intensity of about IV, or about 2% of gravity. Reports of "some chimneys broken" correspond to an intensity of about VII, or about 10% to 20% of gravity. According to the USGS National Seismic Hazard Mapping Project (2008), an earthquake impacting the Town of Middlebury has a 2% chance of exceeding a peak acceleration of 10-12% of the force of gravity in a 50-year period.

According to the FEMA HAZUS-HM Estimated Annualized Earthquake Losses for the United States (2008) document, FEMA used probabilistic curves developed by the USGS for the National Earthquakes Hazards Reduction Program to calculate Annualized Earthquake Losses (AEL) for the United States. Based on the results of this study, FEMA calculated the AEL for Connecticut to be \$11,622,000. This value placed Connecticut 30th out of the 50 states in terms of AEL. The magnitude of this value stems from the fact that Connecticut has a large building inventory that would be damaged in a severe earthquake, and takes into account the lack of damaging earthquakes in the historical record.

The **AEL** is the expected losses due to earthquakes each year. Note that this number represents a long term average; thus actual earthquake losses may be much greater or non-existent for a particular year.

The current Connecticut Natural Hazard Mitigation Plan (2007) states that "there is a 66% chance that an earthquake of a 2.7 magnitude or greater" will occur in the area of Middlebury. According to the previous Connecticut Natural Hazard Mitigation Plan (2004), the State of Connecticut Department of Emergency Management notes the chance that a damaging earthquake of magnitude 5.0 or greater will occur within the state in any one year is 5%, and that the odds of an earthquake of magnitude 6.0 are about one in 300

each year. Therefore, the Town of Middlebury is unlikely to experience a damaging earthquake in any given year. This belief is reinforced by the timeline and damages recorded in the historical record presented in Section 7.3.

Surficial earth materials behave differently in response to seismic activity. Unconsolidated materials such as sand and artificial fill can amplify the shaking associated with an earthquake. In addition, artificial fill material

Liquefaction is a phenomenon in which the strength and stiffness of a soil are reduced by earthquake shaking or other rapid loading. It occurs in soils at or near saturation, especially the finer textured soils.

has the potential for liquefaction. When liquefaction occurs, the strength of the soil decreases and the ability of soil to support building foundations and bridges is reduced. Increased shaking and liquefaction can cause greater damage to buildings and structures, and a greater loss of life.

As explained in Section 2.3, only a few areas of the Town of Middlebury are underlain by sand and gravel of glacial meltwater origin. Figure 2-5 depicts surficial materials in the Town. Structures in these areas are at increased risk from earthquakes due to amplification of seismic energy and/or collapse. The best mitigation for future development in areas of sandy material may be application of the most stringent building codes, or possibly the prohibition of certain types of new construction. However, because these areas are coincident with floodplains, development should be limited.

The areas that are not at increased risk from unstable soils during an earthquake are the areas in Figure 2-5 underlain by glacial till. Most of the town is covered by glacial till.

Areas of steep slopes can collapse during an earthquake, creating landslides. Seismic activity can also break utility lines, such as water mains, electric and telephone lines, and stormwater management systems. Damage to utility lines can lead to fires, especially in electric gas mains. Dam failure can also pose a significant threat to developed areas

during an earthquake. For this Plan, dam failure has been addressed separately in Section 8.0.

7.6 Potential Mitigation Measures, Strategies, and Alternatives

As earthquakes are difficult to predict and can affect the entire Town of Middlebury, potential mitigation can only include adherence to building codes, education of residents, and adequate planning. The following potential mitigation measures have been identified:

- ☐ Consider preventing new residential development in areas prone to collapse.
- ☐ Continue regulating development on or near slopes.
- ☐ Continue to require adherence to the state building codes.
- ☐ Ensure that municipal departments have adequate backup facilities in case earthquake damage occurs to municipal buildings.

In addition, important recommendations that apply to all hazards are listed in Section 10.1.

8.0 DAM FAILURE

8.1 Setting

Dam failures can be triggered suddenly, with little or no warning, from other natural disasters such as floods and earthquakes. Dam failures often occur during flooding when the dam breaks under the additional force of floodwaters. In addition, a dam failure can cause a chain reaction where the sudden release of floodwaters causes the next dam downstream to fail.

With 24 registered dams and potentially several other minor dams in the Town, dam failure can occur almost anywhere in The Town of Middlebury. While flooding from a dam failure generally has a medium geographic extent, the effects are potentially catastrophic. Fortunately, a major dam failure is considered only a possible natural hazard event in any given year (refer to Appended Table 2).

8.2 Hazard Assessment

The Connecticut DEP administers the statewide Dam Safety Program, and designates a classification to each state-registered dam based on its potential hazard.

- ❑ *Class AA* dams are negligible hazard potential dams that upon failure would result in no measurable damage to roadways, land and structures, and negligible economic loss.
- ❑ *Class A* dams are low hazard potential dams that upon failure would result in damage to agricultural land and unimproved roadways, with minimal economic loss.
- ❑ *Class BB* dams are moderate hazard potential dams that upon failure would result in damage to normally unoccupied storage structures, damage to low volume roadways, and moderate economic loss.

- ❑ *Class B* dams are significant hazard potential dams that upon failure would result in possible loss of life, minor damage to habitable structures, residences, hospitals, convalescent homes, schools, and the like, damage or interruption of service of utilities, damage to primary roadways, and significant economic loss.
- ❑ *Class C* dams are high potential hazard dams that upon failure would result in loss of life and major damage to habitable structures, residences, hospitals, convalescent homes, schools, and main highways with great economic loss.

As of 1996, there were 24 DEP-registered dams within the Town of Middlebury. According to the DEP data from 1996 and the 2007 updated "high hazard dam" data, 12 dams are listed as being Class A, seven as being Class BB, two as being Class B, and three as undefined. The list of Class B and C dams was updated by the DEP in 2007. The registered dams in Middlebury are listed in Table 8-1.

This section discusses only the possible effects of failure of significant and high hazard dams (Class B and C dams). Failure of a Class C dam has the potential for loss of life and property damage totaling millions of dollars; fortunately, none are located in Middlebury. Failure of a Class B dam has the potential for loss of life and minor damage to property and critical facilities. Both Class B dams are shown on Figure 8-1. Inundation areas are not depicted, as they have not been delineated or are not available for either waterway downstream of the Class B dams.

Table 8-1
Dams Registered with the DEP in the Town of Middlebury

Number	Name	Class
8101	Quassapaug Dam	B
8103	Little Tracy's Pond Dam	B
8109	Turtle Pond Dam	BB
8104	Miry Pond Dam #2	BB
8105	Abbott's Pond Dam	BB
8111	Fenn Pond Dam	BB
8106	Lake Elise Dam	BB
8102	Summit Pond Dam	BB
8110	Larkin Pond Dam	BB
8108	Sperry Pond Dam	A
8130	Atwood Pond Dam	A
8114	Jenusaitis Dam	A
8132	Miry Pond Dam #1	A
8120	Hetzel Dam	A
8117	Regan Pond Dam	A
8112	Pakovitch Pond Dam #2	A
8126	Pakovitch Pond Dam #1	A
8121	Avalon Farm Pond Dam	A
8127	Larkin Pond #2 Dam	A
8128	Turtle Pond Dam	A
8129	YMCA Pond Dam	A
8131	Sandy Hill Pond Dam	Undefined
8125	Biosky Pond Dam	Undefined
8107	Long Meadow Pond Dam	Undefined

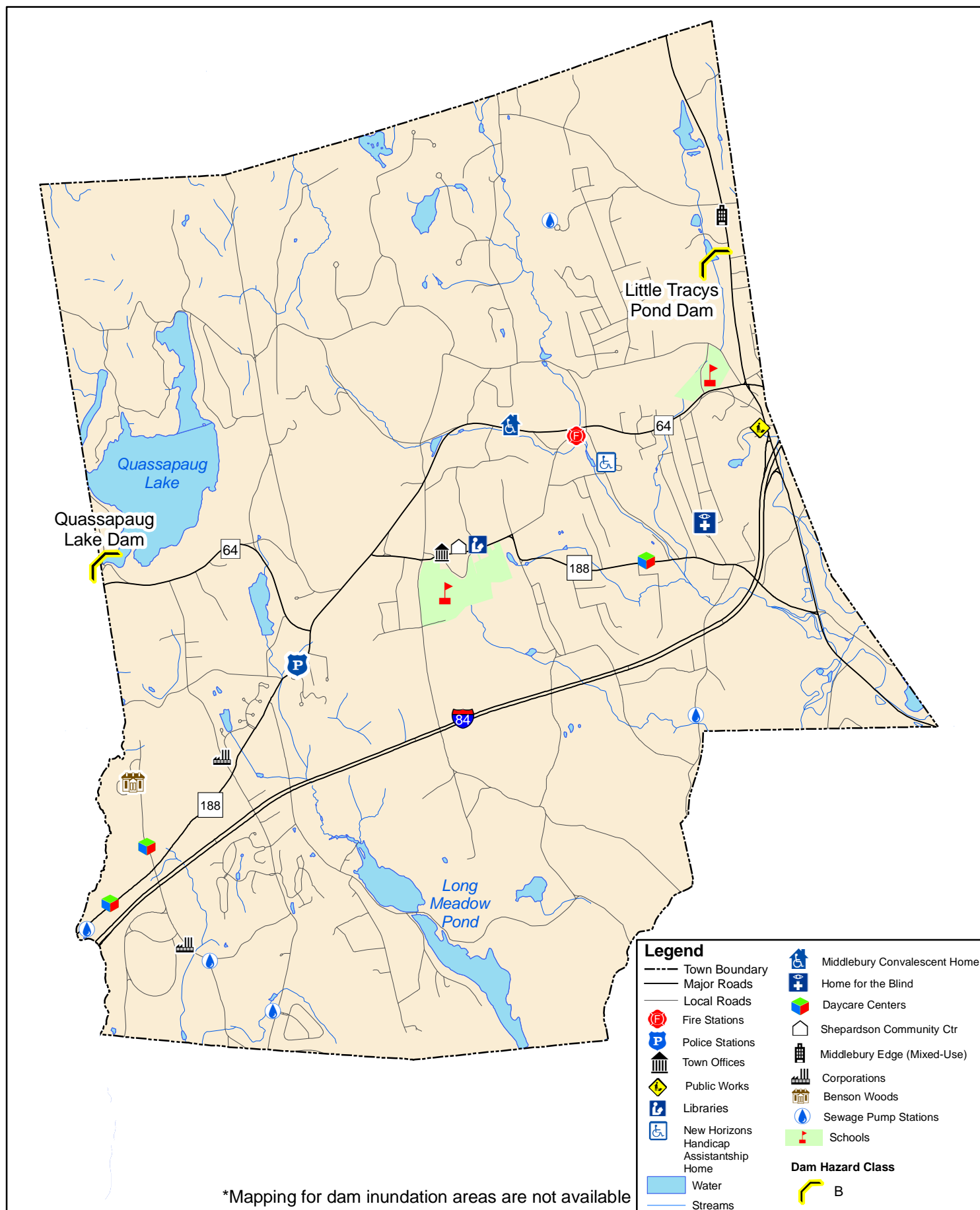
Note: As of October 1, 2007, there were two Class B Dams and no Class C Dams registered with the CT DEP in the Town of Middlebury.

8.3 Historic Record

Approximately 200 notable dam and reservoir failures occurred worldwide in the twentieth century. More than 8,000 people died in these disasters. The following are the most catastrophic dam failures in Connecticut recent history:

- ❑ 1938 and 1955: Exact numbers of dam failures caused by these floods are unavailable, but Connecticut DEP believes that more dams were damaged in these events than in the 1982 or 2005 flooding events described below.

Figure 8-1: High Hazard Dams in Middlebury



*Mapping for dam inundation areas are not available



- ❑ 1961: Crystal Lake dam in Middletown failed, injuring three and severely damaging 11 homes.
- ❑ 1963: Failure of the Spaulding Pond Dam in Norwich caused six deaths and six million dollars in damage (1963 dollars).
- ❑ June 5-6, 1982: Connecticut experienced a severe flood that caused 17 dams to fail and seriously damaged 31 others. Failure of the Bushy Hill Pond Dam in Deep River caused \$50 million in damages, and the remaining dam failures caused nearly \$20 million in damages.

More recently, the NCDC reports that flash flooding on April 16, 1996 caused three small dams in Middletown and one in Wallingford to breach. The Connecticut DEP reported that the sustained heavy rainfall from October 7 to 15, 2005 caused 14 complete or partial dam failures and damage to 30 other dams throughout the State. A sample of damaged dams is summarized in Table 8-2.

Table 8-2
Dams Damaged Due to Flooding from October 2005 Storms

Number	Name	Location	Class	Damage Type	Ownership
-----	Somerville Pond Dam	Somers	--	Partial Breach	DEP
4701	Windsorville Dam	East Windsor	BB	Minor Damage	Private
10503	Mile Creek Dam	Old Lyme	B	Full Breach	Private
-----	Staffordville Reservoir #3	Union	--	Partial Breach	CT Water Co.
8003	Hanover Pond Dam	Meriden	C	Partial Breach	Meriden
-----	ABB Pond Dam	Bloomfield	--	Minor Damage	Private
4905	Springborn Dam	Enfield	BB	Minor Damage	DEP
13904	Cains Pond Dam	Suffield	A	Full Breach	Private
13906	Schwartz Pond Dam	Suffield	BB	Partial Breach	Private
14519	Sessions Meadow Dam	Union	BB	Minor Damage	DEP

No major dam failures have occurred in the Town of Middlebury. According to Town personnel, the dams throughout Town are in varying stages of condition. Most notably in poor condition is the Long Meadow Pond dam on Long Meadow Pond, although the class is undefined for this dam. According to a hydrology report developed by Wengell, McDonald & Costello, Inc. in 2006, the Long Meadow Pond dam is a concrete structure

consisting of a central spillway and secondary spillways on either side of the central spillway. The central spillway is fitted with wooden weir boards, and some of them are reportedly missing.

The following paragraphs provide a description and highlight the general condition of both of the Class B dams based on information in the FEMA FIS and information available at the Connecticut DEP:

- ❑ Quassapaug Lake Dam – This Class B earthen dam with a stone masonry outlet owned by the West Shore Owners Association, Inc. was last repaired and modified in 1992. At that time, repairs were made to the outlet and to the embankment. A Dam Failure Analysis has not been developed for this dam.
- ❑ Little Tracy's Pond Dam – This Class B dam with a ten foot embankment and a 30 foot wide, concrete lined spillway is owned by the Turnpike Office Park LLC. The dam was last repaired in 1988 when there was a crack in the spillway. A Dam Failure Analysis has not been developed for this dam.

8.4 **Existing Programs, Policies, and Mitigation Measures**

The dam safety statutes are codified in Section 22a-401 through 22a-411 inclusive of the Connecticut General Statutes. Sections 22a-409-1 and 22a-409-2 of the Regulations of Connecticut State Agencies, have been enacted which govern the registration, classification, and inspection of dams. Dams must be registered by the owner with the DEP, according to Connecticut Public Act 83-38.

Dams regulated by the DEP are designed to pass the 100-year rainfall event with one foot of freeboard, a factor of safety against overtopping.

Critical and high hazard dams are required to meet a design standard greater than the 100-year rainfall event.

Dam Inspection Regulations require that over 600 dams in Connecticut be inspected annually. The DEP currently prioritizes inspections of those dams which pose the greatest potential threat to downstream persons and properties. Dams found to be unsafe under the inspection program must be repaired by the owner. Depending on the severity of the identified deficiency, an owner is allowed reasonable time to make the required repairs or remove the dam. If a dam owner fails to make necessary repairs to the subject structure, the DEP may issue an administrative order requiring the owner to restore the structure to a safe condition and may refer noncompliance with such an order to the Attorney General's Office for enforcement. As a means of last resort, the DEP Commissioner is empowered by statute to remove or correct, at the expense of the owner, any unsafe structures which present a clear and present danger to public safety.

Owners of Class C dams are required to maintain emergency operations plans. Therefore emergency operations plans are not formally required for any dams in Middlebury.

8.5 Vulnerabilities and Risk Assessment

By definition, failure of Class C dams may cause catastrophic loss of life and property. There are no Class C dams registered with the Connecticut DEP in the Town of Middlebury, but the two Class B dams and the undefined Long Meadow Pond Dam are of concern.

Class B Dams in Middlebury

Both Class B dams described in Section 8.3 can present an issue to residents of Middlebury. Little Tracy's Pond Dam has not been repaired since 1988 and the Quassapaug Lake Dam has not been repaired since 1992. Both dams could benefit from inspection in the near future. Densely-populated areas are located downstream of Little Tracy's Pond Dam, including some areas in Middlebury that are already prone to flooding along Regan Road, Porter Avenue, and Steinmann Avenue.

The Quassapaug Lake Dam is close to the Woodbury municipal boundary, and the reach of Eightmile River immediately downstream of the dam is in Woodbury. Further downstream, the river forms the boundary between the Towns of Middlebury and Southbury, and then between the Towns of Southbury and Oxford. Thus, failure of the dam would be a concern for several communities.

Other Dams in Middlebury

Town personnel have indicated that the Long Meadow Pond Dam is in poor condition and is in need of repairs. Understanding the condition of the dam and determining the best course of action, if needed, should be considered a priority along with both Class B dams. As stated above, the central spillway is fitted with wooden weir boards, and some of them are reportedly missing. Given the dam's location at the municipal boundary with the Town of Oxford, and the fact that all downstream areas are located in Oxford and the Borough of Naugatuck, the failure of the dam would be of greater concern for Oxford and Naugatuck.

8.6 *Potential Mitigation Measures, Strategies, and Alternatives*

The Dam Safety Section of the DEP Inland Water Resources Division is charged with the responsibility for administration and enforcement of Connecticut's dam safety laws. The existing statutes require that permits be obtained to construct, repair, or alter dams, and that existing dams be registered and periodically inspected to assure that their continued operation does not constitute a hazard to life, health, or property.

Although Emergency Operations Plans and Dam Failure Analyses are only required for significant and high hazard dams, they should be developed for Class B and other dams when possible, if interest is strong within downstream vulnerable areas. This would include participation from the Towns of Woodbury, Oxford, and Southbury downstream

of the Quassapaug Lake Dam, and the Town of Oxford and the Borough of Naugatuck downstream of the Long Meadow Pond Dam.

Development of an Emergency Operations Plan is recommended for Little Tracy's Pond Dam, as it would identify specific means of monitoring the dam and warning downstream residents under potential emergency situations.

Both Class B dams in Town should be regularly inspected by their respective owners, along with regular maintenance as required to keep the dams in safe and functional order.

The Towns of Woodbury, Oxford, and Southbury should cooperate with the Town of Middlebury's efforts to address repairs to Quassapaug Lake Dam if needed. Likewise, the Town of Oxford and the Borough of Naugatuck should cooperate with the Town of Middlebury's efforts to address repairs to Long Meadow Pond Dam if needed.

The Town of Middlebury should consider implementing occasional Town inspections of Class BB, A, AA, and unranked dams. The Town's inventory and familiarity with all known dams within Middlebury is important to maintain safe and functional working order of all dams.

The Town should consider including dam failure areas in its CodeRED™ emergency notification system. This technology should be used to warn downstream residents of a potential or impending dam failure and facilitate evacuation.

In addition, there are several suggested potential mitigation strategies which are applicable to all hazards in this plan. These are outlined in Section 10.1.

9.0 WILDFIRES

9.1 Setting

The ensuing discussion about wildfires is focused on the undeveloped wooded and shrubby areas of Middlebury, along with low-density suburban type development found at the margins of these areas known as the wildland interface. Structural fires in higher density areas of the Town are not considered.

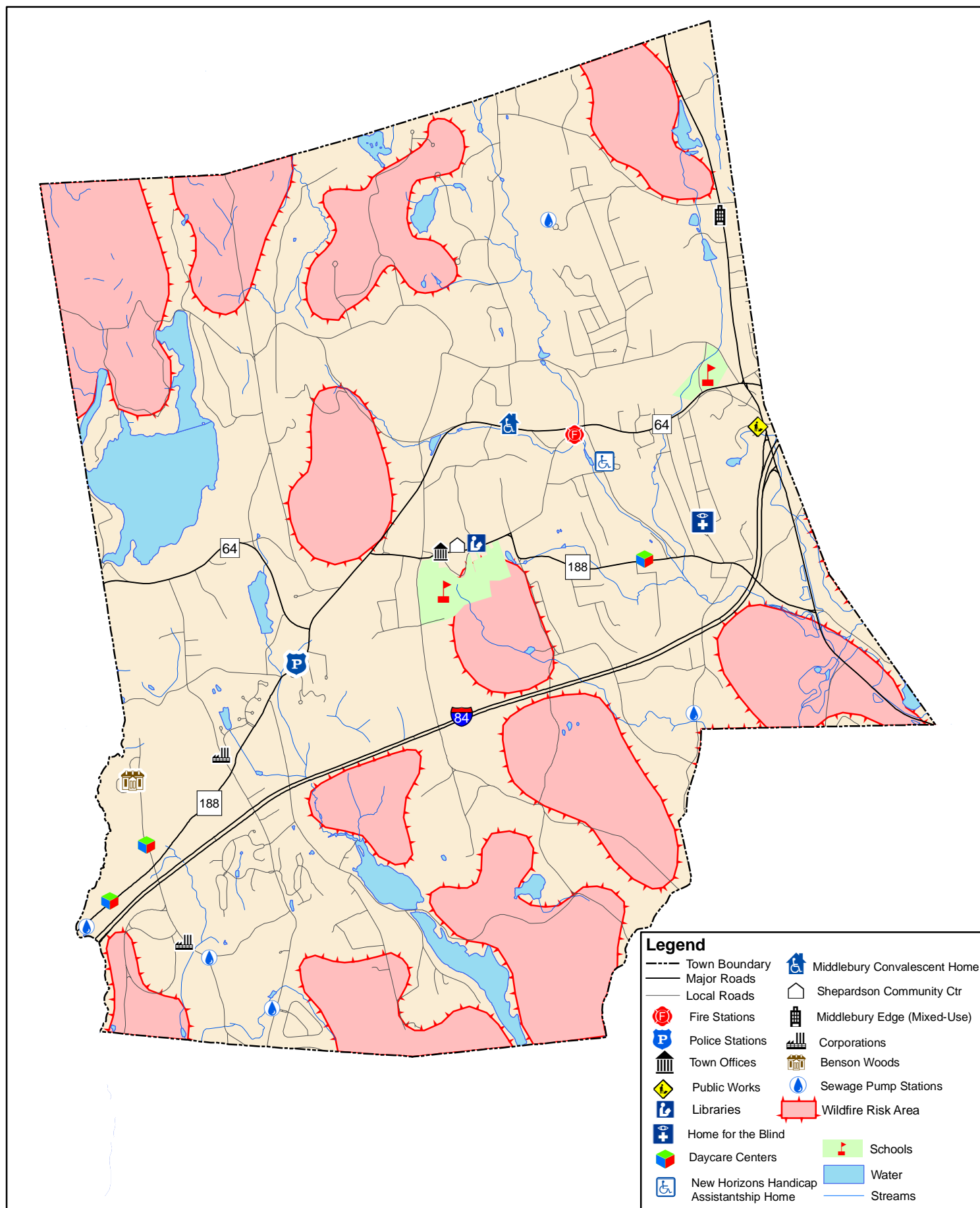
The Town of Middlebury is considered a low-risk area for wildfires. Wildfires are of particular concern in wooded areas and other areas with poor access for fire-fighting equipment. Figure 9-1 depicts wildfire risk areas for the Town of Middlebury. Hazards associated with wildfires include property damage and loss of habitat. Wildfires are considered a likely event each year, but should they occur are generally contained to a small range with limited damage to non-forested areas.

9.2 Hazard Assessment

Wildfires are well-defined by the Massachusetts Hazard Mitigation Plan as being "highly destructive, uncontrollable fires." Although the term brings to mind images of tall trees engulfed in flames, wildfires can occur as brush and shrub fires, especially under dry conditions. Wildfires are also known as "wildland fires."

Nationwide, humans have caused approximately 90% of all wildfires in the last decade. Accidental and negligent acts include unattended campfires, sparks, burning debris, and irresponsibly discarded cigarettes. The remaining 10% of fires are caused mostly by lightning.

Figure 9-1: Middlebury Wildfire Risk Area



Nevertheless, wildfires are also a natural process, and their suppression is now recognized to have created a larger fire hazard, as live and dead vegetation accumulates in areas where fire has been prevented. In addition, the absence of fire has altered or disrupted the cycle of natural plant succession and wildlife habitat in many areas. Consequently, federal, state and local agencies are committed to finding ways, such as prescribed burning to reintroduce fire into natural ecosystems, while recognizing that fire fighting and suppression are still important.

Connecticut has a particular vulnerability to fire hazards where urban development and wildland areas are in close proximity. The "wildland/urban interface" is where many such fires are fought. Wildland areas are subject to fires because of weather conditions and fuel supply. An isolated wildland fire may not be a threat, but the combined effect of having residences, businesses, and lifelines near a wildland area causes increased risk to life and property. Thus, a fire that might have been allowed to burn itself out with a minimum of fire fighting or containment in the past is now fought to prevent fire damage to surrounding homes and commercial areas, as well as smoke threats to health and safety in these areas.

9.3 Historic Record

According to the Connecticut Natural Hazard Mitigation Plan (2007), Connecticut enacted its first state-wide forest fire control system in 1905, when the state was largely rural with very little secondary growth forest. By 1927, the state had most of the statutory foundations for today's forest fire control programs and policies in place, such as the State Forest Fire Warden system, a network of fire lookout towers and patrols, and regulations regarding open burning. The severe fire weather in the 1940's prompted the state legislature to join the Northeastern Interstate Forest Fire Protection Compact with its neighbors in 1949. Today, most of Connecticut's forested areas are secondary growth forests. According to the Connecticut DEP, forest has reclaimed over 500,000 acres of land that was used for agriculture in 1914. However, that new forest has been

fragmented in the past few decades by residential development. The urban/wildland interface is increasing each year as sprawl extends further out from Connecticut's cities.

The technology used to combat wildfires has significantly improved since the early 20th century. An improved transportation network, coupled with advances in firefighting equipment, communication technology, and training, has improved the ability of firefighters to minimize damage due to wildfires in the state. For example, radio and cellular technologies have greatly improved fire fighting command capabilities.

According to the Climate of 2008 Wildfire Season Summary presented by the NCDC, an average of 4.6 million acres per year in the United States was burned by wildfires since 1985. This translates to a nationwide mean of 60 acres per fire (at a mean of approximately 77,000 fires per year). The number one cause of wildfires is arson, with about half of all wildfires being intentionally set.

Wildfire statistics for Connecticut are much lower than the national average. According to the USDA Forest Service Annual Wildfire Summary Report for 1994 through 2003, an average of 600 acres per year in Connecticut was burned by wildfires during this period. In general, the fires are small and detected quickly, with most wildfires being contained to less than 10 acres in size.

Traditionally, the highest forest fire danger in Connecticut occurs in the spring from mid-March to mid-May. The worst wildfire year in Connecticut since 1994 occurred during the extremely hot and dry summer of 1999. Over 1,733 acres of Connecticut burned in 345 separate wildfires, an average of about five acres per fire. Only one wildfire occurred between 1994 and 2003 that burned over 300 acres, and a wildfire in 1986 in the Mattatuck State Forest in the nearby Town of Watertown burned 300 acres.

According to the Middlebury Volunteer Fire Department web site, nine "wildland fires" were reported in Middlebury from December 2006 through June 2007, and three were

reported from July 2007 through November 2007, for a total of 12 in one 12-month period. Most of these incidents were minor.

On April 18, 2008, the Middlebury Volunteer Fire Department responded to a brush fire near 25 Lakeview Court, in the southern portion of Middlebury. Upon arrival, it was determined that there were actually two fires burning at the same time, approximately 500 feet from one other. The first was a relatively small fire, but the second was a rapidly spreading brush fire with an area of nearly one acre.

The smaller fire was extinguished by crews from Engine 4, while the larger fire was extinguished by crews from Engine 3 and Engine 6. When the fire outran the reach of the Engine 3 booster line, forestry hose from Engine 6 was utilized to penetrate deeper into the woods to bring the remaining fire under control.



Photo courtesy of the Middlebury Volunteer Fire Department

Engine crews remained on the scene to rake the entire perimeter of the fire with fire rakes, and to extinguish any remaining hot spots. More than 1,000 gallons of water were used to extinguish this fire. Subsequent to the event, the Fire Department reminded the public that brush fires can be more taxing to firefighters than structure fires due to the

hardships associated with navigating uneven terrain while wearing fire gear and hauling heavy hose lines around trees and rocks. Additional photographs from this incident can be found in Appendix B.

The day after the fire in Middlebury, a 30-acre wildfire occurred in the adjacent Town of Oxford. These two events underscore the propensity of fire hazards to occur in the spring season when dry conditions prevail, before abundant leafy vegetation is present.

9.4 Existing Programs, Policies, and Mitigation Measures

The Town of Middlebury requires that development more distant than one mile by way of a public street to a reliable, year-round source of water, needs to include the installation of either a precast concrete tank or a fire pond with dry hydrant. The location needs to be accessible in all weather conditions and a fire truck needs to have the ability to draw/pump water. This would include those locations exceeding one mile by public roadway from year-round surface water sources or locations having the same distance from the Heritage Village Water Company (HVWC), the Connecticut Water Company (CWC), and the Westover Water Company's (WWC) existing service areas. HVWC and CWC are provided with fire suppression by way of a one-million gallon water tank located at the end of Cedar Road in the southern part of Town, and a water tower located south of Ferndale Avenue in the eastern part of Town.

The sizing of tanks and fire ponds is specified by the Board of Selectman, following consultation with the Fire Chief. At minimum, fire protection tanks need to be at least 10,000 gallons in capacity, while fire ponds need to have a right-of-way at least 30 feet in width. All fire ponds need to be constructed in accordance with the standards and practices of the U.S. Department of Agriculture, Soil Conservation Service. These requirements are outlined in Section 10.1.1 through Section 10.1.4 of Middlebury's Road and Drainage Regulations and Section 5.6 of the Subdivision Regulations. The

redundancy in different sets of regulations underscores the Town's concerns regarding fire mitigation.

In addition, new roads and subdivisions are required to allow for fire truck access and are required to be at least at least 28 feet in width. Residential streets must be paved at least 28 feet in width, while arterial roads and collector streets must be paved 36 feet across.

Mitigation for wildland fire control is also focused on Fire Department training and maintaining an adequate supply of equipment. Unlike wildfires on the west coast of the United States where the fires are allowed to burn toward development and then stopped, the Middlebury Volunteer Fire Department has a proactive approach to go to the sources of the fires. This proactive approach of going on the offense is believed to be effective for controlling wildfires. The Middlebury Volunteer Fire Department has within its fleet a four-by-four brush truck and a four-wheel drive tanker truck which is capable of carrying water to remote fires.

As explained in Section 3.4, the Town of Middlebury provides informational pamphlets free of charge related to citizen preparedness for natural hazard events. These pamphlets include *"Preparing Makes Sense. Get Ready Now"* by the U.S. Department of Homeland Security and *"Disaster Preparedness Coloring Book"* by FEMA and distributed by Connecticut DEHMS, available at the Shepardson Community Center. An additional activity book for children entitled "Sesame Street Fire Safety Station" by FEMA and pertaining to fire safety is also available at the Shepardson Community Center.

9.5 Vulnerabilities and Risk Assessment

The most common causes of wildfires are arson, lightning strikes, and electrical fires from downed trees hitting electrical lines. Thus, wildfires have the potential to occur anywhere and at any time in both undeveloped and lightly developed areas. The extensive forests and fields covering the state are prime locations for a wildfire. In many

areas, structures and subdivisions are built abutting forest borders, creating areas of particular vulnerability. Wildfires are more common in rural areas than in developed areas, as most fires in populated areas are quickly noticed and contained. The likelihood of a severe wildfire developing is lessened by the vast network of water features in the state, which create natural breaks likely to stop the spread of a fire. During long periods of drought, these natural features may dry up, increasing the vulnerability of the state to wildfires.

According to the Connecticut DEP, the actual forest fire risk in Connecticut is low due to several factors. First, the overall incidence of forest fires is very low. Secondly, as the wildfire/forest fire prone areas become fragmented due to development, the local fire departments have increased access to those neighborhoods for firefighting equipment. Third, the problematic interface areas are site specific such as driveways too narrow to permit emergency vehicles. Finally, trained fire fighters at the local and state level are readily available to fight fires in the state, and inter-municipal cooperation on such instances is common.

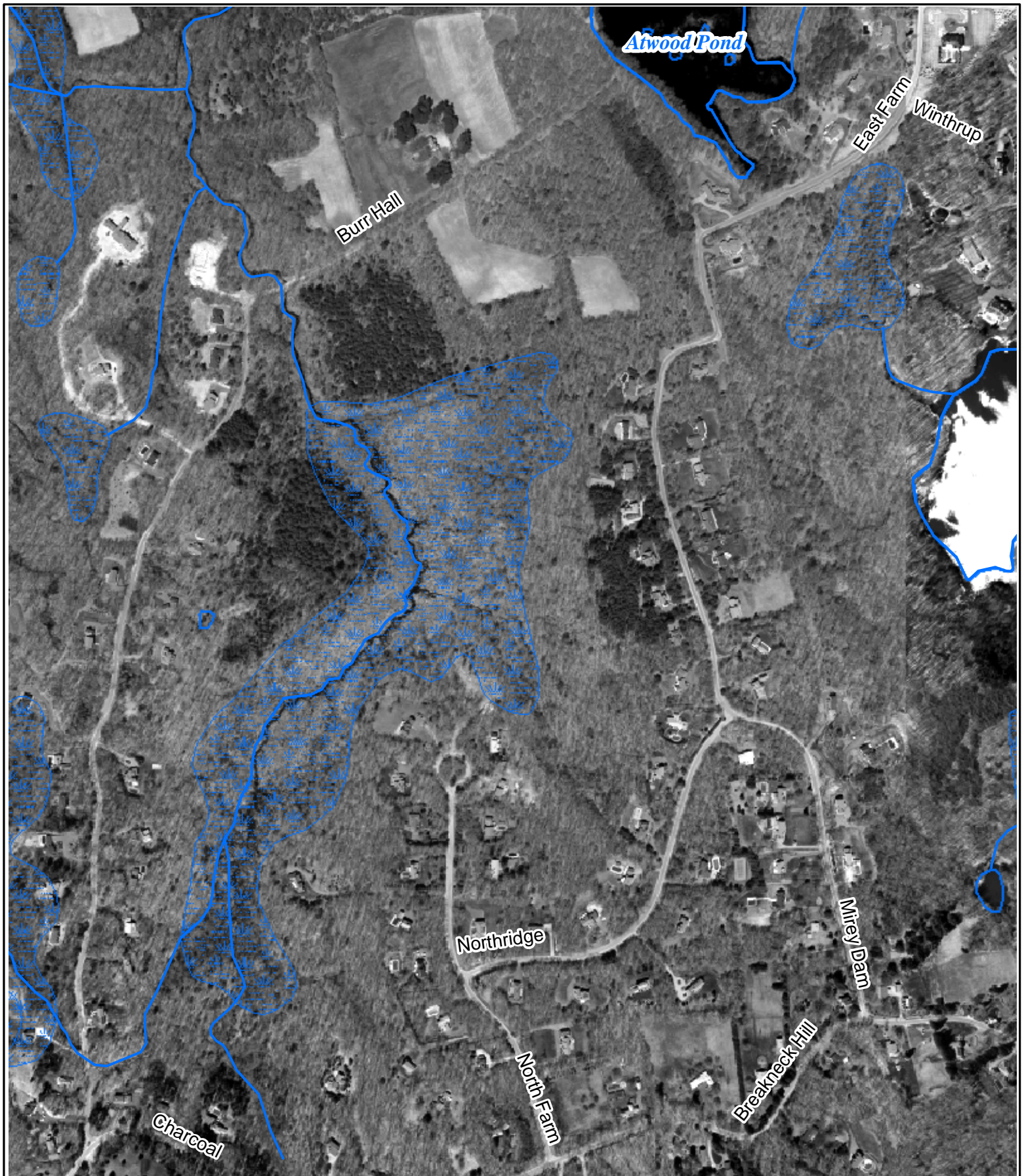
Based on the historic record presented in Section 9.3, most wildfires in Connecticut are relatively small. In the drought year of 1999, the average wildfire burned five acres. In comparison, the most extreme wildfires recorded since 1986 each burned 300 acres. Given the availability of fire fighting water in the Town (including the use of nearby water bodies) and the proactive stance regarding fires, it is believed that the low end of this acreage is possible in Middlebury as well, with the larger acreage reserved for very infrequent severe events.

The wildfire risk areas presented in Figure 9-1 were defined as being contiguous wooded areas greater than 50 acres in size that have limited access in areas near public water service, and contiguous wooded areas greater than 30 acres in size with limited access in the remainder of the Town. These areas are generally associated with state-owned forests, land trust property, and Town owned open space. As each area borders

residential sections of the Town, residents within these risk areas are most vulnerable to fire, heat, and smoke effects of wildfires. The following specific problem areas are notable:

- ❑ Brush fires are a concern south of Interstate 84 near Wooster Road and east of Long Meadow Pond due to limited access in close proximity to the power lines. Brush fires are also a concern southwest of Hop Brook Lake near Allerton Farms Road.
- ❑ Brush fires are especially dangerous north of Lake Quassapaug. Limited accessibility and high concentrations of Mountain Laurel, which produce hazardous fumes when burned, are two conditions characteristic of the area north of Lake Quassapaug. Fires must be fought with self-contained breathing apparatuses, and homes have limited access in and out of the neighborhood in this area.
- ❑ The north-central section of Middlebury (depicted in Figure 9-2) has problems with supplying fire-fighting water. Included in this section of Town are locations to the north end of East Farms Road and locations along Artillery Road, North Farms Road, and Mirey Dam Road. This area is completely without available fire fighting water – either from a surface water source, underground tanks, or a source of community water supply through one of the public water supply companies. Similar concerns are present along Burr Hall Road slightly to the west of East Farms Road.

The Town of Middlebury would like to gain access to Atwood Pond, which lies to the north of East Farm Road in order to establish a dry hydrant. Mirey Dam Pond, located to the west of Falcon Crest Road, is the second highest priority for the establishment of a dry hydrant.



<p>Engineering, Landscape Architecture and Environmental Science</p> <p>MILONE & MACBROOM®</p> <p>99 Realty Drive Cheshire, Connecticut 06410 (203) 271-1773 Fax: (203) 272-9733 www.miloneandmacbroom.com</p>	<p>East Farms Road Wildfire Vulnerability Area</p>		<p>LOCATION: Middlebury, CT</p>	
	<p>MMI#: 2937-02 MXD: H:\Middlebury_Fig 9-2.mxd SOURCE: 2004 CLEAR, CT DEP</p>	<p>N</p> <p>Middlebury Natural Hazard Pre-Disaster Mitigation Plan</p>	<p>Map By: SJB Date: Oct. 2008 Scale: 1:7,200</p>	<p>SHEET: Figure 9-2</p>

- ❑ Finally, a small area in southwest Middlebury may be at increased risk due to the proximity of the Oxford Airport in the neighboring Town of Oxford. The airport primarily caters to corporate jets but can also handle commercial traffic during emergencies. The Triangle Hill subdivision in Middlebury (described in Section 3.5) is located in the runway exclusion zone. While airplanes have not crashed into the Triangle Hill neighborhood, they have crashed in the woods further north of the neighborhood. This area is wooded and an identified area of brush fire concern. The incident of April 18, 2008 described in Section 9.3 occurred in this area.

Recall from Figure 2-6 and Figure 2-8 that the largest population of elderly and disabled persons reside in the east-central part of Middlebury. In comparing these figures with the wildfire risk areas presented in Figure 9-1, it appears unlikely that these segments of the population reside within the wildfire risk areas. Additionally, as seen on Figure 2-9, the majority of critical facilities are located outside the wildfire risk areas presented in Figure 9-1.

In summary, the northern and southern portions of Town are considered most at risk from wildfires. These areas present potential access problems for firefighting purposes in the event of a wildfire due to natural conditions including steep relief, heavily wooded forests, and the lack of water sources. The Town has the support of owners of the open space land to provide access to their lands in the event of a wildfire.

Should a wildfire occur, it is reasonable to estimate that the average area to burn would be five acres, consistent with the state average during long periods of drought. In the case of an extreme wildfire during a long drought on forested lands, it is estimated that up to 300 acres could burn before containment due to the limited access of those lands. Residential areas bordering such lands would also be vulnerable to wildfire, but would likely be more impacted by heat and smoke than by structure fires due to the strong and timely fire response in the Town.

9.6 Potential Mitigation Measures, Strategies, and Alternatives

Potential mitigation measures for wildfires include a mixture of prevention, education, and emergency planning. Fire prevention materials, along with other emergency preparedness materials should continue to be made available at different municipal facilities including the Fire Department, Town Hall, Shepardson Community Center, and the Town website wherever possible. Education of homeowners on methods of protecting their homes is far more effective than trying to steer growth away from potential wildfire areas. This is especially the case since the available land that is environmentally appropriate for development may be forested.

Water system improvements are an important class of potential mitigation for wildfires. It is understood that a major water system expansion and interconnection is planned for central Middlebury, bringing a public water supply of adequate pressure to several critical facilities such as the town hall, the Shepardson Community Center, and Westover School. The interconnection will increase firefighting capabilities from both the Heritage Village Water Company and Connecticut Water Company systems.

The following recommendations are offered to mitigate fire risk:

- ❑ Whenever possible, Connecticut Water Company and Heritage Village Water Company should continue to extend the public water supply systems into areas that require water for fire protection.
- ❑ Connecticut Water Company and Heritage Village Water Company should continue to identify and upgrade those portions of the public water supply systems that are substandard from the standpoint of adequate pressure and volume for fire-fighting purposes, as planned for the central Middlebury area.
- ❑ The Town of Middlebury should continue to require the installation of water tanks or fire ponds with dry hydrants for new developments further than one mile in distance via a public road to a source of fire water supply.

- ❑ The Town of Middlebury should identify and develop sources of fire protection for the vicinity of Burr Hall Road and the north-central section of Middlebury including the north end of East Farms Road and locations along Artillery Road, North Farms Road, and Mirey Dam Road.
- ❑ The Town of Middlebury should explore all possible means of improving accessibility for areas which currently do not have sufficient firefighting access, including the area south of I-84 near Wooster Road and east of Long Meadow Pond and the area north of Lake Quassapaug.

Other potential mitigation strategies for preventing wildfires include:

- ❑ Continue to promote inter-municipal cooperation in firefighting efforts;
- ❑ Continue to support public outreach programs to increase awareness of forest fire danger and how to use common firefighting equipment;
- ❑ Continue reviewing subdivision applications to ensure new neighborhoods and driveways are properly sized to allow access of emergency vehicles;
- ❑ Continue to provide outreach programs on how to properly manage burning and campfires on private property;
- ❑ Distribute copies of a booklet such as "Is Your Home Protected from Wildfire Disaster? – A Homeowner's Guide to Wildfire Retrofit" when developers and homeowners pick up or drop off applications;
- ❑ Patrol Town-owned open space and parks to prevent unauthorized campfires;
- ❑ Enforce regulations and permits for open burning; and
- ❑ Continue to place utilities underground.

In addition, specific recommendations that apply to all hazards are listed in Section 10.1.

10.0 RECOMMENDATIONS

10.1 Additional Recommendations

Recommendations that are applicable to two, three, or four hazards were discussed in the applicable subsections of Sections 3.0 through 9.0. For example, placing utilities underground is a recommendation for hurricane, summer storm, winter storm, and wildfire mitigation. A remaining class of recommendations is applicable to all hazards, because it includes recommendations for improving public safety and planning for emergency response. Instead of repeating these recommendations in section after section of this Plan, these are described herein.

Informing and educating the public about how to protect themselves and their property from natural hazards is essential to any successful hazard mitigation strategy. The Local Emergency Planning Commission should be charged with the creation and/or dissemination of informational pamphlets and guides to public locations such as the library, post office, Shepardson Community Center, and town hall. Such pamphlets include "*Are You Ready? An In-Depth Guide to Citizen Preparedness*" co-published by the American Red Cross, FEMA, and the National Ocean & Atmospheric Administration and includes recommendations for dealing with heat waves, hurricanes, tornadoes, thunderstorms, flooding, fire, and winter storms. Other pamphlets include:

- ☐ "*Food & Water in an Emergency*"
- ☐ "*Disaster Supply Kit*"
- ☐ "*Family Disaster Plan*"
- ☐ "*Preparing for Disaster for People with Disabilities and Other Special Needs*", and
- ☐ "*Helping Children Cope with Disaster*"

In addition, the Town should consider adding pages to its website dedicated specifically to citizen education and preparation for natural hazard events. The town website is already quite sophisticated and the additional information would complement it well.

A community warning system that relies on radios and television is less effective at warning residents during the night when the majority of the community is asleep. Thus the ongoing implementation of CodeRED™ can be a boon for emergency response in the Town of Middlebury. Databases should be set up at best possible for hazards with a specific geographic extent, particularly dam failure. Residents should also be encouraged to purchase a NOAA weather radio containing an alarm feature. In addition, the Town Emergency Operations Plan should continue to be reviewed and updated on a regular basis, at least once annually.

To the extent that critical facilities are needed under all disaster scenarios, prior recommendations related to two of Middlebury's critical facilities are worth repeating here as well. The Fire Station on Tucker Hill Road is adjacent to the Goat Brook and Hop Brook floodplains, and the Department of Public Works is located near an unnamed stream that causes flooding in that area. The Town must strive to keep these two critical facilities operational during the largest of flood events, which is precisely when they will be needed the most. Flood mitigation projects that reduce peak flows along Goat Brook, Hop Brook, and the stream near Woodside Avenue should be prioritized.

10.2 Summary of Specific Recommendations

Recommendations have been presented throughout this document in individual sections as related to each natural hazard. This section lists specific recommendations of the Plan without any priority ranking. Recommendations that span multiple hazards are only reprinted once in this section under the most appropriate hazard event. Refer to the matrix in Appendix A for recommendations with scores based on the STAPLEE methodology described in Section 1.0.

Flooding

Prevention

- ❑ Streamline the permitting process and ensure maximum education of a developer or applicant. Develop a checklist that cross-references the ordinances, regulations, and codes related to flood damage prevention that may be applicable to a proposed project. This list could be provided to an applicant at any Town department.
- ❑ Consider performing a Town-wide inventory of drainage pipes as part of the next Stormwater Management Plan update to help identify undersized and failing portions of the drainage system.
- ❑ Consider joining FEMA's Community Rating System.
- ❑ Continue to require Flood Hazard Area Permits for activities within SFHAs.
- ❑ Consider requiring buildings constructed in flood prone areas to be protected to the highest recorded flood level, regardless of being within a defined SFHA.
- ❑ After Map Mod has been completed, consider restudying local flood prone areas and produce new local-level regulatory floodplain maps using more exacting study techniques, including using more accurate contour information to map flood elevations provided with the FIRM.
- ❑ Given the importance of maintaining the viability of the Fire Station and Department of Public Works during disasters, flood mitigation projects that reduce peak flows along Goat Brook, Hop Brook, and the stream near Woodside Avenue should be prioritized.

Property & Natural Resource Protection

- ❑ Pursue the acquisition of additional municipal open space properties inside SFHAs and set those aside as greenways, parks, or other non-residential, non-commercial or non-industrial use.

- ❑ Selectively pursue conservation recommendations listed in the Plan of Conservation and Development and other studies and documents.
- ❑ Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains.
- ❑ Work with homeowners on Regan Road, Old Regan Road, Ravenwood Drive, Porter Avenue, Steinmann Avenue, and Woodside Avenue to pursue wet floodproofing, dry floodproofing, or elevation of structures. If FEMA funds are to be pursued, a cost-benefit analysis for each home will help determine whether wet floodproofing, dry floodproofing, or elevation of the structure is most appropriate.

Structural Projects

- ❑ Increase the capacity of the Hop Brook culvert where it flows under Watertown Road to prevent future washouts like the one that occurred in 2006.
- ❑ Increase the conveyance capacities of the culverts for the unnamed stream under the intersection of Cemetery Road and Middlebury Road, the culvert beneath Middlebury Road at the end of Steinmann Avenue associated with Long Swamp Brook, and the culvert associated with stream running along and beneath Woodside Avenue.
- ❑ Replace the bridge over Long Meadow Pond on Long Meadow Road in order to mitigate for flooding problems along the local roadway.

Wind Damage Related to Hurricanes, Summer Storms, and Winter Storms

- ❑ Continue to conduct and follow the tree maintenance program currently in place. Continue inspections of trees on all Town property near power lines, Town right-of-ways, and private properties.
- ❑ Continue to promote tree maintenance on private properties when dangerous trees are identified by Town personnel.

- ❑ Increase tree limb maintenance and inspections frequency prior to hurricane/tropical storm season. This is especially important along primary evacuation routes which include Interstate 84, Route 64, Route 63, and Route 188.
- ❑ Secondary priority for tree limb maintenance includes Watertown Road and Old Watertown Road (routes to Watertown), Christian Road (route to Oxford), and Long Meadow Road to South Street (route to Naugatuck).
- ❑ Continue to require that utilities be placed underground in new developments in all possible cases and pursue funding to place them underground in existing developed areas where they are not.
- ❑ Review all evacuation plans to ensure timely migration of people seeking shelter in all areas of Town.
- ❑ Seek to outfit back-up shelters with generators in an effort to make them available for when a large-scale evacuation is needed.
- ❑ Continue to require compliance with the amended Connecticut Building Code for wind speeds.
- ❑ Provide for the Building Department or the Planning or Zoning Commissions to make literature available during the permitting process regarding appropriate design standards.

Winter Storms

- ❑ Post a list of Town sheltering facilities and snow plowing prioritization in the Town Hall and on the Town's website so residents can best plan how to access critical facilities during a winter storm event.
- ❑ Continue to encourage two modes of egress into every neighborhood by the creation of through streets.

Earthquakes

- ❑ Consider preventing new residential development in areas prone to collapse.

- ❑ Continue regulating development on or near slopes.
- ❑ Continue to require adherence to the state building codes.
- ❑ Ensure that municipal departments have adequate backup facilities in case earthquake damage occurs to municipal buildings.

Dam Failure

- ❑ If interest is strong within downstream vulnerable areas, Emergency Operations Plans and Dam Failure Analyses should be developed for Class B and other dams when possible. This would include participation from the Towns of Woodbury, Oxford, and Southbury downstream of the Quassapaug Lake Dam, and the Town of Oxford and the Borough of Naugatuck downstream of the Long Meadow Pond Dam.
- ❑ Develop an Emergency Operations Plan for Little Tracy's Pond Dam, as it would identify specific means of monitoring the dam and warning downstream residents under potential emergency situations.
- ❑ Both Class B dams in Town should be regularly inspected by their respective owners, along with regular maintenance as required to keep the dams in safe and functional order.
- ❑ The Towns of Woodbury, Oxford, and Southbury should cooperate with the Town of Middlebury's efforts to address repairs to Quassapaug Lake Dam if needed. Likewise, the Town of Oxford and the Borough of Naugatuck should cooperate with the Town of Middlebury's efforts to address repairs to Long Meadow Pond Dam if needed.
- ❑ Consider implementing occasional Town inspections of Class BB, A, AA, and unranked dams. The Town's inventory and familiarity with all known dams within Middlebury is important to maintain safe and functional working order of all dams.
- ❑ Consider including dam failure areas in the CodeRED™ emergency notification system. This technology should be used to warn downstream residents of a potential or impending dam failure and facilitate evacuation.

Wildfires

- ❑ Whenever possible, Connecticut Water Company and Heritage Village Water Company should continue to extend the public water supply systems into areas that require water for fire protection.
- ❑ Connecticut Water Company and Heritage Village Water Company should continue to identify and upgrade those portions of the public water supply systems that are substandard from the standpoint of adequate pressure and volume for fire-fighting purposes, as planned for the central Middlebury area.
- ❑ Continue to require the installation of water tanks or fire ponds with dry hydrants for new developments further than one mile in distance via a public road to a source of fire water supply.
- ❑ Identify and develop sources of fire protection for the vicinity of Burr Hall Road and the north-central section of Middlebury including the north end of East Farms Road and locations along Artillery Road, North Farms Road, and Mirey Dam Road.
- ❑ Explore all possible means of improving accessibility for areas which currently do not have sufficient firefighting access, including the area south of I-84 near Wooster Road and east of Long Meadow Pond and the area north of Lake Quassapaug.
- ❑ Continue to promote inter-municipal cooperation in firefighting efforts.
- ❑ Continue to support public outreach programs to increase awareness of forest fire danger and how to use common firefighting equipment.
- ❑ Continue reviewing subdivision applications to ensure new neighborhoods and driveways are properly sized to allow access of emergency vehicles.
- ❑ Continue to provide outreach programs on how to properly manage burning and campfires on private property.
- ❑ Distribute copies of a booklet such as "Is Your Home Protected from Wildfire Disaster? – A Homeowner's Guide to Wildfire Retrofit" when developers and homeowners pick up or drop off applications.
- ❑ Patrol Town-owned open space and parks to prevent unauthorized campfires.
- ❑ Enforce regulations and permits for open burning.

10.3 Sources of Funding

The following sources of funding and technical assistance may be available for the priority projects listed above. This information comes from the FEMA website (<http://www.fema.gov/government/grant/index.shtm>). Funding requirements and contact information is given in Section 11.4.

FEMA (Federal Emergency Management Agency) Grants and Assistance Programs

Buffer Zone Protection Program (BZPP)

<http://www.fema.gov/government/grant/bzpp/index.shtm>

This grant provides security and risk management capabilities at State and local level for Tier I and II critical infrastructure sites that are considered high-risk/high-consequence facilities. Each State with a BZPP site is eligible to submit applications for its local communities to participate in and receive funding under the program. The funding for this grant is based on the number, type, and character of the site.

Citizen Corps Program National Emergency Technology Guard (NET Guard) Pilot Program

<http://www.fema.gov/government/grant/netguard/index.shtm>

The purpose of this grant, under the Homeland Security Act of 2002, is to re-establish a communication network in the event that the current information systems is attacked and rendered inoperable. A total of \$80,000 may be available to each applicant provided they are a locality that meets the required criteria.

Community Disaster Loan Program

http://www.fema.gov/government/grant/fs_cdl.shtm

This program provides funds to any eligible jurisdiction in a designated disaster area that has suffered a substantial loss of tax and other revenue. The assistance is in the form of loans not to exceed 25 percent of the local government's annual operating budget for the fiscal year in which the major disaster occurs, up to a maximum of five million dollars.

Competitive Training Grants Program (CTGP)

<http://www.fema.gov/emergency/ctgp/index.shtm>

Funds allocated from this program will be used to bolster training and education for Homeland Security. Applicants, if funded, must deliver innovative training/education programs to its trainees.

Emergency Food and Shelter Program

<http://www.fema.gov/government/grant/efs.shtm>

This program was created in 1983 to supplement the work of local social service organizations, both private and governmental, to help people in need of emergency assistance.

Emergency Management Performance Grants

<http://www.fema.gov/emergency/empg/empg.shtm>

The Emergency Management Performance Grant (EMPG) is designed to assist local and state governments in maintaining and strengthening the existing all-hazards, natural and man-made, emergency management capabilities. Allocations of this fund is authorized by the 9/11 Commission Act of 2007, and grant amount is determined demographically at the state and local level.

Emergency Operations Center (EOC) Grant Program

<http://www.fema.gov/government/grant/eoc/index.shtm>

The Emergency Operations Center Grant is designated to support the needed construction, renovation or improvement of emergency operation centers at the State, Local, or Tribal governments. The State Administrative Agency (SAA) is the only eligible entity able to apply for the available funding on behalf of qualified State, local, and tribal EOCs.

Flood Mitigation Assistance (FMA) Program

<http://www.fema.gov/government/grant/fma/index.shtm>

The FMA was created as part of the National Flood Insurance Reform Act of 1994 with the goal of reducing or eliminating claims under the NFIP. FEMA provides funds in the form of planning grants for Flood Mitigation Plans and project grants to implement measures to reduce flood losses, including elevation, acquisition, or relocation of NFIP-insured structures. Repetitive loss properties are prioritized under this program. This grant program is administered through the DEP.

Hazard Mitigation Grant Program (HMGP)

<http://www.fema.gov/government/grant/hmgp/index.shtm>

The HMGP provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable

mitigation measures to be implemented during the immediate recovery from a disaster. This grant program is administered through the DEP.

Homeland Security Grant Program (HSGP)

<http://www.fema.gov/government/grant/hsgp/index.shtm>

The objective of the FY 2008 HSGP is to enhance the response, preparedness, and recovery of local, State, and tribal governments in the event of a disaster or terrorist attack. Eligible applicants include all 50 states, the District of Columbia, Puerto Rico, American Samoa, Guam, Northern Mariana Islands, and the Virgin Islands. Risk and effectiveness, along with a peer review, determine the amount allocated to each applicant.

Interoperable Emergency Communications Grant Program

<http://www.fema.gov/government/grant/iecp/index.shtm>

Funding through the Interoperable Emergency Communications Grant Program will enable States, Territories, local units of government, and tribal communities to implement their Statewide Communication Interoperability Plans (SCIP) in conjunction with the National Emergency Communications Plan (NECP) to further enhance interoperability. The only applicants eligible for funding through this grant are State Administration Agencies.

Intercity Bus Security Grant Program (IBSGP)

<http://www.fema.gov/government/grant/ibsgp/index.shtm>

The mission of the IBSGP is to maintain the protection of intercity bus systems and public transportation from terrorism. The only eligible grantees for this program are private operators servicing at least 50 trips annually along fixed established routes.

National Flood Insurance Program (NFIP)

<http://www.fema.gov/library/viewRecord.do?id=3005>

This program enables property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Municipalities that join the associated Community Rating System can gain discounts of flood insurance for their residents.

Pre-Disaster Mitigation Grant Program

<http://www.fema.gov/government/grant/pdm/index.shtm>

The purpose of the PDM program is to fund communities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. PDM grants are provided to states, territories, Indian tribal governments,

communities, and universities, which, in turn, provide sub-grants to local governments. PDM grants are awarded on a competitive basis. This grant program is administered through the DEP.

Port Security Grant Program (PSGP)

<http://www.fema.gov/government/grant/psgp/index.shtm>

The goal of the PSGP is to provide protection of critical port infrastructure from terrorism, involving explosive and non-conventional weapons. Protection includes enhancing training, recovery, prevention, management, response and awareness. Those who may apply include owners of federally regulated terminals, facilities, U.S. inspected passenger vessels, state and local agencies, and local stakeholders.

Public Assistance Grant Program

<http://www.fema.gov/government/grant/pa/index.shtm>

The Public Assistance Grant Program (PA) is designed to assist State, Tribal and local governments, and certain types of private non-profit organizations in recovering from major disasters or emergencies. Along with helping to recover, this grant also encourages prevention against potential future disasters by strengthening hazard mitigation during the recovery process. The first grantee to apply and receive the PA would usually be the State, and the State could then allocate the granted funds to the sub-grantees in need of assistance.

Regional Catastrophic Preparedness Grant Program (RCPGP)

<http://www.fema.gov/government/grant/rcp/index.shtm>

The main focus of RCPGP is to strengthen the national preparedness against any catastrophic event within the designated Tier I and Tier II Urban Areas. RCPGP will fund the designated Tier I and II Urban areas only.

Repetitive Flood Claims Program

<http://www.fema.gov/government/grant/rfc/index.shtm>

The Repetitive Flood Claims (RFC) grant program was set into place to assist States or communities with insured properties that have had prior claims to the National Flood Insurance Program (NFIP) but do not meet the requirements for FMA. This grant is provided to eligible States/Tribes/Territories that, in turn, will allocate sub-grants to local governments.

Severe Repetitive Loss (SRL) Program

<http://www.fema.gov/government/grant/srl/index.shtm>

The SRL provides funding to reduce or eliminate the long-term risk of flood damage to SRL structures insured under the NFIP. This program is for residential properties

only, and eligible project activities include acquisition and demolition or relocation of the structure with conversion of the property to open space, elevation, minor localized flood reduction projects, and dry flood proofing (historic properties only).

Transit Security Grant Program (TSGP)

<http://www.fema.gov/government/grant/tsgp/index.shtm>

The purpose of TSGP is to bolster security and safety for public transit infrastructure within Urban Areas throughout the United States. Applicable grantees include only the state Governor and the designated State Administrative Agency (SAA) appointed to obligate program funds to the appropriate transit agencies.

Trucking Security Program (TSP)

<http://www.fema.gov/government/grant/tsp/index.shtm>

The TSP provides funding for an anti-terrorism and security awareness program for highway professionals in support of the National Preparedness Guidelines. All applicants are accepted so long as they support all four funding priority areas: participant identification and recruitment; training; communications; and information analysis and distribution for an anti-terrorism and security awareness program.

Urban Areas Security Initiative Nonprofit Security Grant Program (UASI-NSGP)

<http://www.fema.gov/government/grant/uasi/index.shtm>

The UASI-NSGP specifically targets major areas of concern, those being areas designated as having the highest level of terrorist threat or vulnerability, and aims to improve the protection and preparedness of potentially targeted organizations. Applicants only include non-profit organizations deemed as having a high risk to terrorism and who reside within the areas of concern.

U.S. Fire Administration

Assistance to Firefighters Grant Program (AFGP)

<http://www.firegrantsupport.com/afg/>

<http://www.usfa.dhs.gov/fireservice/grants/>

The primary goal of the Assistance to Firefighters Grants (AFG) is to meet the firefighting and emergency response needs of fire departments and nonaffiliated emergency medical services organizations. Since 2001, AFG has helped firefighters and other first responders to obtain critically needed equipment, protective gear, emergency vehicles, training, and other resources needed to protect the public and emergency personnel from fire and related hazards. The Grant Programs Directorate of the Federal Emergency Management Agency administers the grants in cooperation with the U.S. Fire Administration.

Fire Prevention & Safety Grants (FP&S)

<http://www.firegrantsupport.com/fps/>

The Fire Prevention and Safety Grants (FP&S) are part of the Assistance to Firefighters Grants (AFG) and are under the purview of the Grant Programs Directorate in the Federal Emergency Management Agency. FP&S grants support projects that enhance the safety of the public and firefighters from fire and related hazards. The primary goal is to target high-risk populations and mitigate high incidences of death and injury. Examples of the types of projects supported by FP&S include fire prevention and public safety education campaigns, juvenile firesetter interventions, media campaigns, and arson prevention and awareness programs.

Reimbursement for Firefighting on Federal Property

<http://www.usfa.dhs.gov/fireservice/grants/rfff/>

Reimbursement may be made to fire departments for fighting fires on property owned by the federal government for firefighting costs over and above normal operating costs. Claims are submitted directed to the U.S. Fire Administration. For more information, please contact Tim Ganley at (301) 447-1358.

Staffing for Adequate Fire & Emergency Response (SAFER)

<http://www.firegrantsupport.com/safer/>

The goal of SAFER is to enhance the local fire departments' abilities to comply with staffing, response and operational standards established by NFPA and OSHA (NFPA 1710 and/or NFPA 1720 and OSHA 1910.134 - see <http://www.nfpa.org/SAFERActGrant> for more details). Specifically, SAFER funds should assist local fire departments to increase their staffing and deployment capabilities in order to respond to emergencies whenever they may occur. As a result of the enhanced staffing, response times should be sufficiently reduced with an appropriate number of personnel assembled at the incident scene. Also, the enhanced staffing should provide that all front-line/first-due apparatus of SAFER grantees have a minimum of four trained personnel to meet the OSHA standards referenced above. Ultimately, a faster, safer and more efficient incident scene will be established and communities will have more adequate protection from fire and fire-related hazards.

Other Grant Programs

Flood Mitigation

- ❑ U.S. Army Corps of Engineers – *50/50 match funding for flood proofing and flood preparedness projects.*
- ❑ U.S. Department of Agriculture – *financial assistance to reduce flood damage in small watersheds and to improve water quality.*
- ❑ CT Department of Environmental Protection – *assistance to municipalities to solve flooding and dam repair problems through the Flood and Erosion Control Board Program.*

Hurricane Mitigation

- ❑ FEMA State Hurricane Program - *financial and technical assistance to local governments to support mitigation of hurricanes and coastal storms.*
- ❑ FEMA Hurricane Program Property Protection – *grants to hurricane prone states to implement hurricane mitigation projects.*

General Hazard Mitigation

- ❑ Americorps – *teams may be available to assist with landscaping projects such as surveying, tree planting, restoration, construction, and environmental education, and provide volunteers to help communities respond to natural hazard-related disasters.*

Erosion Control and Wetland Protection

- ❑ U.S. Department of Agriculture – *technical assistance for erosion control.*
- ❑ CT Department of Environmental Protection – *assistance to municipalities to solve beach erosion problems through the Flood and Erosion Control Board Program.*

- ❑ North American Wetlands Conservation Act Grants Program – *funding for projects that support long term wetlands acquisition, restoration, and/or enhancement. Requires a 1-to-1 funds match.*

11.0 PLAN IMPLEMENTATION

11.1 Implementation Strategy and Schedule

The Council of Governments of the Central Naugatuck Valley is authorized to update this hazard mitigation plan as needed, coordinate its adoption with the Town of Middlebury, and guide it through the FEMA approval process.

The individual recommendations of the hazard mitigation plan must be implemented by the municipal departments that oversee these activities. The Office of the First Selectman and the Department of Public Works in the Town of Middlebury will primarily be responsible for developing and implementing selected projects, while some projects will be implemented by other departments. Appendix A incorporates an implementation strategy and schedule, detailing the responsible department and anticipated time frame for the specific recommendations listed throughout this document.

Upon adoption, the Plan will be made available to all Town departments and agencies as a planning tool to be used in conjunction with existing documents. It is expected that revisions to other Town plans and regulations, such as the Plan of Conservation and Development, department annual budgets, and the Zoning and Subdivision Regulations, will reference this plan and its updates. The Office of the First Selectman will be responsible for ensuring that the actions identified in this plan are incorporated into ongoing Town planning activities, and that the information and requirements of this plan are incorporated into existing planning documents within five years from the date of adoption or when other plans are updated, whichever is sooner.

The Office of the First Selectman will be responsible for assigning appropriate Town officials to update the Plan of Conservation and Development, Zoning Regulations, Subdivision Regulations, Wetlands Regulations, and Emergency Operations Plan to include the provisions in this plan. Should a general revision be too cumbersome or cost

prohibitive, simple addendums to these documents will be added that include the provisions of this plan. The Plan of Conservation and Development and the Emergency Operations Plan are the two documents most likely to benefit from the inclusion of the Plan in the Town's library of planning documents.

Finally, information and projects in this planning document will be included in the annual budget and capital improvement plans as part of implementing the projects recommended in this Plan. This will primarily include the annual budget and capital improvement projects lists maintained and updated by the Department of Public Works.

11.2 Progress Monitoring and Public Participation

The Office of the First Selectman will be the party responsible for monitoring the successful implementation of the Plan as part of his/her oversight of all municipal departments. Such monitoring may include periodic reports to the COGCNV regarding certain projects, meetings, site visits, and telephone calls as befits the project being implemented. The COGCNV will coordinate an annual discussion for review and evaluation of the plan. Participants in this review may include, but need not be limited to, representatives of the departments listed in Section 11.1.

Matters to be reviewed will include the goals and objectives of the original plan, hazards or disasters that occurred during the preceding period, mitigation activities that have been accomplished to date, a discussion of reasons that implementation may be behind schedule, and recommendations for new projects and revised activities. The annual discussion will be conducted in the late summer or autumn, at least three months before the annual application cycle for pre-disaster grants closes. This will enable a list of possible projects to be circulated for Town Departments to review, with sufficient time for developing an application.

Continued public involvement will be sought regarding the monitoring, evaluating, and updating of the Plan. Public input may be solicited through community meetings and input to web-based information gathering tools. Public comment on changes to the Plan may be sought through posting of public notices, and notifications posted to the website of the Council of Governments of the Central Naugatuck Valley, as well as of the Town of Middlebury.

11.3 Updating the Plan

The Town of Middlebury plans to formally update the plan at least once every five years. The COGCNV will remind the Town to formally update the plan within this timeframe. More frequent updates can be accomplished if a consensus to do so is reached by the Board of Selectmen. The COGCNV will update the plan for the Town if the Town of Middlebury submits a request to the COGCNV and secures funding enabling the COGCNV to do so.

To develop the plan update, a committee will be formed consisting of representatives of many of the same departments solicited for input to this plan. In addition, local business leaders, community and neighborhood group leaders, relevant private and non-profit interest groups, and the six neighboring municipalities will be solicited for representation, including the following:

- ❑ The Central Naugatuck Valley Emergency Planning Committee, managed by the COGCNV;
- ❑ Key organizations from the list presented on Pages 1-10;
- ❑ Town of Watertown Public Works Department and Planning Department;
- ❑ Town of Woodbury Public Works Department and Planning Department;
- ❑ Town of Southbury Public Works Department and Planning Department;
- ❑ Town of Oxford Public Works Department and Planning Department;
- ❑ Borough of Naugatuck Public Works Department and Planning Department;

- ❑ City of Waterbury Public Works Department and Planning Department;

Updates may include deleting recommendations as projects are completed, adding recommendations as new hazard impacts arise, or modifying hazard vulnerabilities as land use changes. In addition, the list of shelters and critical facilities should be updated as necessary, or at least every five years.

11.4 Technical and Financial Resources

This Section is comprised of a list of resources to be considered for technical assistance and potentially financial assistance for completion of the actions outlined in this plan. This list is not all-inclusive and is intended to be updated as necessary.

Federal Resources

Federal Emergency Management Agency

Region I
99 High Street, 6th floor
Boston, MA 02110
(617) 956-7506
<http://www.fema.gov/>

Mitigation Division

The Mitigation Division is comprised of three branches that administer all of FEMA's hazard mitigation programs. The **Risk Analysis Branch** applies planning and engineering principles to identify hazards, assess vulnerabilities, and develop strategies to manage the risks associated with natural hazards. The **Risk Reduction Branch** promotes the use of land use controls and building practices to manage and assess risk in both the existing built developments and future development areas in both pre- and post-disaster environments. The **Risk Insurance Branch** mitigates flood losses by providing affordable flood insurance for property owners and by encouraging communities to adopt and enforce floodplain management regulations.

FEMA Programs administered by the Risk Analysis Branch include:

- ❑ *Flood Hazard Mapping Program*, which maintains and updates National Flood Insurance Program maps;
- ❑ *National Dam Safety Program*, which provides state assistance funds, research, and training in dam safety procedures;
- ❑ *National Hurricane Program*, which conducts and supports projects and activities that help protect communities from hurricane hazards; and
- ❑ *Mitigation Planning*, a process for states and communities to identify policies, activities, and tools that can reduce or eliminate long-term risk to life and property from a hazard event.

FEMA Programs administered by the Risk Reduction Branch include:

- ❑ *Hazard Mitigation Grant Program (HMGP)*, which provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration;
- ❑ *Flood Mitigation Assistance Program (FMA)*, which provides funds to assist states and communities to implement measures that reduce or eliminate long-term risk of flood damage to structures insurable under the National Flood Insurance Program;
- ❑ *Pre-Disaster Mitigation Grant Program (PDM)*, which provides program funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event;
- ❑ *Severe Repetitive Loss Program (SRL)*, which provides funding to reduce or eliminate the long-term risk of flood damage to "severe repetitive loss" structures insured under the National Flood Insurance Program;
- ❑ *Community Rating System (CRS)*, a voluntary incentive program under the National Flood Insurance Program that recognizes and encourages community floodplain management activities; and
- ❑ *National Earthquake Hazards Reduction Program (NEHRP)*, which in conjunction with state and regional organizations supports state and local programs designed to protect citizens from earthquake hazard.

The Risk Insurance Branch oversees the *National Flood Insurance Program (NFIP)*, which enables property owners in participating communities to purchase flood insurance. The NFIP assists communities in complying with the requirements of the program and publishes flood hazard maps and flood insurance studies to determine areas of risk.

FEMA also can provide information on past and current acquisition, relocation, and retrofitting programs, and has expertise in many natural and technological hazards. FEMA also provides funding for training state and local officials at Emergency Management Institute in Emmitsburg, Maryland.

The Mitigation Directorate also has in place several *Technical Assistance Contracts (TAC)* that support FEMA, States, territories, and local governments with activities to enhance the effectiveness of natural hazard reduction program efforts. The TACs support FEMA's responsibilities and legislative authorities for implementing the earthquake, hurricane, dam safety, and floodplain management programs. The range of technical assistance services provided through the TACs varies based on the needs of the eligible contract users and the natural hazard programs. Contracts and services include:

- ❑ *The Hazard Mitigation Technical Assistance Program (HMTAP) Contract*-supporting post-disaster program needs in cases of large, unusual, or complex projects; situations where resources are not available; or where outside technical assistance is determined to be needed. Services include environmental and biological assessments, benefit/cost analyses, historic preservation assessments, hazard identification, community planning, training, and more.
- ❑ *The Wind and Water Technical Assistance Contract (WAWTAC)*-supporting wind and flood hazards reduction program needs. Projects include recommending mitigation measures to reduce potential losses to post-FIRM structures, providing mitigation policy and practices expertise to States, incorporating mitigation into local hurricane program outreach materials, developing a Hurricane Mitigation and Recovery exercise, and assessing the hazard vulnerability of a hospital.
- ❑ *The National Earthquake Technical Assistance Contract (NETAC)* – supporting earthquake program needs. Projects include economic impact analyses of various earthquakes, vulnerability analyses of hospitals and schools, identification of and training on non-structural mitigation measures, and evaluating the performance of seismically rehabilitated structures, post-earthquake.

Response & Recovery Division

As part of the National Response Plan, this division provides information on dollar amounts of past disaster assistance including Public Assistance, Individual Assistance, and Temporary Housing, as well as information on retrofitting and acquisition/relocation initiatives. The Response & Recovery Division also provides mobile emergency response support to disaster areas, supports the National Disaster Medical System, and provides urban search and rescue teams for disaster victims in confined spaces.

The division also coordinates federal disaster assistance programs. The Public Assistance Grant Program (PA) that provides 75% grants for mitigation projects to protect eligible damaged public and private non-profit facilities from future damage. "Minimization" grants at 100% are available through the Individuals and Family Grant Program. The Hazard Mitigation Grant Program and the Fire Management Assistance Grant Program are also administered by this division.

Computer Sciences Corporation

New England Regional Insurance Manager
Bureau and Statistical Office
(781) 848-1908

Corporate Headquarters
3170 Fairview Park Drive
Falls Church, VA 22042
(703) 876-1000
<http://www.csc.com/>

A private company contracted by the Federal Insurance Administration as the National Flood Insurance Program Bureau and Statistical Agent, CSC provides information and assistance on flood insurance, including handling policy and claims questions, and providing workshops to leaders, insurance agents, and communities.

Small Business Administration

Region I
10 Causeway Street, Suite 812
Boston, MA 02222-1093
(617) 565-8416
<http://www.sba.gov/>

SBA has the authority to "declare" disaster areas following disasters that affect a significant number of homes and businesses, but that would not need additional assistance through FEMA. (SBA is triggered by a FEMA declaration, however.) SBA can provide additional low-interest funds (up to 20% above what an eligible applicant would "normally" qualify for) to install mitigation measures. They can also loan the cost of bringing a damaged property up to state or local code requirements. These loans can be used in combination with the new "mitigation insurance" under the NFIP, or in lieu of that coverage.

Environmental Protection Agency

Region I
1 Congress Street, Suite 1100
Boston, MA 02114-2023
(888) 372-7341

Provides grants for restoration and repair, and educational activities, including:

- ❑ *Capitalization Grants for State Revolving Funds:* Low interest loans to governments to repair, replace, or relocate wastewater treatment plans damaged in floods. Does not apply to drinking water or other utilities.
- ❑ *Clean Water Act Section 319 Grants:* Cost-share grants to state agencies that can be used for funding watershed resource restoration activities, including wetlands and other aquatic habitat (riparian zones). Only those activities that control non-point pollution are eligible. Grants are administered through the CT DEP, Bureau of Water Management, Planning and Standards Division.

U.S. Department of Housing and Urban Development

20 Church Street, 19th Floor
Hartford, CT 06103-3220
(860) 240-4800
<http://www.hud.gov/>

The U.S. Department of Housing and Urban Development offers *Community Development Block Grants (CDBG)* to communities with populations greater than 50,000, who may contact HUD directly regarding CDGB. One program objective is to improve housing conditions for low and moderate income families. Projects can include acquiring flood prone homes or protecting them from flood damage. Funding is a 100% grant; can be used as a source of local matching funds for other funding programs, such as FEMA's "404" Hazard Mitigation Grant Program. Funds can also be applied toward "blighted" conditions, which is often the post-flood condition. A separate set of funds exists for conditions that create an "imminent threat." The funds have been used in the past to replace (and redesign) bridges where flood damage eliminates police and fire access to the other side of the waterway. Funds are also available for smaller municipalities through the State Administered CDBG program participated in by the State of Connecticut.

U.S. Army Corps of Engineers

Institute for Water Resources
7701 Telegraph Road
Alexandria, VA 22315
(703) 428-8015
<http://www.iwr.usace.army.mil/>

The Corps provides 100% funding for floodplain management planning and technical assistance to states and local governments under the Floodplain Management Services Program (FPMS). Various flood protection measures such as beach re-nourishment, stream clearance and snagging projects, flood proofing, and flood preparedness are funded on a 50/50 matching basis by Section 22 planning Assistance to States

program. They are authorized to relocate homes out of the floodplain if it proves to be more cost effective than a structural flood control measure.

U.S. Department of Commerce

National Weather Service

Northeast River Forecast Center

445 Myles Standish Blvd.

Taunton, MA 02780

(508) 824-5116

<http://www.nws.noaa.gov/>

The National Weather Service prepares and issues flood, severe weather, and coastal storm warnings. Staff hydrologists can work with communities on flood warning issues and can give technical assistance in preparing flood warning plans.

U.S. Department of the Interior

National Park Service

Steve Golden, Program Leader

Rivers, Trails, & Conservation Assistance

15 State Street

Boston, MA 02109

(617) 223-5123

<http://www.nps.gov/rtca/>

The National Park Service provides technical assistance to community groups and local, state, and federal government agencies to conserve rivers, preserve open space, and develop trails and greenways, as well as identify non-structural options for floodplain development.

U.S. Fish and Wildlife Service

New England Field Office

70 Commercial Street, Suite 300

Concord, NH 03301-5087

(603) 223-2541

<http://www.fws.gov/>

The U.S. Fish and Wildlife Service provide technical and financial assistance to restore wetlands and riparian habitats through the North American Wetland Conservation Fund and Partners for Wildlife programs. It also administers the *North American Wetlands Conservation Act Grants Program*, which provides matching grants to organizations and individuals who have developed partnerships to carry out wetlands

projects in the United States, Canada, and Mexico. Funds are available for projects focusing on protecting, restoring, and/or enhancing critical habitat.

U.S. Department of Agriculture

Natural Resources Conservation Service (formerly SCS)

Connecticut Office

344 Merrow Road, Suite A

Tolland, CT 06084-3917

(860) 871-4011

The Natural Resources Conservation Service provides technical assistance to individual land owners, groups of landowners, communities, and soil and water conservation districts on land-use and conservation planning, resource development, stormwater management, flood prevention, erosion control and sediment reduction, detailed soil surveys, watershed/river basin planning and recreation, and fish and wildlife management. Financial assistance is available to reduce flood damage in small watersheds and to improve water quality. Financial assistance is available under the Emergency Watershed Protection Program; the Cooperative River Basin Program; and the Small Watershed Protection Program.

Regional Resources

Northeast States Emergency Consortium

1 West Water Street, Suite 205

Wakefield, MA 01880

(781) 224-9876

<http://www.serve.com/NESEC/>

The Northeast States Emergency Consortium (NESEC) develops, promotes, and coordinates "all-hazards" emergency management activities throughout the Northeast. NESEC works in partnership with public and private organizations to reduce losses of life and property. They provide support in areas including interstate coordination and public awareness and education, along with reinforcing interactions between all levels of government, academia, non-profit organizations, and the private sector.

State Resources

Connecticut Department of Economic and Community Development

505 Hudson Street
Hartford, CT 06106-7106
(860) 270-8000
<http://www.ct.gov/ecd/>

The Connecticut Department of Economic and Community Development administers HUD's State CDBG Program, awarding smaller communities and rural areas grants for use in revitalizing neighborhoods, expanding affordable housing and economic opportunities, and improving community facilities and services.

Connecticut Department of Environmental Protection

79 Elm Street
Hartford, CT 06106-5127
(860) 424-3000
<http://www.dep.state.ct.us/>

The Connecticut DEP includes several divisions with various functions related to hazard mitigation:

Bureau of Water Management, Inland Water Resources Division - This division is generally responsible for flood hazard mitigation in Connecticut, including administration of the National Flood Insurance Program. Other programs within the division include:

- ❑ *National Flood Insurance Program State Coordinator*: Provides flood insurance and floodplain management technical assistance, floodplain management ordinance review, substantial damage/improvement requirements, community assistance visits, and other general flood hazard mitigation planning including the delineation of floodways.
- ❑ *State Hazard Mitigation Officer (shared role with the Department of Emergency Management and Homeland Security)*: Hazard mitigation planning and policy; oversight of administration of the Hazard Mitigation Grant Program, Flood Mitigation Assistance Program, and Pre-Disaster Mitigation Program. Has the responsibility of making certain that the Natural Hazard Mitigation Plan is updated every 3 years.
- ❑ *Flood Warning and Forecasting Service*: Prepares and issues flood, severe weather, and coastal storm warnings. Staff engineers and forecaster can work with communities on flood warning issues and can give technical assistance in

preparing flood warning plans. This service has helped the public respond much faster in flooding condition.

- ❑ *Flood & Erosion Control Board Program:* Provides assistance to municipalities to solve flooding, beach erosion and dam repair problems. Have the power to construct and repair flood and erosion management systems. Certain non-structural measures that mitigate flood damages are also eligible. Funding is provided to communities that apply for assistance through a Flood & Erosion Control Board on a non-competitive basis.
- ❑ *Stream Channel Encroachment Line Program:* Similar to the NFIP, this state regulatory program places restrictions on the development of floodplains along certain major rivers. This program draws in environmental concerns in addition to public safety issues when permitting projects.
- ❑ *Inland Wetlands and Watercourses Management Program:* Provides training, technical and planning assistance to local Inland Wetlands Commissions, reviews and approves municipal regulations for localities. Also controls flood management and natural disaster mitigations.
- ❑ *Dam Safety Program:* Charged with the responsibility for administration and enforcement of Connecticut's dam safety laws. Regulates the operation and maintenance of dams in the state. Permits the construction, repair or alteration of dams, dikes or similar structures and maintains a registration database of all known dams statewide. This program also operates a statewide inspection program.
- ❑ *Rivers Restoration Grant Program:* Administers funding and grants under the Clean Water Act involving river restoration, and reviews and provides assistance with such projects.

Bureau of Water Management - Planning and Standards Division - Administers the Clean Water Fund and many other programs directly and indirectly related to hazard mitigation including the Section 319 non-point source pollution reduction grants and municipal facilities program which deals with mitigating pollution from wastewater treatment plants.

Office of Long Island Sound Programs (OLISP) - Administers the Coastal Area Management Act (CAM) program and Long Island Sound License Plate Program.

Connecticut Department of Emergency Management and Homeland Security

25 Sigourney Street, 6th Floor

Hartford, CT 06106-5042

(860) 256-0800

<http://www.ct.gov/demhs/>

DEMHS is the lead agency responsible for emergency management. Specifically, responsibilities include emergency preparedness, response & recovery, mitigation, and an extensive training program. DEMHS is the state point of contact for most FEMA grant and assistance programs. DEMHS administers the Earthquake and Hurricane programs described above under the FEMA resource section. Additionally, DEMHS operates a mitigation program to coordinate mitigation throughout the state with other government agencies.

Connecticut Department of Public Safety

1111 Country Club Road

Middletown, CT 06457

(860) 685-8190

<http://www.ct.gov/dps/>

Office of the State Building Inspector - The Office of the State Building Inspector is responsible for administering and enforcing the Connecticut State Building Code, and is also responsible for the municipal Building Inspector Training Program.

Connecticut Department of Transportation

2800 Berlin Turnpike

Newington, CT 06131-7546

(860) 594-2000

<http://www.ct.gov/dot/>

The Department of Transportation administers the federal Intermodal Surface Transportation Efficiency Act (ISTEA) that includes grants for projects which promote alternative or improved methods of transportation. Funding through grants can often be used for projects with mitigation benefits such as preservation of open space in the form of bicycling and walking trails. CT DOT is also involved in traffic improvements and bridge repairs which could be mitigation related.

Private and Other Resources

The Association of State Floodplain Managers (ASFPM)

2809 Fish Hatchery Road, Suite 204
Madison, WI 53713
(608) 274-0123
<http://www.floods.org/>

ASFPM is a professional association of state employees that assist communities with the NFIP with a membership of over 1,000. ASFPM has developed a series of technical and topical research papers, and a series of Proceedings from their annual conferences. Many "mitigation success stories" have been documented through these resources, and provide a good starting point for planning.

Institute for Business & Home Safety

4775 East Fowler Avenue
Tampa, FL 33617
(813) 286-3400
<http://www.ibhs.org/>

A non-profit organization put together by the insurance industry to research ways of reducing the social and economic impacts of natural hazards. The Institute advocates the development and implementation of building codes and standards nationwide and may be a good source of model code language.

Multidisciplinary Center for Earthquake Engineering and Research (MCEER)

University at Buffalo
State University of New York
Red Jacket Quadrangle
Buffalo, New York 14261
(716) 645-3391
<http://mceer.buffalo.edu/>

A source for earthquake statistics, research, and for engineering and planning advice.

The National Association of Flood & Stormwater Management Agencies (NAFSMA)

1301 K Street, NW, Suite 800 East
Washington, DC 20005
(202) 218-4122
<http://www.nafsma.org>

NAFSMA is an organization of public agencies who strive to protect lives, property, and economic activity from the adverse impacts of stormwater by advocating public policy, encouraging technology, and conducting educational programs. NAFSMA is a voice in national politics on water resources management issues concerning stormwater management, disaster assistance, flood insurance, and federal flood management policy.

National Emergency Management Association (NEMA)

P.O. Box 11910
Lexington, KY 40578
(859)-244-8000
<http://www.nemaweb.org/>

A national association of state emergency management directors and other emergency management officials, the NEMA Mitigation Committee is a strong voice to FEMA in shaping all-hazard mitigation policy in the nation. NEMA is also an excellent source of technical assistance.

Natural Hazards Center

University of Colorado at Boulder
482 UCB
Boulder, CO 80309-0482
(303) 492-6818
<http://www.colorado.edu/hazards/>

The Natural Hazards Center includes the Floodplain Management Resource Center, a free library and referral service of the ASFPM for floodplain management publications. The Natural Hazards Center is located at the University of Colorado in Boulder. Staff can use keywords to identify useful publications from the more than 900 documents in the library.

New England Flood and Stormwater Managers Association, Inc. (NEFSMA)

c/o MA DEM
100 Cambridge Street
Boston, MA 02202

NEFSMA is a non-profit organization made up of state agency staff, local officials, private consultants and citizens from across New England. NEFSMA sponsors seminars and workshops and publishes the NEFSMA News three times per year to bring the latest flood and stormwater management information from around the region to its members.

Volunteer Organizations - Volunteer organizations including the American Red Cross, the Salvation Army, Habitat for Humanity, and the Mennonite Disaster Service are often available to help after disasters. Service Organizations such as the Lions Club, Elks Club, and the Veterans of Foreign Wars are also available. Habitat for Humanity and the Mennonite Disaster Service provide skilled labor to help rebuild damaged buildings while incorporating mitigation or flood proofing concepts. The office of individual organizations can be contacted directly, or the FEMA Regional Office may be able to assist.

Flood Relief Funds - After a disaster, local businesses, residents and out-of-town groups often donate money to local relief funds. They may be managed by the local government, one or more local churches, or an ad hoc committee. No government disaster declaration is needed. Local officials should recommend that the funds be held until an applicant exhausts all sources of public disaster assistance, allowing the funds to be used for mitigation and other projects than cannot be funded elsewhere.

Americorps - Americorps is the recently installed National Community Service Organization. It is a network of local, state, and national service programs that connects volunteers with nonprofits, public agencies, and faith-based and community organizations to help meet our country's critical needs in education, public safety, health, and the environment. Through their service and the volunteers they mobilize, AmeriCorps members address critical needs in communities throughout America, including helping communities respond to disasters. Some states have trained Americorps members to help during flood-fight situations, such as by filling and placing sandbags.

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APPENDED TABLES

Appended Table 1 Hazard Event Ranking

Each hazard may have multiple effects; for example, a hurricane causes high winds and inland flooding. Some hazards may have similar effects; for example, hurricanes and earthquakes may cause dam failure.

Natural Hazards	Location	Frequency of Occurrence	Magnitude / Severity	Rank
	1 = small 2 = medium 3 = large	0 = unlikely 1 = possible 2 = likely 3 = highly likely	1 = limited 2 = significant 3 = critical 4 = catastrophic	
Winter Storms	3	3	2	8
Hurricanes	3	1	3	7
Summer Storms and Tornadoes	2	3	2	7
Earthquakes	3	1	2	6
Wildfires	1	2	1	4

Location

1 = small	isolated to specific area during one event
2 = medium	multiple areas during one event
3 = large	significant portion of the town during one event

Frequency of Occurrence

0 = unlikely	less than 1% probability in the next 100 years
1 = possible	between 1 and 10% probability in the next year; or at least one chance in next 100 years
2 = likely	between 10 and 100% probability in the next year; or at least one chance in next 10 years
3 = highly likely	near 100% probability in the next year

Magnitude / Severity

1 = limited	injuries and/or illnesses are treatable with first aid; minor "quality of life" loss; shutdown of critical facilities and services for 24 hours or less; property severely damaged < 10%
2 = significant	injuries and / or illnesses do not result in permanent disability; shutdown of several critical facilities for more than one week; property severely damaged <25% and >10%
3 = critical	injuries and / or illnesses result in permanent disability; complete shutdown of critical facilities for at least two weeks; property severely damaged <50% and >25%
4 = catastrophic	multiple deaths; complete shutdown of facilities for 30 days or more; property severely damaged >50%

Frequency of Occurrence, Magnitude / Severity, and Potential Damages based on historical data from NOAA National Climatic Data Center and Town records

Appended Table 2 Hazard Effect Ranking

*Some effects may have a common cause; for example, a hurricane causes high winds and inland flooding.
Some effects may have similar causes; for example, hurricanes and nor'easters both cause heavy winds.*

Natural Hazard Effects	Location	Frequency of Occurrence	Magnitude / Severity	Rank
	1 = small 2 = medium 3 = large	0 = unlikely 1 = possible 2 = likely 3 = highly likely	1 = limited 2 = significant 3 = critical 4 = catastrophic	
Nor'Easter Winds	3	3	2	8
Snow	3	3	2	8
Blizzard	3	3	2	8
Hurricane Winds	3	1	3	7
Ice	3	2	2	7
Thunderstorm and Tornado Winds	2	2	2	6
Shaking	3	1	2	6
Flooding from Dam Failure	1	1	3	5
Lightning	1	3	1	5
Flooding from Poor Drainage	1	3	1	5
Inland Flooding	2	2	1	5
Falling Trees/Branches	1	3	1	5
Hail	1	2	1	4
Fire/Heat	1	1	1	3
Smoke	1	1	1	3

Location

1 = small	isolated to specific area during one event
2 = medium	multiple areas during one event
3 = large	significant portion of the town during one event

Frequency of Occurrence

0 = unlikely	less than 1% probability in the next 100 years
1 = possible	between 1 and 10% probability in the next year; or at least one chance in next 100 years
2 = likely	between 10 and 100% probability in the next year; or at least one chance in next 10 years
3 = highly likely	near 100% probability in the next year

Magnitude / Severity

1 = limited	injuries and/or illnesses are treatable with first aid; minor "quality of life" loss; shutdown of critical facilities and services for 24 hours or less; property severely damaged < 10%
2 = significant	injuries and / or illnesses do not result in permanent disability; shutdown of several critical facilities for more than one week; property severely damaged <25% and >10%
3 = critical	injuries and / or illnesses result in permanent disability; complete shutdown of critical facilities for at least two weeks; property severely damaged <50% and >25%
4 = catastrophic	multiple deaths; complete shutdown of facilities for 30 days or more; property severely damaged >50%

Frequency of Occurrence, Magnitude / Severity, and Potential Damages based on historical data from NOAA National Climatic Data Center and Town records

Appended Table 3
Development Permit Checklist for Hazard Mitigation
and Effective Emergency Management

	Zoning Regulations	Road & Drainage Regulations	Subdivision Regulations	Inland Wetlands and Watercourses Regulation
Flood Plain District In the Flood Plain District, no structure within the Town should be constructed, reconstructed, enlarged, extended, moved or structurally altered, no land use shall be established and no land shall be filled, graded or excavated until the Planning and Zoning Commission has approved a plan for the proposed structure, land use or alteration of land contour.	53 <input type="checkbox"/>			
General Standards sets for standards for anchoring; use of flood-resistant materials; siting and placement of systems such as water, wastewater, electrical, heating, and cooling; maintaining flood carrying capacities of streams; outdoor storage; and installation of manufactured homes	53.3 <input type="checkbox"/>			
Specific Standards provides for elevation of new construction and substantial improvements at least two feet above the base flood elevation, and requires dry floodproofing of the parts of structures below the base flood elevation.	53.4 <input type="checkbox"/>			
Floodway Standards prohibits development that cumulatively increases the base flood elevation by more than one foot	53.5 <input type="checkbox"/>			
Soil Erosion and Sedimentation Control Any proposal for development that will cumulatively create a disturbed area more than one-half acre in area on land being developed must have a Certified Erosion and Sediment Control Plan.	68.2 <input type="checkbox"/>			

Appended Table 3
Development Permit Checklist for Hazard Mitigation
and Effective Emergency Management

	Zoning Regulations	Road & Drainage Regulations	Subdivision Regulations	Inland Wetlands and Watercourses Regulation
Storm Drainage <p>Outlines the Town's requirements to manage stormwater, which includes the collection and disposal thereof in an attempt to design drainage systems which take into account effects upon downstream systems; coordinate with general drainage requirements for the use and development of the abutting land; avoid diversion of drainage from one watershed or watercourse to another is to be avoided; minimize all adverse effects of all work to the stream or watercourse which is being affected; discharge all storm water into sufficient streams or rivers or into Town or State drainage systems with sufficient capacity to carry the discharge; and locate and size drainage facilities in order to minimize danger to life and property. This section also calls for the protection and improvement of the natural drainage system and the prevention of flooding and soil erosion.</p>		7 <input type="checkbox"/>		
Drainage Standards <p>The storm drainage system shall provide for drainage from the entire area of the subdivision and shall take into account land outside the subdivision that normally drains across the area of the subdivision, as well as the effects of the subdivision upon downstream drainage systems. Additionally, the drainage system shall provide for the following: Adequate drainage of proposed streets, Interception of existing channeled drainage coming from any adjoining streets, Protection of locations necessary for on-site sewage disposal and water supply facilities, Prevention of flooding and soil erosion, and protection of wetlands and watercourses, and On-site detention where feasible, in order that runoff from the developed subdivision not exceed the rate of runoff before subdivision.</p>			7 <input type="checkbox"/>	

Appended Table 3
Development Permit Checklist for Hazard Mitigation
and Effective Emergency Management

	Zoning Regulations	Road & Drainage Regulations	Subdivision Regulations	Inland Wetlands and Watercourses Regulation
Inland Wetlands and Watercourses These regulations cover actions within and surrounding wetlands and watercourses throughout the Town of Middlebury. Although flooding is not specifically addressed, many of the requirements of the regulations are believed to be preventive of flooding				<input type="checkbox"/>

APPENDIX A
STAPLEE MATRIX

Strategies Listed by Primary Report Section for Middlebury	Responsible Department	Schedule	Associated Report Sections							Category	STAPLEE Criteria							
			Inland Flooding	Hurricanes	Summer Storms and Tornadoes	Winter Storms	Earthquakes	Dam Failure	Wildfires		Good = 3, Average =2, and Poor = 1							
											Socially acceptable?	Technically feasible?	Administratively workable?	Politically acceptable?	Can it be legally implemented?	Economically beneficial?	Environmentally beneficial?	STAPLEE Sum of Scores
		A. Ongoing								1. Prevention								
		B. 2008-2013								2. Property Protection								
		C. 2013-2018								3. Natural Resource Prot.								
										4. Structural Projects								
		D. 2018-2023								5. Public Information								
										6. Emergency Services								
ALL HAZARDS																		
Dissemination of informational pamphlets regarding natural hazards to public locations	LEPC	A	x	x	x	x	x	x	x	1,2,5	3	3	3	3	3	3	3	21
Add pages to Town website dedicated to citizen education and preparation for natural hazard events	LEPC	B	x	x	x	x	x	x	x	1,2,5	3	3	2	3	3	3	3	20
Continue implementation of CodeRED emergency notification system	LEPC	A	x	x	x	x	x	x	x	1,2,5	3	3	3	3	3	3	1	19
Encourage residents to purchase and use NOAA weather radio with an alarm feature	LEPC	B	x	x	x	x	x	x	x	2,5	3	3	2	3	3	2	1	17
Continue to review and update Emergency Operations Plan, at least once annually	LEPC	A	x	x	x	x	x	x	x	1	3	3	3	3	3	3	1	19
Pursue flood mitigation projects that protect the Fire Station and Public Works facility, both located in floodprone areas	Numerous	A	x	x	x	x	x	x	x	Various; see below	--	--	--	--	--	--	--	--
INLAND FLOODING																		
Prevention																		
Streamline the permitting process to ensure maximum education of developer/applicant; use a checklist that cross-references regulations and codes	PZC/ZEO	B	x	x	x	x	x	x	x	1	3	2	2	3	3	3	3	19
Perform a Town-wide drainage study	DPW	B,C,D	x	x	x	x		x		1	3	3	2	3	3	2	1	17
Consider joining FEMA's Community Rating System	First Selectman	B	x	x	x	x		x		2	3	3	2	3	3	2	1	17
Continue to require Flood Hazard Area permits for activities within SFHAs	PZC	A	x	x	x	x		x		1	2	3	2	3	3	3	2	18
Require new buildings constructed in flood prone areas to be protected to the highest recorded flood level regardless of SFHA	PZC	B	x	x	x	x		x		1,2	2	2	2	2	2	3	1	14
After Map Mod, consider restudying local flood prone areas and produce new local-level regulatory floodplain maps using more exacting study techniques	DPW	C, D	x	x	x	x		x		1,2	2	2	2	2	2	3	1	14
Property and Natural Resource Protection																		
Acquire open space properties within SFHAs and set aside as greenways, parks, or other non-residential, non-commercial, or non-industrial use	First Selectman	A	x	x	x	x		x		2,3	3	2	2	3	3	3	3	19
Selectively pursue conservation objectives listed in the Plan of Conservation & Development	First Selectman	A	x	x	x	x				3	3	2	2	3	3	2	3	18
Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains	PZC, IWC	A	x	x	x	x	x	x	x	3	2	3	3	2	3	2	3	18
Work with homeowners on Regan Rd, Old Regan Rd, Ravenwood Dr, Porter Ave, Steinmann Ave, and Woodside Ave to pursue wet floodproofing	First Selectman	B	x	x	x					2	2	3	2	2	2	3	3	17
Work with homeowners on Regan Rd, Old Regan Rd, Ravenwood Dr, Porter Ave, Steinmann Ave, and Woodside Ave to pursue dry floodproofing	First Selectman	B	x	x	x					2	2	3	2	2	2	3	3	17
Work with homeowners on Regan Rd, Old Regan Rd, Ravenwood Dr, Porter Ave, Steinmann Ave, and Woodside Ave to pursue elevation of structures	First Selectman	B	x	x	x					2	2	3	2	2	2	3	3	17
Structural Projects																		
Increase the capacity of the Hop Brook culvert where it flows under Watertown Road to prevent future washouts like the one that occurred in 2006	DPW	B	x	x	x					4	3	3	3	3	3	2	3	20
Increase the conveyance capacities of the culverts for the unnamed stream under the intersection of Cemetery Road and Middlebury Road	DPW	C	x	x	x					4	3	3	3	3	3	2	3	20
Increase the conveyance capacities of the culverts for the culvert beneath Middlebury Rd at the end of Steinmann Ave associated with Long Swamp Brook	DPW	C	x	x	x					4	3	3	3	3	3	2	3	20
Increase the conveyance capacities of the culverts for the culvert associated with stream running along and beneath Woodside Avenue.	DPW	C	x	x	x					4	3	3	3	3	3	2	3	20
Replace the bridge over Long Meadow Pond on Long Meadow Road in order to mitigate for flooding problems along the local roadway.	DPW	B	x	x	x					4	3	3	3	3	3	2	3	20
WIND DAMAGE RELATED TO HURRICANES, SUMMER STORMS, AND WINTER STORMS																		
Continue to conduct the tree maintenance program currently in place - inspections on all Town property near power lines, Town right-of-ways, and private properties.	DPW	A		x	x	x				1,2	3	2	2	3	2	3	2	17
Continue to promote tree maintenance on private properties when dangerous trees are identified by Town personnel.	DPW	A		x	x	x				1,2	3	2	2	2	1	3	2	15
Increase tree limb maintenance and inspections frequency prior to hurricane/tropical storm season. This is especially important along primary evacuation routes.	DPW	B		x	x	x				1,2	3	2	2	3	2	3	2	17
Secondary priority for tree limb maintenance includes Watertown Road and Old Watertown Road, Christian Road, and Long Meadow Road to South Street.	DPW	B		x	x	x				1,2	3	2	2	3	3	3	2	18
Continue to require that utilities be placed underground in new developments, and pursue funding to place them underground in existing developed areas.	DPW	A, C		x	x	x				1,2	3	2	2	3	3	3	2	18
Review all evacuation plans to ensure timely migration of people seeking shelter in all areas of Town.	LEPC	B		x	x	x				1,2	3	2	2	3	3	3	2	18
Seek to outfit back-up shelters with generators in an effort to make them available for when a large-scale evacuation is needed.	LEPC	B		x	x	x				1,2	3	2	2	3	3	3	2	18
Continue to require compliance with the Connecticut Building Code for Wind Speeds.	Building	A		x	x	x				1,2	3	3	3	3	3	3	2	20
Provide for the Building Department to make literature available during the permitting process regarding appropriate design standards.	Building	B		x	x	x				1,2	3	3	3	3	3	3	2	20

Strategies Listed by Primary Report Section for Middlebury	Responsible Department	Schedule	Associated Report Sections							Category	STAPLEE Criteria							
			Inland Flooding	Hurricanes	Summer Storms and Tornadoes	Winter Storms	Earthquakes	Dam Failure	Wildfires		Good = 3, Average =2, and Poor = 1							
											Socially acceptable?	Technically feasible?	Administratively workable?	Politically acceptable?	Can it be legally implemented?	Economically beneficial?	Environmentally beneficial?	STAPLEE Sum of Scores
		A. Ongoing								1. Prevention								
		B. 2008-2013								2. Property Protection								
		C. 2013-2018								3. Natural Resource Prot.								
		D. 2018-2023								4. Structural Projects								
										5. Public Information								
										6. Emergency Services								
WINTER STORMS																		
Post a list of Town sheltering facilities in the Town Hall and on the Town's website	LEPC	B	x	x	x	x	x	x	x	5	3	3	3	3	3	3	2	20
Post the snow-plowing prioritization in Town buildings each winter, and continue to post on Town's police website	DPW, LEPC	A, B				x				5	2	3	3	3	3	3	2	19
Provide educational materials to property owners regarding using shutters, storm windows, pipe insulators, and removing snow from flat roofs	LEPC	B				x				2,5	3	3	3	3	3	3	2	20
Provide educational materials with safety tips and reminders regarding cold weather	LEPC	B				x				1,5	3	3	3	3	3	3	2	20
Encourage two modes of egress into every neighborhood by the creation of through streets	PZC	A	x	x	x	x	x	x	x	6	2	2	2	3	3	2	1	15
EARTHQUAKES																		
Consider preventing new residential development in areas prone to collapse.	PZC	B					x			1	2	3	2	2	2	2	2	15
Continue regulating development on or near slopes.	PZC	A, B					x			1	2	3	2	2	2	2	3	16
Continue to require adherence to the state building codes.	Building	A		x	x	x	x			1, 2	3	3	3	3	3	3	2	20
Ensure that municipal departments have adequate backup facilities in case earthquake damage occurs to municipal buildings.	LEPC	B		x	x	x	x	x		1, 6	3	2	2	2	3	2	2	16
DAM FAILURE																		
If interest is strong within downstream areas, EOPs and Dam Failure Analyses should be developed for Class B and other dams when possible*	LEPC	B						x		2	3	3	2	3	2	2	3	18
Develop an EOP for Little Tracy's Pond Dam, as it would identify specific means of monitoring the dam and warning downstream residents of emergency situations.	LEPC	B						x		2,6	3	3	2	3	2	3	3	19
Class B dams should be regularly inspected by their respective owners, along with regular maintenance as required to keep the dams in safe and functional order.	LEPC	B						x		1,4	3	3	2	2	1	2	3	16
The Towns of Woodbury, Oxford, and Southbury should cooperate with the Town of Middlebury's efforts to address repairs to Quassapaug Lake Dam if needed.	LEPC	C						x		1,4	3	3	1	2	1	2	3	15
Likewise, the Town of Oxford and the Borough of Naugatuck should cooperate with Middlebury's efforts to address repairs to Long Meadow Pond Dam if needed.	LEPC	C						x		1,4	3	3	1	2	1	2	3	15
Consider implementing occasional Town inspections of Class BB, A, AA, and unranked dams.	LEPC, DPW	C						x		1	3	3	2	3	1	2	3	17
Consider including dam failure areas in the CodeRED emergency notification system.	LEPC	B						x		6	3	3	2	3	3	3	2	19
WILDFIRES																		
Connecticut Water Co. and Heritage Village Water Co. should continue to extend the public water supply systems into areas that require water for fire protection.	First Selectman	A							x	2,4	3	2	3	3	3	3	2	19
Connecticut Water Co. and Heritage Village Water Co. should continue to identify and upgrade those portions of the public water supply systems that are substandard for fire-fighting.	First Selectman	A							x	2,4	3	3	3	3	3	2	3	20
Continue to require the installation of water tanks or fire ponds with dry hydrants for new developments further than one mile in distance via a public road to a source of fire water supply.	PZC	A							x	2,4	3	2	2	3	3	2	2	17
Identify and develop sources of fire protection for the vicinity of Burr Hall Road and the north-central section of Middlebury including the north end of East Farms Road and locations along Artillery Road, North Farms Road, and Mirey Dam Road.	LEPC, Fire Dept.	B							x	2,4	3	2	2	3	2	2	2	16
Explore all possible means of improving accessibility for areas which currently do not have sufficient firefighting access, including the area south of I-84 near Wooster Road and east of Long Meadow Pond and the area north of Lake Quassapaug.	LEPC, Fire Dept.	B							x	2,4	3	2	2	3	2	2	2	16
Continue to promote inter-municipal cooperation in fire-fighting efforts	Fire Dept.	A							x	6	3	3	3	3	3	3	3	21
Continue to support public outreach programs to increase awareness of forest fire danger and how to use common fire fighting equipment	LEPC	A							x	5	3	3	2	3	3	3	3	20
Continue reviewing subdivision applications to ensure proper access for emergency vehicles	PZC	A							x	6	3	3	3	3	3	2	2	19
Provide outreach programs that include tips on how to properly manage burning and campfires on private property	Fire Dept.	B							x	5	3	3	2	3	3	3	3	20
Distribute copies of a booklet such as "Is Your Home Protected from Wildfire Disaster? – A Homeowner's Guide to Wildfire Retrofit."	LEPC	B							x	5	3	3	2	3	3	3	3	20
Patrol Town-owned open space and parks to prevent campfires	Police Dept.	B							x	3	2	3	2	3	3	2	3	18
Enforce regulations and permits for open burning	Fire Dept.	A							x	1	2	3	2	3	3	3	3	19

Notes

*This would include participation from the Towns of Woodbury, Oxford, and Southbury downstream of the Quassapaug Lake Dam, and the Town of Oxford and the Borough of Naugatuck downstream of the Long Meadow Pond Dam.
LEPC = Local Emergency Planning Commission
PZC = Planning & Zoning Commission
DPW = Department of Public Works / Highway Department
IWC = Inland Wetlands & Watercourses Commission

APPENDIX B
DOCUMENTATION OF PLAN DEVELOPMENT

APPENDIX B

PREFACE

An extensive data collection, evaluation, and outreach program was undertaken to compile information about existing hazards and mitigation in the Town of Middlebury, as well as to identify areas that should be prioritized for hazard mitigation. Documentation of this process is provided within the following sets of meeting minutes and field reports.

COGCNV field notes

Field inspection on February 13, 2008.

Notes typed February 15, 2008.

Shawn Goulet

Connecticut experienced a period of heavy rains on frozen ground on February 13, 2008. Precipitation measured 1.35 inches over approximately 9 hours in nearby Litchfield and 1.62 inches in Waterbury. On February 13, 2008 David Murphy and Shawn Goulet highlighted high priority areas of potential flooding mentioned during the initial data collection meeting in the Town of Southbury. Additionally, areas of potential flooding were outlined in the Town of Middlebury. These sites were visited on February 13, 2008 and problematic areas were photographed. These problematic areas primarily included areas of potential poor drainage due to the snow cover. The sequence of photography is listed below:

Photographs:

1. Nuisance flooding along River Rd.
2. Nuisance flooding along River Rd.
3. The Town of Southbury alleviating nuisance flooding along River Road
4. The Town of Southbury alleviating nuisance flooding along River Road
5. A front yard along Pomperaug Trail is flooded
6. The end of Pomperaug Trail is flooded
7. Another front yard along Pomperaug Trail is flooded
8. River Road Bridge over the Pomperaug River
9. The view looking upstream of the Pomperaug River from Manor Road
10. The view looking west and upgradient along Jeremy Swamp Road
11. Nuisance flooding along Jeremy Swamp Road
12. Jeremy Brook bends after the culvert crossing beneath Hulls Hill Road
13. View looking south of Jeremy Brook culvert crossing outlet along Hulls hill Road
14. View of Jeremy Brook near the culvert crossing
15. Water from Jeremy Brook begins to spill onto Hulls Hill Road
16. An undersized culvert appears stressed due to the substantial precipitation
17. Water associated with Jeremy Brook before entering the culvert crossing
- 18.
- 19.
- 20.

These notes follow the sequence of photography above.

- a) River Road (west of Glen Rd.), Southbury – Looking north along River Road, water from an unnamed stream builds (Photo #1). The cause of the nuisance flooding looks to be a failing culvert due to its overcapacity or damming.



1. Nuisance flooding along River Road

- b) River Road (west of Glen Road), Southbury – This is the same location as Photo #1. The Town of Southbury has to alleviate the culvert during large-scale rain events along this portion of River Rd. in Photo #3.



3. The Town of Southbury alleviating nuisance flooding along River Road

- c) Pomperaug Trail, Southbury – The front yards of different homes along Pomperaug Trail were flooded like the representative home in Photo #3. The backyards of these homes border the Pomperaug River.



5. A front yard along Pomperaug Trail is flooded

- d) River Road Bridge (over the Pomperaug River), Southbury – The River Road Bridge over the Pomperaug River becomes instrumental to vehicular transportation when traffic on I-84 becomes problematic or the highway is shut-down. The bridge is currently rated as being in “poor” to “very poor” condition and is owned by the Town. Photo #4 shows the view of the bridge from Berkshire Road.



8. River Road Bridge over the Pomperaug River

- e) Manor Road, Southbury – Photo #5 is the view looking upstream the Pomperaug River from Manor Road. Homes, Manor Road, and Pomperaug Trail are often inundated during sustained precipitation events. Ice jams at this location often bring about flooding events.



9. The view looking upstream of the Pomperaug River from Manor Road

- f) Jeremy Swamp Road, Southbury – Traveling east along Jeremy Swamp Road, water was found to be moving rapidly downgradient towards Jeremy Brook (Photo #6) prior to the Jeremy Swamp Road/Hulls Hill Road intersection. Potential for storm drain failure along this road can lead towards substantial nuisance flooding (Photo #7).



10. The view looking west and upgradient along Jeremy Swamp Road



11. Nuisance flooding along Jeremy Swamp Road

- g) Hulls Hill Road/Jeremy Swamp Road, Southbury – Jeremy Brook flows rapidly to the east of the Hulls Hill Road/Jeremy Swamp Road intersection (Photo #8).



13. View looking south of Jeremy Brook culver crossing outlet along Hulls hill Road

The intersection often becomes inundated during heavy precipitation events and is subsequently closed by the Town. The intersection was approaching inundation at the time of data collection (Photo #9).



15. Water from Jeremy Brook begins to spill onto Hulls Hill Road

The lone culvert crossing at the location appears to be insufficient for a storm of this scale (Photo #10).



16. An undersized culvert appears stressed due to the substantial precipitation

- h) Regan Road, Middlebury – Regan Road, which follows part of Hop Brook through Middlebury was determined to be a possible source of road and property/house inundation. Photos 18-20 show Hop Brook at an elevated stage level during the rain event alongside the road and near homes in this section of the Town.



18. The downstream view of Hop Brook along Regan Road



19. The upstream view of Hop Brook along Regan Road



20. The view of Hop Brook from Regan Road

Meeting Minutes

NATURAL HAZARD PRE-DISASTER MITIGATION PLAN FOR MIDDLEBURY Council of Governments Central Naugatuck Valley Initial Data Collection Meeting February 20, 2008

I. Welcome & Introductions

The following individuals attended the data collection meeting:

- ☐ David Murphy, P.E., Milone & MacBroom, Inc. (MMI)
- ☐ Samuel Eisenbeiser, Fitzgerald & Halliday, Inc. (FHI)
- ☐ Shawn Goulet, Milone & MacBroom, Inc. (MMI)
- ☐ Tom Gormley, Middlebury First Selectman
- ☐ Claudia Tata, Middlebury Administrative Manager to the First Selectman
- ☐ Jean Donegan, Middlebury Planning and Zoning Commission

II. Description and Need for Hazard Mitigation Plans / Disaster Mitigation Act of 2000

David described the basis for the natural hazard planning process and possible outcomes. Middlebury is responsible for a 1/8 cost share through in-kind services.

III. Project Scope and Schedule

The project scope was described, including project initiation and data collection, the vulnerability assessment, public meetings, development of recommendations, and the FEMA Review and Plan adoption. A 12-month schedule was presented.

First Selectman Gormley noted that he has assigned Paul Perrotti, the Middlebury Fire Chief, as the point of contact person for the project. Paul did not attend the meeting. The Board of Selectmen was identified as the governing body to eventually approve the Plan.

IV. Hazards to Address

The Middlebury plan will likely address flooding, mud slides and slumps, hurricanes and tropical storms, winter storms and nor'easters, summer storms and tornadoes, earthquakes, dam failure, and wildfires.

V. Discussion of Hazard Mitigation Procedures in Effect & Problem Areas

- ☐ Although procedures were brought up by David and Shawn, it was determined that Paul Perrotti, Dan Norton (DPW Director), and Kenny Long of the DPW Department would be most versed in the hazard mitigation procedures for the Town.

- ❑ The informational public meeting was scheduled for April 7, 2008 at 6:30 PM at the Town Hall. David noted that Virginia will issue a press release for the informational public meeting.

Emergency Response Capabilities & Evacuation Routes

- ❑ The Fire House, Library, and Community Center were noted as the three shelters in the Town. All three locations have generators. The Police Department, located at 200 Southford Road, was also noted as having a generator. However, the Police Department does not have a similar capacity as the three designated shelter facilities. The schools in Town are Region 15 schools. Therefore, they cannot be used by the Town as shelters.
- ❑ Another meeting with Paul, Dan and Kenny will be scheduled to gain a better understanding of the emergency response capabilities and evacuation routes in Town.

Critical Facilities

- ❑ Benson Woods, a development with residents of age 55+ (N. Benson Road)
- ❑ Middlebury Convalescent Home (Route 64)
- ❑ Smaller Convalescent Home (Exact location not immediately known)
- ❑ Home for the Blind (George Street near Yale Avenue)
- ❑ Daycare Centers (On Route 64 and on Triangle Boulevard)
- ❑ New Horizon Handicap Assistantship Home (Nutmeg Road)
- ❑ Middlebury Edge, a mixed-use development including a large-scale daycare center with approximately 100 adolescents (Route 63 and Park Road)
- ❑ Middlebury Volunteer Fire House (65 Tucker Hill Road)
- ❑ Middlebury Public Library (65 Crest Road)
- ❑ Shepardson Community Center (1172 Whittemore Road)

Zoning, Subdivision, Inland Wetlands Regulations

- ❑ An age-restricted development located near Straw Pond is the subject of safety concerns. The buildings received a height approval, even though they are considered considerably high for elderly residents.
- ❑ Underground water tanks for fire protection are not a requirement of developments in Town when water service is not available. Fire ponds, however, are required in this scenario.
- ❑ Utilities are underground.

- ❑ Claudia and Jean indicated that there are regulations associated with streets (i.e. cul-de-sacs and road widths) in subdivision developments. Referring to regulations and the discussion with Paul, Dan and Kenny would offer information about specifics.
- ❑ The Middlebury Land Trust, which owns a substantial amount of acres in the Town was mentioned by all as being a notable stakeholder in this project. Curt Smith, who is active in the Land Trust, was identified as the point of contact.

Dams & Noted Flooding and/or Drainage Problem Areas

- ❑ At the dam on Long Meadow Pond, there is a Federal grant to replace the bridge which is rated in very poor condition by DEP. The water level is at the bridge elevation at this location. The dam also needs replacement as it is in poor condition. The ownership of the dam has not been identified.
- ❑ The Quassapaug Lake Dam, owned by the Tyler Cove Association, has an associated drainage problem. Water from Munson Road migrates to Sandy Beach Road in this area. The dam is in very poor condition. David mentioned that the Town can partner with the owner and apply for a grant through this project.
- ❑ Homes along Regan and Old Regan Roads and the streets become inundated during large scale precipitation events. A development was recently proposed to the Town that would affect stormwater drainage in the area. Because residents along these roads produced photos and videos of problems associated with these properties, the proposed development was denied.

Problem Areas for Wind Damage

- ❑ There are no mobile home parks in the Town.
- ❑ Tornadoes are rare.
- ❑ Any other issues regarding tree maintenance will be discussed in the meeting with Paul, Dan, and Kenny.

Problems Due to Snow and Ice

- ❑ These issues will be part of the discussion in the meeting with Paul, Dan, and Kenny.

Wildfires and Fire Protection

- ❑ Wildfires and fire protection will be discussed with Paul.

Development Trends

- ❑ The DeSantis Development is currently underway.

- ❑ The Estates at Long Meadow (Longmeadow Road/Washington Drive), a combination of adjacent projects, has been approved and consists of approximately 135 homes
- ❑ A development of 126 units on Christian Road near Southford Road has been completed. There is limited entrance/exit capacity associated with Southford Road in this area.
- ❑ Benson Woods (Age 55+) and a development near Straw Pond have been completed.
- ❑ A Golf Course development, that may or may not be age restricted has been approved.

VI. *Acquisitions*

- ❑ *Town of Middlebury Subdivision Regulations (2006)*
- ❑ *Town of Middlebury Inland Wetlands and Watercourses Regulations (2004)*
- ❑ *Town of Middlebury Plan of Conservation and Development (2001)*
- ❑ *Town of Middlebury Zoning Regulations (2007)*
- ❑ *Town of Middlebury Road and Drainage Regulations (2007)*
- ❑ *Town of Middlebury Rock Excavation Regulations (2004)*
- ❑ *Town of Middlebury Excavation and Grading Regulations (2004)*
- ❑ *Town of Middlebury Declaration of a Local Disaster Emergency Ordinance (2007)*

Meeting Minutes

NATURAL HAZARD PRE-DISASTER MITIGATION PLAN FOR MIDDLEBURY Council of Governments Central Naugatuck Valley Initial Data Collection Meeting March 3, 2008

I. Introduction

The following individuals attended the data collection meeting:

- ☐ Samuel Eisenbeiser, Fitzgerald & Halliday, Inc. (FHI)
- ☐ Shawn Goulet, Milone & MacBroom, Inc. (MMI)
- ☐ Dan Norton, Town of Middlebury Director of the Department of Public Works

II. Description and Need for Hazard Mitigation Plans / Disaster Mitigation Act of 2000

Shawn and Samuel described the basis for the natural hazard planning process and possible outcomes.

III. Project Scope and Schedule

- ☐ The project scope was described, including project initiation and data collection, the vulnerability assessment, public meetings, development of recommendations, and the FEMA Review and Plan adoption. A 12-month schedule was presented.

IV. Discussion of Hazard Mitigation Procedures in Effect & Problem Areas

Problem Areas for Wind Damage

- ☐ Dan talked of the procedures that the DPW takes in addressing tree maintenance on public property.
- ☐ If, in any way, the tree crosses the vertical imaginary plane of Town property, then the Town considers itself owning the tree.
- ☐ These trees are subject to Town maintenance and/or take-downs.
- ☐ Priority given to these cases are on a first-call/first-come basis and are given a relative condition rating by Dan and DPW staff as to prioritizing when/which are taken care of.
- ☐ The Town is sufficiently suited for debris removal having equipment such as brush claws, a tub grinder and various other claws in the event of needing to process debris obstructing Town roads and other public property.

- ☐ The processed debris will be disposed of at different specified locations around Town.
- ☐ Right now, the Town does not have a specific person to conduct tree maintenance or take-downs.
- ☐ DPW is hopeful that the person in charge of these issues will be re-hired in July when the budget is re-evaluated.
- ☐ Tornadoes are rare.
- ☐ Any other issues regarding tree maintenance will be discussed in the meeting with Paul, Dan, and Kenny.

Problems Due to Snow and Ice

- ☐ DPW does not break the Town into sections and assign routes within those sections.
- ☐ There are 8 trucks which run 8 routes and they continue until they finish their route. Once they are complete with their “pass around”, they return to DPW and assess further work.
- ☐ There are no specific priorities in Town. However, streets with hills and intersections are given more attention than those without.
- ☐ The northwest section of Town is higher in elevation and has a substantial amount of relief, so it generally garners more attention compared to the lower elevation/relief in the southeast section of Town.

Problem Areas for Nuisance Flooding

- ☐ Flooding complaints associated with public property and public roads are usually phoned to the police department which forwards these to the DPW.
- ☐ Any drainage issues associated with public property are also funneled to DPW.
- ☐ Ravenwood Drive near Watertown road is prone to nuisance flooding from Hop Brook.
- ☐ Long Meadow Road, including the Long Meadow Road Bridge, on either side of Long Meadow Pond is prone to inundation during large scale precipitation events.

- ❑ The easternmost section of Triangle Boulevard (northeast of Hill Parkway) is prone to nuisance flooding.
- ❑ Judd Hill Road Extension, at the Woodbury/Middlebury border becomes inundated during large scale precipitation events.
- ❑ Charcoal Avenue near Artillery Road often becomes inundated because of water from Goat Brook.
- ❑ Cemetery Road near Route 64 is sometimes subject to nuisance flooding associated with a small watercourse which also affects a gas station.
- ❑ Shadduck Road is sometimes inundated near the pump station.
- ❑ Porter Avenue, Steinmann Avenue and Reagan Road are all prone to nuisance flooding from Long Swamp Brook and Hop Brook in the area.
- ❑ Watertown Road experienced a substantial wash-out in 2006, which was the result of water from Watertown crossing the Town line. Watertown was not prepared to submit FEMA applications with Middlebury, so funds from FEMA could not be obtained. Middlebury has pictures of which they plated the road for the weekend and began repairs the following Monday.
- ❑ DPW has volumes of photographs associated with their crews conducting work associated with tree maintenance/take-downs, snow/ice removal and flooding issues.

Range Plan, investigating library site alternatives, soliciting feedback from residents and finalizing and proposing a plan for consideration to the Board of Selectmen.

MIDDLEBURY

Town seeks ideas on ways to minimize disaster impact

There will be a meeting at 6:30 p.m. Monday at Town Hall to discuss the importance of planning to minimize the effects of natural disasters on the community.

Residents who experience flooding problems every time it rains or who have sump pumps that drain into the street are invited to attend and share their stories.

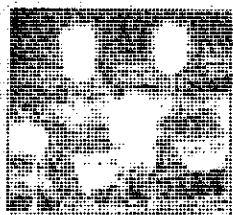
Middlebury is one of six area towns which received a grant through the Council of Governments of the Central Naugatuck Valley to identify natural hazards and ways the town can reduce their impact.

Consultants Milone & MacBroom will seek input about possible natural hazards such as hurricanes, nor'easters, floods, severe thunderstorms, icing and earthquakes.

Then they will develop a plan to identify projects that can be undertaken before a disaster to reduce loss and damages afterwards. The plan will be submitted to the Federal Emergency Management Agency, which may award the community money to fix the problems.

MORE NEWS INSIDE

Energy fair lessons



Homeowners learn how to lower their electric bills with new efficient technology at an energy fair in Bethlehem on Saturday. PAGE 2B

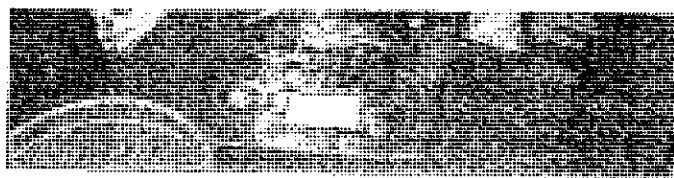
School gets community award

A Hartford group has given Oxford High School a Community Impact Award for renewing residents' sense of community. PAGE 2B

School head to be reviewed

The Naugatuck school board is about to evaluate Superintendent John Tindall-Gibson and will help decide whether he keeps his job past 2010. PAGE 6B

>>> DEATHS ON PAGE 2B



Alaina Edmonds, 3, of Seymour, puts raffle tickets into jars as Home Party Connection event at the Middlebury Volunteer Fire Beverly Dassonville. The event was a fundraiser for the auxilian

Schools win some Consultants' review finds faults,

BY MICHAEL PUFFER
REPUBLICAN-AMERICAN

WATERBURY — The city's schools need a great deal of improvement, but there are signs of improvement even among the lowest performing schools.

Or so says a British consulting firm that visited five city schools in December under orders from the State Depart-

ment of Education.

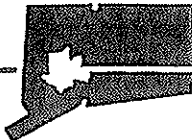
Waterbury is one of 12 chronically under-performing districts targeted by state officials. The state ordered Waterbury to hire Cambridge Education to review five struggling schools and take a broad view of the entire district.

The resulting reports, delivered in March, and offer a mixed bag of praise and criti-

It's going, going, gon



Sol Adams of Marlin Art in New York auctions a plate-signed lithograph called 'Sluggers' during the Southbury Junior Women's Club fundraiser on Saturday at the Southbury Center Firehouse.



February 28, 2008

Mr. Francis G Brennan
Economic Development Commission
13 Gaveson Court
Middlebury, CT 06762

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Brennan,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

In order to successfully develop the local mitigation plans, a significant public outreach effort is required by FEMA. In addition, FEMA requests that stakeholders such as land trusts, neighborhood groups, chambers of commerce, health districts, watershed associations, and educational institutions be invited to provide input. Therefore, COGCNV invites your participation at one or more of the public informational meetings listed below:

<i>Meeting</i>	<i>Date</i>	<i>Time</i>	<i>Location</i>
Naugatuck	March 3, 2008	6:00 PM	Town Hall
Southbury	March 19, 2008	6:30 PM	Town Hall
Thomaston	March 24, 2008	7:00 PM	Town Hall
Beacon Falls	April 3, 2008	7:00 PM	Town Hall
Middlebury	April 7, 2008	6:30 PM	Town Hall
Bethlehem	<i>To Be Determined</i>		

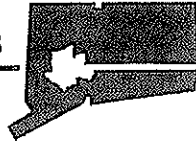
Correspondence will be mailed within the next two weeks with a date, time, and location for the meeting in Bethlehem. Please contact the COGCNV at 203-757-0535 or vmason@cogcnv.org if you have any questions about the planning process or the meetings.

We hope that you will assist in this very important project, and we look forward to seeing you soon.

Sincerely,

Virginia Mason

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February 28, 2008

Dr. Raymond Sullivan
Director of Health
Middlebury Health Department
1212 Whittemore Road
Middlebury, CT 06762

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Dr. Sullivan,

The Council of Governments Central Naugatuck Valley (COGCV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

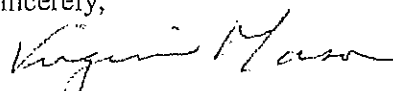
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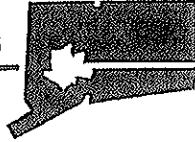
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We hope that you will assist in this very important project, and we look forward to seeing you soon.

Sincerely,


Virginia Mason

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February 28, 2008

Mr. Leavenworth P. Sperry, Jr.
Middlebury Land Trust
346 South Street
Middlebury, CT 06762

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Sperry,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

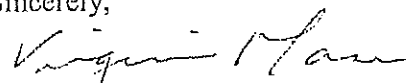
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We hope that you will assist in this very important project, and we look forward to seeing you soon.

Sincerely,


Virginia Mason

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February 28, 2008

Terry Smith
Planning & Zoning Commission
1212 Whittemore Road
Middlebury, CT 06762

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Smith,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

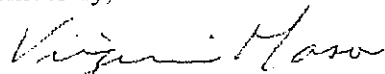
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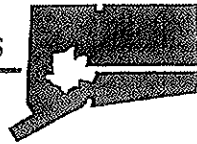
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We hope that you will assist in this very important project, and we look forward to seeing you soon.

Sincerely,


Virginia Mason

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February 28, 2008

Dan Norton
Director of Public Works
1212 Whittamore Road
Middlebury, CT 06762

**Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Norton,

The Council of Governments Central Naugatuck Valley (COGCV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

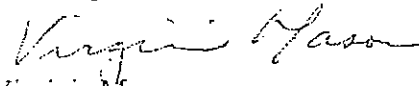
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<i>Meeting</i>	<i>Date</i>	<i>Time</i>	<i>Location</i>
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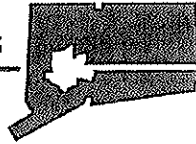
Correspondence will be mailed within the next two weeks with a date, time, and location for the meeting in Bethlehem. Please contact the COGCV at 203-757-0535 or vmason@cogcnv.org if you have any questions about the planning process or the meetings.

We hope that you will assist in this very important project, and we look forward to seeing you soon.

Sincerely,


Virginia Mason

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February 28, 2008

Ken Long
 Department of Public Works
 1212 Whittemore Road
 Middlebury, CT 06762

**Re: Pre-Disaster Natural Hazard Mitigation Planning
 Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Long,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

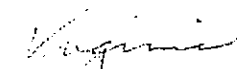
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Sincerely,


 Virginia Mason

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February 28, 2008

Peter Grimm
 Tribury Chamber of Commerce
 PO Box 807
 Southbury, CT 06488

**Re: Pre-Disaster Natural Hazard Mitigation Planning
 Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. Grimm,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

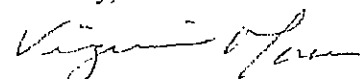
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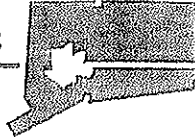
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We hope that you will assist in this very important project, and we look forward to seeing you soon.

Sincerely,


 Virginia Mason

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February 26, 2008

Kristen Bulkovitch
President
United Way of Greater Waterbury
P.O. Box 2688
Waterbury, CT 06723-2688

Re: Pre-Disaster Natural Hazard Mitigation Planning
Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston

Dear Ms. Bulkovitch,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

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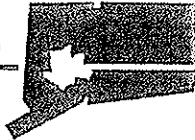
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Sincerely,

Virginia Mason, es
Virginia Mason

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February 28, 2008

Richard Stubbs
 American Red Cross Waterbury Area
 64 Holmes Avenue
 Waterbury, CT 06710

**Re: Pre-Disaster Natural Hazard Mitigation Planning
 Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston**

Dear Mr. ^{Rich}Stubbs,

The Council of Governments Central Naugatuck Valley (COGCNV) is coordinating the development of pre-disaster natural hazard mitigation plans for Beacon Falls, Bethlehem, Middlebury, Naugatuck, Southbury, and Thomaston. Plan development and adoption is required in order to be eligible for certain pre-disaster mitigation funds from FEMA, as well as a greater portion of post-disaster funding.

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Natural Hazard Pre-Disaster Mitigation Plan Middlebury, Connecticut



Presented by:

David Murphy, P.E. – Associate
 **Milone & MacBroom, Inc.**

Sam Eisenbeiser, AICP
 **Fitzgerald & Halliday, Inc.**

April 7, 2008

History of Hazard Mitigation Plans



- **Authority**

- Disaster Mitigation Act of 2000 (amendments to Stafford Act of 1988)

- **Goal of Disaster Mitigation Act**

- Encourage disaster preparedness
- Encourage hazard mitigation measures to reduce losses of life and property



Municipalities Currently Involved in the Regional Mitigation Planning Process

- Beacon Falls
- Bethlehem
- Middlebury
- Naugatuck
- Southbury
- Thomaston

Local municipalities must have a FEMA approved Hazard Mitigation Plan in place to receive federal grant funds for hazard mitigation projects



Selection of FEMA Pre-Disaster Mitigation Grants: 2003-2006

List does not include seismic, wind retrofit, home acquisition, and planning projects

<i>State</i>	<i>Description</i>	<i>Grant</i>
Colorado	Detention pond	\$3,000,000
Oregon	Water conduit replacement	\$3,000,000
Washington	Road elevation	\$3,000,000
Oregon	Floodplain restoration	\$2,984,236
Colorado	Watershed mitigation	\$2,497,216
Georgia	Drainage improvements	\$1,764,356
Massachusetts	Pond flood hazard project	\$1,745,700
Oregon	Ice storm retrofit	\$1,570,836
North Dakota	Power transmission replacement	\$1,511,250
Texas	Home elevations	\$1,507,005
Florida	Storm sewer pump station	\$1,500,000
Massachusetts	Flood hazard mitigation project	\$1,079,925
Kansas	Effluent pump station	\$765,000
South Dakota	Flood channel restoration	\$580,657
Massachusetts	Culvert project	\$525,000
Texas	Storm shelter	\$475,712
Massachusetts	Housing elevation and retrofit	\$473,640
Utah	Fire station retrofit	\$374,254
Washington	Downtown flood prevention project	\$255,000
New York	WWTP Floodwall construction	\$223,200
Massachusetts	Road mitigation project	\$186,348
Massachusetts	Flood mitigation project	\$145,503
Vermont	Road mitigation project	\$140,441
New Hampshire	Water planning for firefighting	\$134,810
Oregon	Bridge scour relocation project	\$116,709
New Hampshire	Box culvert project	\$102,000
Missouri	Bank stabilization	\$48,750
Tennessee	Utility protection	\$40,564
Wisconsin	Waterway stabilization	\$12,909



What is a Natural Hazard ?

- An extreme natural event that poses a risk to people, infrastructure, and resources



What is Hazard Mitigation?

- ***Pre-disaster*** actions that reduce or eliminate long-term risk to people, property, and resources from natural hazards and their effects



A Road Closure During / After a Large Scale Rainfall Event is a Type of Hazard Mitigation



Long-Term Goals of Hazard Mitigation

- Reduce loss / damage to life, property, and infrastructure
- Reduce the cost to residents and businesses
- Educate residents and policy-makers about natural hazard risk and vulnerability
- Connect hazard mitigation planning to other community planning efforts
- Enhance and preserve natural resource systems in the community



What a Hazard Mitigation Plan Does Not Address

- Terrorism and Sabotage
- Disaster Response and Recovery
- Human Induced Emergencies (some fires, hazardous spills and contamination, disease, etc.)



Components of Hazard Mitigation Planning Process

- Identify natural hazards that could occur in Middlebury
- Evaluate the vulnerability of structures and populations and identify critical facilities and areas of concern
- Assess adequacy of mitigation measures currently in place
- Evaluate potential mitigation measures that could be undertaken to reduce the risk and vulnerability
- Develop recommendations for future mitigation actions



Middlebury's Critical Facilities

- Emergency Services – Police, Fire, Ambulance
- Municipal Facilities – Shepardson Community Center
- The Fire House & Library
- Daycare Centers



Shepardson Community Center is equipped with a generator



A mixed-use development located along Route 63 near Park Road. This development includes a large daycare center.

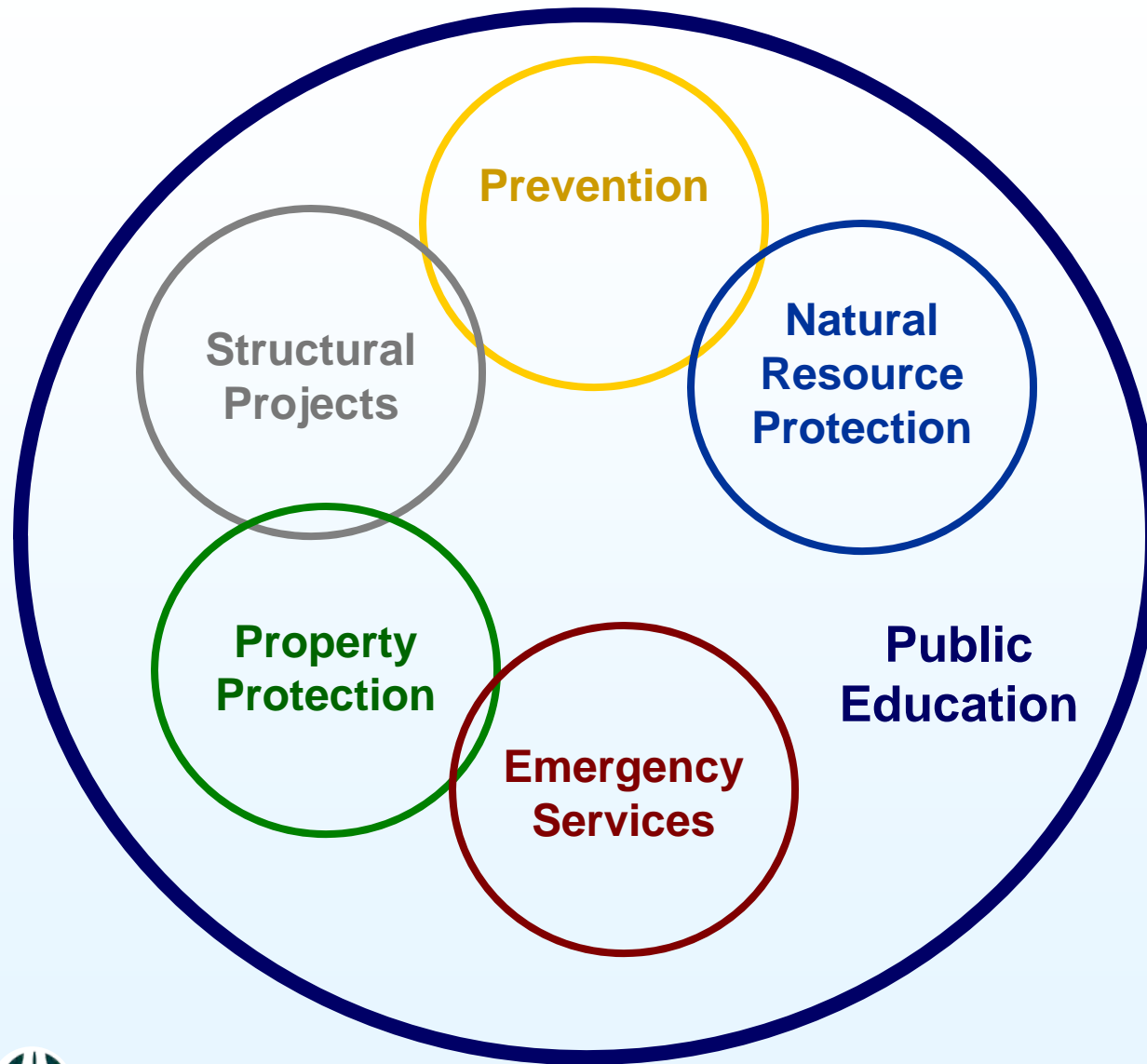


Middlebury's Critical Facilities

- Life / Health Care and Assisted Living
- Water Utilities – Tanks, Pumping Stations
- Wastewater Utilities
- Home for the Blind
- Key Roads and Evacuation Routes



Potential Mitigation Categories



Potential Mitigation Measures

- Utilization of the Police & Fire Emergency Number: 911
- Provide some Emergency Notification System in the future, such as the CodeRED System.
- Adopt local legislation that limits or regulates development in vulnerable areas
- Public education programs – dissemination of public safety information
- Construction of structural measures
- Preserve critical land areas and natural systems
- Elevate or Remove Flood-prone Buildings



Primary Natural Hazards Facing Middlebury

- Inland flooding
- Winter storms, nor'easters, heavy snow, blizzards, ice storms
- Hurricanes
- Summer storms, tornadoes, thunderstorms, lightning, hail
- Dam failure
- Wildfires
- Earthquakes



High flows seen within Hop Brook during a large-scale precipitation event



Hurricanes

- Winds
- Heavy rain / flooding



Summer Storms and Tornadoes



Lightning over Boston

- Heavy wind / tornadoes / downbursts
- Lightning
- Heavy rain
- Hail



Tornado in KS



Flooding in MN



Winter Storms

- Blizzards and nor'easters
- Heavy snow and drifts
- Freezing rain / ice



CT River - April 2007



Dam Failure

- Severe rains or earthquakes can cause failure
- Possibility of loss of life and millions of dollars in property damage



Long Meadow Pond Dam



Lake Quassapaug Dam



Wildfires

- Based on aerial and topographical mapping, Middlebury has low to moderate risk of wildfires
- The majority of the land prone to wildfires is in the northeast portion of the Town near the Woodbury town line
- Fire
- Heat
- Smoke



Photo courtesy of FEMA



Earthquakes

- Middlebury is in an area of minor seismic activity
- Chester, CT experienced a small, 2.0 magnitude earthquake on March 11, 2008
- Can cause dam failure
 - ◆ Shaking
 - ◆ Liquefaction
 - ◆ Secondary (Slides/Slumps)



Photos courtesy of FEMA



Area-Specific Problems

- Roadway and property flooding at rivers and streams
 - ◆ Ravenwood Drive near Watertown Road & Regan road along Hop Brook
 - ◆ Long Meadow Road & Lake Shore Drive along Long Meadow Pond
 - ◆ Triangle Boulevard along an unnamed stream
 - ◆ Porter Avenue & Steinmann Avenue along Long Swamp Brook
 - ◆ Other streams and localized problems
- Potential bridge maintenance / replacement



Flooding at Rivers and Streams

- Ravenwood Drive near Watertown Road & Regan Road along Hop Brook



Ravenwood Drive crosses Hop Brook in the northern section of Middlebury



Regan Road runs parallel to Hop Brook south of Route 64



Flooding at Rivers and Streams

- Long Meadow Road & Lake Shore Drive along Long Meadow Pond



Lake Shore Drive



Long Meadow Road Bridge



Flooding at Rivers and Streams

- Triangle Boulevard east of Hill Parkway is prone to flooding from an unnamed stream



Flooding at Rivers and Streams

- Porter Avenue & Steinmann Avenue along Long Swamp Brook



Flooding at Rivers and Streams

- Shadduck Road near Hop Brook
- Judd Hill Extension near the Woodbury town line
- Charcoal Avenue near Artillery Road in the area of Goat Brook
- Cemetery Road near Goat Brook



Potential Bridge Maintenance / Replacement

- A Federal Grant exists to replace the Long Meadow Road Bridge, considered to be in poor condition



Next Steps

- Incorporate input from residents
- Rank hazard vulnerability
- Develop a response strategy
- Prepare the draft plan with recommendations for review by the Town and the public
- Adopt and implement the plan



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Meeting Minutes

NATURAL HAZARD PRE-DISASTER MITIGATION PLAN FOR MIDDLEBURY Council of Governments Central Naugatuck Valley Public Information Meeting April 7, 2008

I. Welcome & Introductions

The following individuals attended the public meeting:

- ☐ David Murphy, P.E., Milone & MacBroom, Inc. (MMI)
- ☐ Samuel Eisenbeiser, Fitzgerald & Halliday, Inc. (FHI)
- ☐ Virginia Mason, Council of Governments Central Naugatuck Valley (CGCNV)
- ☐ Jean Donegan, Town of Middlebury Planning
- ☐ Kenneth Long, Town of Middlebury DPW
- ☐ Paul Perrotti, Town of Middlebury Emergency Management
- ☐ Rich Giusti, Town of Middlebury Chief of Police
- ☐ Raymond Sullivan, MD, Health Director, Town of Middlebury
- ☐ Ellen Mascoli, resident
- ☐ Nick Mascoli, resident
- ☐ Tom Murray, resident
- ☐ James Beckett, resident
- ☐ Bob Scholl, resident
- ☐ Allan Dabkowski, resident
- ☐ Marilee Dabkowski, resident

Ms. Mason introduced the project team and the project, explaining the COG's role in the project, the goals of the Disaster Mitigation Act, and the relationship to the FEMA pre-disaster and post-disaster funding processes.

II. Power Point: "Natural Hazard Pre-Disaster Mitigation Plan, Middlebury, Connecticut"

Mr. Murphy and Mr. Eisenbeiser presented the power point slideshow.

III. Questions, Comments, and Discussion

- ☐ Most of the residents in attendance were present to discuss nuisance and basement water problems downslope from single-family developments along Park Road Extension. Mr. Scholl of 470 Park Road Extension, Mr. and Mrs. Dabkowski of 22 Briarwood Terrace, and Dr. Gagne of 54 Janet Drive provided copies of written correspondence to the Conservation Commission and Planning & Zoning Commission. This correspondence describes the nuisance and basement water problems that have allegedly occurred. A berm and swale are supposed to move water into the municipal stormwater system but it reportedly is not working.

- ❑ Watertown Road was flooded in the June 2006 storm at Hop Brook. This area has reportedly washed out.
- ❑ Residents on Woodside Avenue in the eastern part of town suffer from nuisance flooding.
- ❑ The Triangle Blvd area is impacted by runoff from the airport. Water from a small stream jumps a culvert, flows onto the road, and floods at least two homes to the north while making its way to the nearby stream channel. The Town has added a catch basin to help collect water, but it doesn't work well if the outlet is submerged.
- ❑ Two residents of the Regan Road area (Mr. Murray at 420 Regan Road and Mr. Beckett at 54 Old Regan Road) reported that flooding occurs along Hop Brook. Storms have appeared to intensify in the last eight years. Floods have occurred in April 2006, June 2006, and April 2007. The stream is aggrading. It was reportedly dredged in the 1980s and the residents would like to see it dredged again. Some of the homes (including 420 Regan Road) have streams in the front (Hop Brook) and the back (Long Swamp Brook), and they both flood.
- ❑ In general, a focus on the Hop Brook corridor is necessary.
- ❑ The East Farms Road area is in need of fire protection. Tanks, ponds, and hydrants are not available. It's a long way for pumper trucks to get to the end of the development.

Local Emergency Operations and Planning Committee

Meeting
Thursday, April 24, 2008
7:00 P.M.



Meeting called to order by Chief Perrotti 7:10 P.M.

Present: Virginia Mason, Paul Perrotti, Jon Vaughn, Robert Desmarais, James Roy,
Tom Reynolds, Carol Santos, Representatives of Malone and McBroom

Introductions

Chief spoke about the meeting at Town Hall with Virginia Mason and Malone and McBroom.
Chief spoke on the importance of Westover in our Emergency Plan.

Virginia Mason spoke on her role with COG and also on FEMA reimbursements.

Presentation from Malone and McBroom on available grant programs for pre disaster mitigation and post disaster.

Malone and McBroom spoke with group on flooding spots in Town and priority flooding problems.

Chief asked about grants for fire suppression tanks in areas where there are no hydrants available.

Chief will compile a list of priority flooding problems to be submitted to Malone and McBroom.

Chief spoke on the importance of "Code Red" and how it would be utilized by the Town.
Virginia Mason said that funds will hopefully be coming from the State for future years of Code Red.

Chief spoke on ID's for everyone which he hopes to implement in the near future.

Chief spoke on adding Pet Annex to Emergency Plan.

Next meeting will be on **Thursday, June 19, 2008 at 7:00 P.M.** at Fire Headquarters.

Meeting adjourned at 8:25 P.M.

Respectfully submitted

Kim Connors, Administrative Assistant
Middlebury Fire Department

Meeting Minutes

NATURAL HAZARD PRE-DISASTER MITIGATION PLAN FOR MIDDLEBURY Council of Governments Central Naugatuck Valley Data Collection Meeting with Middlebury LEPC *April 24, 2008*

I. Introduction

The following individuals attended the data collection meeting:

- ☐ Scott Bighinatti, Milone & MacBroom, Inc. (MMI)
- ☐ Shawn Goulet, Milone & MacBroom, Inc. (MMI)
- ☐ Virginia Mason, Council of Governments of the Central Naugatuck Valley (COGCNV)
- ☐ Paul Perrotti, MVFD Chief / Emergency Management Director
- ☐ Robert Desmarais Sr., Board of Selectmen
- ☐ James Roy, Middlebury Police Department
- ☐ Jonathan Vaughan, Middlebury Volunteer Fire Department
- ☐ Kim Connors, Middlebury Volunteer Fire Department
- ☐ Carol Santos, Westover School
- ☐ David Sikora, Middlebury Resident (Organic Chemist)
- ☐ Tom Reynolds, Middlebury Resident

II. Description and Need for Hazard Mitigation Plans / Disaster Mitigation Act of 2000

Virginia and Scott described the need for the hazard mitigation plan and the goals for the data collection meeting.

III. Project Scope and Schedule

- ☐ The project scope was briefly discussed, including data collection, public meetings, and the FEMA Review and Plan adoption. A draft should be available for the Town to review in September.

IV. Discussion of Hazard Mitigation Procedures in Effect & Problem Areas

Critical Facilities

- ☐ Westover School is considered one of the Town's critical facilities. It houses up to 200 overnight students during the school year, and can act as a shelter (though it is more effective as a shelter in the summer). Because of the overnight students, the school is involved with the local LEPC. MVFD is aware that the 1920's wood-frame construction of the school makes it susceptible to fast-spreading fires, so MVFD is well prepared for such a fire if it occurred at the school.

- ❑ Middlebury has adopted CODE RED for communications. The MVFD and ambulance service currently operates on high band and they have no communication dead spots. The Police currently operate on a lower band, and they have some communications dead spots near the intersection of Route 64 and Route 63. There is limited cellular service in that area of Town due to topography. The Town is currently looking into an upgrade to put all emergency services on the same radio band.
- ❑ Middlebury uses the state and regional evacuation plans. Interstate 84 and State Routes 63, 64, and 188 are the primary evacuation routes. Secondary evacuation routes include Watertown Road and Old Watertown Road (to Watertown), Christian Road (to Oxford), and Long Meadow Road to South Street (to Naugatuck).
- ❑ The Timex facility off Christian Road and the Chemtura facility (600 employees) off Benson Road are of special concern because they work with hazardous chemicals.
- ❑ There are no sewage treatment plants in Middlebury. All sewage flows by gravity main to the sewage treatment plant in Naugatuck. There are at least five pump stations located throughout Town. The ones that were mentioned are at the west end of Gleneagle Road, on Shadduck Road near Hop Brook, Route 188 at the Southbury Town line, and near the intersection of Benson Road and Kissawaug Road, and on Christian Lane outside the Triangle Hill subdivision.
- ❑ The Fire Department on Tucker Hill Road is the primary emergency facility. MVFD handles fires and ambulance service. Campion ambulance service in Waterbury also responds to any calls requiring an ambulance. The Fire Department Building acts as a primary shelter accommodating up to 50 people and is equipped with a generator. Shepardson Community Shelter on Route 188 is also a primary shelter, has a generator, and can accommodate a maximum of 100 people. Long Meadow School on North Benson Road is also a primary shelter with a generator that can hold 100 people.
- ❑ Memorial school on Memorial Drive is a backup shelter and does not have a generator, but can shelter 100 people.
- ❑ The Department of Public works is considered a critical facility and is located on Service Road off Woodside Avenue.
- ❑ The Police Department on Route 188 is the second emergency facility. It acts as a secondary fire station and has two fire trucks on site to dispatch to fires in the west part of Town.
- ❑ A new power plant is planned to be built south of Long Meadow Pond in Oxford. The LEPC is not sure yet what its effects will be on emergency planning.

Development Trends

- ❑ There are many planned or ongoing developments in Middlebury.
- ❑ New developments are planned for areas off Christian Road and South Street (south part of Town). A new development called the Ridgewood Project is also planned between Route 188 and South Street north of I-84. A smaller development is planned near the intersection of Route 188 and Long Meadow Road. The number of homes is undetermined.
- ❑ A 50 home development is in construction off Benson Road near the Southbury Town line.
- ❑ Another 50-home development, Avalon Homes, is in construction on Route 188 near the north end of Long Meadow Road.
- ❑ A housing development of up to 250 homes is planned between Three Mile Hill Road and Route 63. Part of this area is near where Timex performs its court ordered water sampling / cleaning.
- ❑ A potential development could go in south of Route 64 and east of White Avenue.
- ❑ A 250-300 unit condominium development is planned between Porter Avenue and Regan Road. This area is near the floodplain of Hop Brook.
- ❑ 28 to 30 homes are planned off Washington Drive in the south part of Town.
- ❑ New houses are proposed off Park Road north of Gleneagle Road. This area is west of a steep grade (the “Western Hills” of Route 63 near Waterbury) and has poor infiltration, so water tends to pond.

Problems due to Localized Flooding

- ❑ Park Road (see above), Park Road Extension, and Old Regan Road and Regan Road (homes low in relation to nearby Hop Brook and tributary) were mentioned as having flooding problems.
- ❑ Paul is going to compile a list of areas that regularly flood and send to MMI.
- ❑ Watertown Road washed out in 2006 and Middlebury tried to “piggy-back” on Waterbury’s application to FEMA to get grant money to rebuild the road, but the application did not succeed.

- ❑ Westover School was mentioned as having some flooding problems along some of its boarding houses. The nature of the flooding was not addressed. Scott explained that because Westover School is private the Town would have to be the sub-applicant for any funding request.
- ❑ Kelly Pond in Southbury floods Judd Hill Road in Middlebury.
- ❑ Water runs down the Hill near the intersection of Cemetery Road and Route 64. The three culverts are undersized and cannot handle the flow.
- ❑ A culvert running under Route 64 that passes a tributary to Hop Brook is undersized. This culvert is near the north end of Steinman Avenue.
- ❑ Flooding is a problem along Woodside Road due to an undersized culvert. The road doesn't overtop, but the backwater condition causes lawn and basement flooding of nearby properties.

Problems due to Snow and Ice

- ❑ Route 188 gets very icy coming out of Southbury due to topography. Route 64/188 is also slow due to snow and ice from the intersection of Route 188 and Route 64 to West Street.
- ❑ Drifting snow is a problem along Route 64 near Christian Road and Abbot Farm Road, and on Route 188 near the Police Station.

Problem Areas for Wildfires

- ❑ There are several areas that are susceptible to fires. Many areas of the Town do not have water service, and the MVFD simply cannot transport enough water to fight large fires in certain areas. The remainder of the Town is served primarily by Connecticut Water Company.
- ❑ The Oxford Airport is located in the northern part of Oxford near the southern boundary of Middlebury. The airport primarily caters to corporate jets but can also handle commercial traffic during emergencies. The airport is attempting to buy out the Triangle Hill subdivision near the airport in Middlebury because they are located in the runway exclusion zone. While planes have not crashed into the neighborhood, they have crashed in the woods further from the airport north of the neighborhood. This area is well wooded and a brush fire concern area. Another subdivision is planned north of the Triangle Hill subdivision that is out of the exclusion zone but in the area where planes have crashed.

- ❑ Brush fires are a concern south of I-84 near Wooster Road and east of Long Meadow Pond because of limited access along the power lines. Fires are also a concern southwest of Hop Brook Lake near Allerton Farms Road.
- ❑ Brush fires are a concern along Burr Hall Road as there is limited water and it is a long dead end road. They are also a concern along the “Western Hills” section of Waterbury along Route 63 in the northeast part of Town due to topography.
- ❑ Brush fires are a concern south of Route 64 and east of White Avenue.
- ❑ Brush fires are especially dangerous north of Lake Quassapaug, as the area has limited access and high concentrations of Mountain Laurel that produces hazardous fumes when burned. Fires must be fought with self-contained breathing apparatuses. Homes in this area have limited access in and out of the neighborhood.
- ❑ A one-million gallon water tank is located at the end of Cedar Road in the south part of Town, and a second water tower is located south of Ferndale Avenue in the eastern part of Town.
- ❑ The north end of East Farms Road has no fire fighting water. The Town would like to get access to the pond north of East Farm Road for a dry hydrant. A pond west of Falcon Crest Road is the second highest priority for a dry hydrant.
- ❑ The north-central section of Town has problems with supplying fire-fighting water. This includes Artillery Road, North Farms Road, and Mirey Dam Road. There are no ponds in this area to install dry hydrants and the nearest public water service is currently downhill to the southeast along Route 64.
- ❑ The MVFD has a 4x4 brush truck and a 4WD tanker truck capable of carrying water to remote fires.

Fire Department Responds To Brush Fire

25 Lakeview Court

April 18, 2008 14:34 Hours



The Heal Edge Of The Fire

The recent lack of rain in our area has created the perfect conditions for the likelihood of brush fires. On Friday April 18th, the MVFD responded to a Brush Fire at 25 Lakeview Court. Upon arrival it was determined that there were actually two fires burning at the same time approximately 500 feet from each other. The first was a relatively small fire, but the second was a rapidly spreading brush fire of almost 1 acre.

The smaller fire was extinguished by crews from Engine 4, while the larger fire was extinguished by crews from Engine 3 and Engine 6. When the fire outran the reach of Engine 3's booster line, forestry hose from Engine 6 was utilized to penetrate deeper into the woods to bring the remaining fire under control.

Engine crews remained on-scene to rake the entire perimeter of the fire with fire rakes, and to extinguish any remaining hotspots. More than 1000 gallons of water was use to extinguish this fire.

Brush fires in many ways can be more taxing to firefighters than structure fires. Navigating uneven terrain wearing 25 pound fire gear, and hauling heavy hoselines around trees and rocks on a warm day can be quite tiring. Luckily this was a fairly small fire and was easily controlled.



The Black



**Firefighters take a break after knocking down the fire.
From left to right. John Desmarais, Harold Zinno, CD Captain Kevin
Fecteau, Bill Calabrese, and Mike Devino.**

**Also on-scene, Former Deputy Chief Bob Desmarais, Lieutenant Chip Longo, Tom Proulx, Dave
Proulx, Ed
Rockhill, Captain James Redway, and Deputy Chief Dave Desmarais.**

Story and photos by James Redway, MVFD INC - All Rights Reserved.



Firefighter Harold Zinno With Boosterline From Engine 3.

APPENDIX C
RECORD OF MUNICIPAL ADOPTION

S. Bighinatti

U.S. Department of Homeland Security
Region I
99 High St. 6th Floor
Boston, MA 02110-2320

RECEIVED
MAR 13 2009

MILONE AND MACBROOM



FEMA

March 10, 2009

Thomas P. Gormley, First Selectman
Town Hall
1212 Whittemore Road
Middlebury, CT 06762

Dear Mr. Gormley:


Thank you for the opportunity to review the Town of Middlebury Natural Hazard Pre-Disaster Mitigation Plan. The Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) Region I has evaluated the plan for compliance with the Interim Final Rule published in the Federal Register on February 26, 2002 (44 CFR Parts 201 and 206). The plan satisfactorily meets all of the mandatory requirements of the regulations except §201.6(c)(5), adoption by the local governing body.

Federal regulations require that a plan must include documentation of its formal adoption by the local governing body (e.g., Board of Selectmen). Accordingly, this letter reflects a conditional approval of the plan until we receive a copy of its signed and stamped adoption resolution. Once this adoption resolution has been received and accepted, FEMA Region I will send a formal letter of approval to you confirming the Town of Middlebury's eligibility to apply for Mitigation Grants administered by FEMA. If the plan is not adopted within one calendar year of FEMA's conditional approval, the jurisdiction must update the entire plan and resubmit it for FEMA review.

Along with a copy of the plan's adoption resolution, please also be sure to submit an electronic version of the plan. FEMA must upload complete, electronic versions of all approved plans into the National Emergency Management Information System (NEMIS) database. Acceptable electronic formats include a .doc or .pdf file and may be submitted to us on a CD.

Thank you for your continued dedication to public service demonstrated by preparing and adopting a strategy for reducing future disaster losses. Congratulations once again for achieving this milestone and ensuring a safer future for the residents of the Town of Middlebury. Should you have any questions, please do not hesitate to contact Marilyn Hilliard at (617) 956-7536.

Sincerely,


Kevin M. Merli, Director
Mitigation Division

Enclosure

Cc: Art Christian, CT State Hazard Mitigation Officer
Scott Bighinatti, Environmental Scientist, Milone & MacBroom
Virginia Mason, Assistant Director, COGCNV

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

INSTRUCTIONS FOR USING THE PLAN REVIEW CROSSWALK FOR REVIEW OF LOCAL MITIGATION PLANS

Attached is a Plan Review Crosswalk based on the *Local Multi-Hazard Mitigation Planning Guidance*, published by FEMA in July, 2008. This Plan Review Crosswalk is consistent with the *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (Stafford Act), as amended by Section 322 of the *Disaster Mitigation Act of 2000* (P.L. 106-390), the *National Flood Insurance Act of 1968*, as amended by the *National Flood Insurance Reform Act of 2004* (P.L. 108-264) and 44 Code of Federal Regulations (CFR) Part 201 – *Mitigation Planning*, inclusive of all amendments through October 31, 2007.

SCORING SYSTEM

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Each requirement includes separate elements. All elements of a requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a summary score of "Satisfactory." A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing.

When reviewing single jurisdiction plans, reviewers may want to put an N/A in the boxes for multi-jurisdictional plan requirements. When reviewing multi-jurisdictional plans, however, all elements apply. States that have additional requirements can add them in the appropriate sections of the *Local Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements. Optional matrices for assisting in the review of sections on profiling hazards, assessing vulnerability, and identifying and analyzing mitigation actions are found at the end of the Plan Review Crosswalk.

The example below illustrates how to fill in the Plan Review Crosswalk:

Assessing Vulnerability: Overview				
Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.				
Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?	Section II, pp. 4-10	The plan describes the types of assets that are located within geographically defined hazard areas as well as those that would be affected by winter storms.		
B. Does the new or updated plan address the impact of each hazard on the jurisdiction?	Section II, pp. 10-20	The plan does not address the impact of two of the five hazards addressed in the plan. Required Revisions: <ul style="list-style-type: none">• Include a description of the impact of floods and earthquakes on the assets. Recommended Revisions: This information can be presented in terms of dollar value or percentages of damage.		
SUMMARY SCORE				

LOCAL MITIGATION PLAN REVIEW SUMMARY

The plan cannot be approved if the plan has not been formally adopted. Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk. A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. Reviewer's comments must be provided for requirements receiving a "Needs Improvement" score.

Prerequisite(s) (Check Applicable Box)	NOT MET	MET
1. Adoption by the Local Governing Body: §201.6(c)(5) OR	X	
2. Multi-Jurisdictional Plan Adoption: §201.6(c)(5) AND		N/A
3. Multi-Jurisdictional Planning Participation: §201.6(a)(3)		N/A
Planning Process	N	S
4. Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)		X
Risk Assessment	N	S
5. Identifying Hazards: §201.6(c)(2)(i)		X
6. Profiling Hazards: §201.6(c)(2)(i)		X
7. Assessing Vulnerability: Overview: §201.6(c)(2)(ii)		X
8. Assessing Vulnerability: Addressing Repetitive Loss Properties: §201.6(c)(2)(ii)		X
9. Assessing Vulnerability: Identifying Structures, Infrastructure, and Critical Facilities: §201.6(c)(2)(ii)(B)		X
10. Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	X	
11. Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)		X
12. Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii)		N/A

*States that have additional requirements can add them in the appropriate sections of the Local Multi-Hazard Mitigation Planning Guidance or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

**Plan conditionally approved pending receipt of adoption documentation

SCORING SYSTEM

Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Mitigation Strategy	N	S
13. Local Hazard Mitigation Goals: §201.6(c)(3)(i)		X
14. Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)		X
15. Identification and Analysis of Mitigation Actions: NFIP Compliance. §201.6(c)(3)(ii)		X
16. Implementation of Mitigation Actions: §201.6(c)(3)(iii)		X
17. Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)		N/A

Plan Maintenance Process	N	S
18. Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(ii)		X
19. Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)		X
20. Continued Public Involvement: §201.6(c)(4)(iii)		X

Additional State Requirements*	N	S
Insert State Requirement		
Insert State Requirement		
Insert State Requirement		

LOCAL MITIGATION PLAN APPROVAL STATUS

PLAN NOT APPROVED

See Reviewer's Comments

PLAN APPROVED

X**

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

Local Mitigation Plan Review and Approval Status

Jurisdiction: Middlebury, CT	Title of Plan: Town of Middlebury, CT Natural Hazard Pre-Disaster Mitigation Plan	Date of Plan: February 2009
Local Point of Contact: Scott Bighinatti	Address: 99 Realty Drive Cheshire, Connecticut 06702	
Title: Environmental Scientist		
Agency: Milone & MacBroom		
Phone Number: (203) 271-1773	E-Mail: scottb@miloneandmacbroom.com	

State Reviewer:	Title:	Date:
------------------------	---------------	--------------

FEMA Reviewer: Reid Dominie	Title: Hazard Mitigation Specialist	Date: December 9, 2008
Date Received in FEMA Region [Insert #]		
Plan Not Approved		
Plan Conditionally Approved	3.10.09	
Date Approved		

Jurisdiction: Middlebury, CT	NFIP Status*			
	Y	N	N/A	CRS Class
	X			

* Notes: Y = Participating N = Not Participating N/A = Not Mapped

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

PREREQUISITE(S)

1. Adoption by the Local Governing Body

Requirement §201.6(c)(5): [The local hazard mitigation plan **shall** include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Has the local governing body adopted new or updated plan?			X	
B. Is supporting documentation, such as a resolution, included?			X	
SUMMARY SCORE			X	

2. Multi-Jurisdictional Plan Adoption

Requirement §201.6(c)(5): For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Does the new or updated plan indicate the specific jurisdictions represented in the plan?				
B. For each jurisdiction, has the local governing body adopted the new or updated plan?				
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?				
SUMMARY SCORE				N/A

3. Multi-Jurisdictional Planning Participation

Requirement §201.6(a)(3): Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Does the new or updated plan describe how each jurisdiction participated in the plan's development?				
B. Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?				
SUMMARY SCORE				N/A

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

PLANNING PROCESS: §201.6(b): *An open public involvement process is essential to the development of an effective plan.*

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:*

- (1) *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
- (2) *An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and*
- (3) *Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

Requirement §201.6(c)(1): *[The plan **shall** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan provide a narrative description of the process followed to prepare the new or updated plan?	Pg 1-8 to 1-11	The Plan provides a detailed description of the planning process.		X
B. Does the new or updated plan indicate who was involved in the current planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)	Pg 1-8 to 1-11	Ms. Virginia Mason of COGCNV spearheaded the development of Middlebury's Plan. The Town personnel involved in the planning process are listed on page 1-9.		X
C. Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)	Pg 1-8 to 1-11	The Public was invited to participate in the planning process via newspaper and were also encouraged to "contact the COG with any comments that should arise subsequent to the meeting" (1-10). Additional public comments will be heard at the tentatively scheduled Plan adoption meeting in March 2009.		X
D. Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?	Pg 1-8 to 1-11	"Eight municipal agencies and civic organizations were invited via a mailed copy of the press release that announced the public information meeting" (1-10). These entities are listed on page 1-10 and included neighboring communities. "Of the above listed organizations, representatives from the Town Department of Public Works and the Town Health Department were represented at the meeting" (1-10).		X
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?	Pg 1-8 to 1-11	The Plan cites the CT State Hazard Mitigation Plan. Plans and Studies are referenced throughout the Plan and cited in Section 12.0. Under each hazard section, a subsection analyzes existing programs, policies and mitigation measures.		X
F.		This is a new Plan.		N/A

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

B. Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in the new or updated plan?	Sections 3-9	See above		X
C. Does the plan provide information on previous occurrences of each hazard addressed in the new or updated plan?	Sections 3-9	See Above		X
D. Does the plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the new or updated plan?	Sections 3-9	See Above		X
SUMMARY SCORE				X

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

7. Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): [The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?	Sections 3-9	Each hazard is granted its own section, under which fall the following subsections: setting; hazard assessment; historic record; existing programs, policies and mitigation measures; vulnerabilities and risk assessment; and potential mitigation measures, strategies and alternatives.		X
B. Does the new or updated plan address the impact of each hazard on the jurisdiction?	Sections 3-9	See above		X
SUMMARY SCORE				X

8. Assessing Vulnerability: Addressing Repetitive Loss Properties

Requirement §201.6(c)(2)(ii): [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?	Pg 3-13	Note: This requirement becomes effective for all local plans approved after October 1, 2008. "Based on correspondence with the State of Connecticut NFIP Coordinator, one repetitive loss property is located in the Town of Middlebury" (3-13).		X
SUMMARY SCORE				X

9. Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan **should** describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?	Pg 2-21 to 2-29	Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing. Critical Facilities in Middlebury are listed and mapped. "Two of Middlebury's critical facilities are located near flood prone areas. The Fire Station on Tucker Hill Road is adjacent to the Goat Brook		X

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

			and Hop Brook floodplains, located to the south and east of the facility respectively. The Department of Public Works is not located adjacent to a mapped floodplain, but its location south of Woodside Avenue and near the unnamed stream causes flooding in that area is of concern" (2-24).		
B. Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?	Pg 2-24 and 2-27		<p>Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.</p> <p>"Two of Middlebury's critical facilities are located near flood prone areas. The Fire Station on Tucker Hill Road is adjacent to the Goat Brook and Hop Brook floodplains, located to the south and east of the facility respectively. The Department of Public Works is not located adjacent to a mapped floodplain, but its location south of Woodside Avenue and near the unnamed stream causes flooding in that area is of concern" (2-24).</p> <p>"Some of the sewer pumping stations are located in or adjacent to floodplains" (2-27).</p>	X	
SUMMARY SCORE				X	

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

10. Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): [The plan **should** describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan estimate potential dollar losses to vulnerable structures?	Not Found	Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.	X	
B. Does the new or updated plan describe the methodology used to prepare the estimate?	Not Found	Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.	X	
SUMMARY SCORE			X	

11. Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): [The plan **should** describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe land uses and development trends?	Pg 2-4 to 2-5 and 2-19 to 2-21	Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.		X
SUMMARY SCORE				X

12. Multi-Jurisdictional Risk Assessment

Requirement §201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?				
SUMMARY SCORE				N/A

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

MITIGATION STRATEGY: § 201.6(c)(3): *The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

13. Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards?	Pg 1-3 to 1-4	Hazard Mitigation Goals are listed. In future updates of the Plan, we recommend that a description of the process used to develop these goals be provided.		X
SUMMARY SCORE				X

14. Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): *[The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?	Sections 3-9 and Specifically Section 10	A summary of proposed mitigation actions can be found on pages 10-2 to 10-7		X
B. Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?	Sections 3-9 and Specifically Section 10			X
C. Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?	Sections 3-9 and Specifically Section 10			X
SUMMARY SCORE				X

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Requirement: §201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe the jurisdiction (s) participation in the NFIP?	Pg 3-3 & 3-11	Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008. The Plan includes the publication date of its FIRM of October 16, 1979. The Middlebury Zoning Enforcement Officer is called out as being the NFIP administrator overseeing the flood regulations.		X
B. Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?	Pg 10-2 to 10-7	Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008. The Plan proposes such actions as "Consider joining FEMA's Community Rating System" and considering a restudy of local flood prone areas and "produce new local level regulatory maps... (10-3)"		X
SUMMARY SCORE				X

16. Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)	Pg 1-7 to 1-8	The Plan provides a discussion of STAPLEE ranking method used to prioritize the Town's mitigation actions.		X
B. Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources and the timeframe to complete each action?	Pg 11-1 and Appendix A			X
C. Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?	Pg 1-8	STAPLEE		X
D. Does the new or updated plan identify the "benefits" of proposed mitigation actions as a benefit review?		This is a new Plan.		N/A

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

17. Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?				
B. Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (<i>i.e.</i> , deferred), does the updated plan describe why no changes occurred?				
SUMMARY SCORE				N/A

PLAN MAINTENANCE PROCESS

18. Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): [The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe the method and schedule for monitoring the plan, including the responsible department?	Pg 11-2	"The Office of the First Selectman will be the party responsible for monitoring the successful implementation of the Plan as part of his/her oversight of all municipal departments" (11-2). The method and schedule for monitoring the Plan is discussed.		X
B. Does the new or updated plan describe the method and schedule for evaluating the plan, including how, when and by whom (<i>i.e.</i> the responsible department)?	Pg 11-2 to 11-3			X
C. Does the new or updated plan describe the method and schedule for updating the plan within the five-year cycle?	Pg 11-3	"The Town of Middlebury plans to formally update the plan at least once every five years" (11-3).		X
SUMMARY SCORE				X

Middlebury, CT LOCAL MITIGATION PLAN REVIEW CROSSWALK

19. Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(iii): [The plan **shall** include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?	Pg 11-1 to 11-2	"It is expected that revisions of other Town plans and regulations, such as the Plan of Conservation and Development, department annual budgets, and the Zoning and Subdivision Regulations, will reference this plan and its updates" (11-1).		X
B. Does the new or updated plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?	Pg 11-1 to 11-2	"The Office of the First Selectmen will be responsible for assigning appropriate Town officials to update the Plan of Conservation and Development, Zoning Regulations, Subdivision Regulations, Wetland Regulations, and Emergency Operations Plan to include the provisions in this plan...(11-1). This is a new Plan.		X
C.				N/A
SUMMARY SCORE				X

Continued Public Involvement

Requirement §201.6(c)(4)(iii): [The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan explain how continued public participation will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)	Pg 11-3	"Continued public involvement will be sought regarding the monitoring, evaluating, and updating of the Plan. Public input may be solicited through community meetings and input to web-based information gathering tools. Public comment on changes to the Plan may be sought through posting of public notices, and notifications posted to the website of the Council of Governments of the Central Naugatuck Valley, as well as the website of the Town of Middlebury" (11-3).		X
SUMMARY SCORE				X

D Murphy



COUNCIL OF GOVERNMENTS OF THE CENTRAL NAUGATUCK VALLEY

60 NORTH MAIN ST • 3rd FLOOR • WATERBURY, CT 06702 (203)757-0535

Transmittal Letter

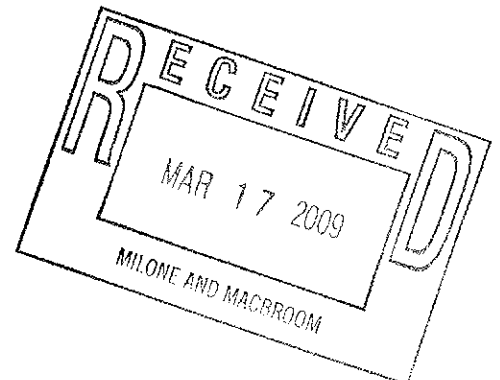
To: David Murphy
Milone and MacBroom
99 Realty Drive
Cheshire, CT 06410

From: Virginia Mason, Assistant Director

Subject: Middlebury — Public Hearing Notice, Pre-Disaster Mitigation

Date: March 16, 2009

Enclosed is the Pre-Disaster Mitigation Public Hearing Notice for Middlebury.



RepublicanAmerican

389 Meadow Street - P.O. Box 2090

Waterbury, CT 06722-2090

Phone: 203-574-8686 Fax: 203-573-0090 Toll Free: 800-992-8282

e mail: advbilling@rep-am.com

Customer	A/C #	Billing Period
MIDDLEBURY SELECTMEN	32895	02/01/09-02/28/09

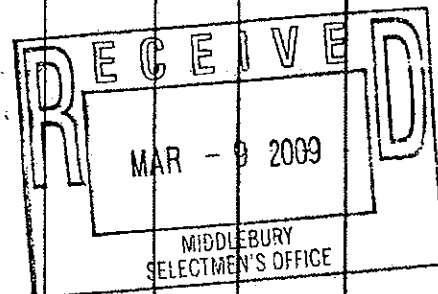
PAYMENT TERMS	30 DAYS
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TOTAL AMOUNT DUE	\$ 90.48
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Fed EIN 06-0581760

* Please See Reverse Side for Pub Index

DATE	AD # / INV #	CUST ORDER #	PUB #	DESCRIPTION	SIZE	BILLED UNITS	TIMES RUN	RATE	BILLED AMOUNT
02/27/09	RA0288173 / INV000434120	cogcnv	RA	PREVIOUS BALANCE					\$0.00
				TOWN OF MIDDLEBURY NOTICE OF PUBLIC HEARING COUNCIL	1x	39.000	1	\$2.3200	\$90.48
				CURRENT AMOUNT DUE					\$90.48
				TOTAL AMOUNT DUE					\$90.48



Past due balance accrues finance charge of 1.5% per month

All charges include any applicable Connecticut State sales tax

REMITTANCE ADVICE - PLEASE RETURN WITH PAYMENT

REMITTANCE ADDRESS

REPUBLICAN AMERICAN
PO BOX 2090
WATERBURY, CT 06722-2290

CUSTOMER	A/C #	BILLING PERIOD	TOTAL AMOUNT DUE	AMOUNT REMITTED
MIDDLEBURY SELECTMEN	32895	02/01/09-02/28/09	\$ 90.48	

CREDIT CARD #	
EXPIRATION DATE	
SIGNATURE	

MIDDLEBURY SELECTMEN
1212 WHITTEMORE ROAD
MIDDLEBURY CT 06762

CHECK #

TOWN OF MIDDLEBURY

1212 Whittemore Road
Middlebury, CT 06762
(203) 758-1770 - Phone
(203) 758-2915 - Fax

Fax

To: Dave Murphy
Scott J. Bighinatti
Fax #: Milone & MacBroom
203-272-9733

From: Claudia P. Tata
Administrative Manager

Date: April 14, 2009

Pages: 4

Re: Hazard Mitigation Plan

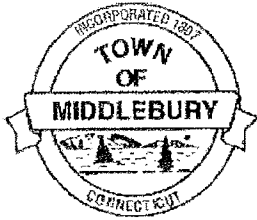
cc: Virginia Mason, CAJ
756-7688

Enclosed is a copy of the notice of the Public Hearing, minutes of the Public Hearing, and the Resolution adopted by the Board of Selectmen.

If there's anything else, please let me know.

Thank you.

Enclosures

**TOWN OF MIDDLEBURY***Office of the Selectmen***RESOLUTION
NATURAL HAZARD PRE-DISASTER MITIGATION PLAN
FOR NATURAL DISASTERS**

WHEREAS, the Disaster Mitigation Act of 2000 encourages communities to prepare a Natural Hazard Pre-Disaster Mitigation Plan for natural disasters, such as hurricanes or flood; and

WHEREAS, given the personal and financial severity of recent natural disasters, the Council of Governments of the Central Naugatuck Valley has been working with its member Municipalities to understand local conditions and plan accordingly; and

WHEREAS, the primary goal of the Plan is to reduce the loss of or damage of life, property, infrastructure, and natural, cultural, and economic resources from natural disasters; and

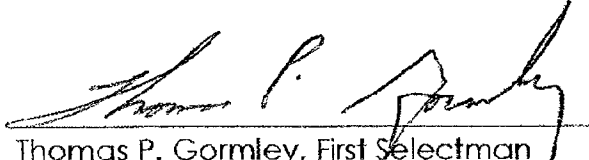
WHEREAS, the Natural Hazard Pre-Disaster Mitigation Plan recommends many hazard mitigation actions that, provided Federal funding assistance is available, will protect the people and property affected by the natural hazards that potentially face the Town of Middlebury; and

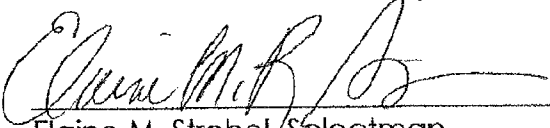
WHEREAS, a Public Information Meeting was held to solicit input and recommendations, and a Public Hearing was held to review the Plan as required by law;

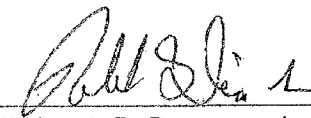
BE IT RESOLVED by the Board of Selectmen of the Town of Middlebury that the Natural Hazard Pre-Disaster Mitigation Plan is hereby adopted as an official plan of the Town of Middlebury and that First Selectman Thomas P. Gormley shall implement the plan; and that the Municipal Departments will report regularly on their activities, accomplishments, and progress for the Town of Middlebury.

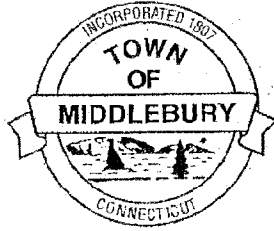
BE IT FURTHER RESOLVED, the Town of Middlebury is authorized to apply and accept any future Federal or State Grant assistance thereto.

Adopted this 6th day of April, 2009 by the Board of Selectmen of Middlebury, Connecticut.


Thomas P. Gormley, First Selectman


Elaine M. Strobel, Selectman


Robert C. Desmarais, Sr., Selectman



TOWN OF MIDDLEBURY

1212 Whittemore Road
Middlebury, Connecticut 06762

MINUTES

Public Hearing
Natural Hazard Pre-Disaster Mitigation Plan
March 9, 2009
Shepardson Community Center, Middlebury, CT

In attendance:

First Selectman Thomas P. Gormley
Robert C. Desmarais, Selectmen
Police Chief Richard Guisti
Lawrence Hutvagner, Chief Financial Officer
Claudia Tata, Administrative Manager
Virginia Mason, Council of Governments
Barbara Whitaker, Secretary to First Selectman
Robin Gulick, Secretary of Police Chief
David Murphy, Milone & MacBroom, Inc.
Residents of the Town of Middlebury

First Selectman Thomas P. Gormley opened the hearing at 6:00 PM reading the notice that was published in the Republican American newspaper on February 27, 2009. A copy of said notice is attached. Mr. Gormley then introduced Virginia Mason from the Council of Governments of the Central Naugatuck Valley. Ms. Mason spoke briefly about the grant the Town of Middlebury received to prepare a Natural Hazard Pre-Disaster Mitigation Plan.

Mr. David Murphy, P.E. of Milone & MacBroom, Inc. distributed a 12 page hand out of a slide presentation he narrated to the residents and the government officials. A copy of the plan was available for inspection as well as a booklet from FEMA titled "Are you ready? An In-depth guide to citizen preparedness."

There was no opposition expressed to the plan as presented. The hearing ended at 6:20 PM.

Submitted by,

Claudia Tata
Administrative Manager

March 10, 2009

**TOWN OF MIDDLEBURY
NOTICE OF PUBLIC HEARING**

**COUNCIL OF GOVERNMENTS OF THE CENTRAL
NAUGATUCK VALLEY
NATURAL HAZARD PRE-DISASTER MITIGATION PLAN**

The Board of Selectmen of the Town of Middlebury will hold a public hearing at 6:00 p.m. on Monday, March 9, 2009 in the Auditorium of the Shepardson Community Center, 1172 Whittemore Road, Middlebury, Connecticut, to consider the proposed Council of Governments of the Central Naugatuck Valley's Natural Hazard Pre-Disaster Mitigation Plan for the Town of Middlebury.

Electors and citizens will be heard at the public hearing concerning this plan. A copy of the plan is available for inspection at www.cogcnv.org or at the First Selectman's office, Town Hall, 1212 Whittemore Road, Middlebury, CT.

Dated at Middlebury, Connecticut, this 25th day of February 2009.

By: Thomas P. Gormley
First Selectman

R/A February 27, 2009