TOWN OF NEW FAIRFIELD
HAZARD MITIGATION PLAN UPDATE

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Prepared for:

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Updated under a Hazard Mitigation Grant Program (HMGP) grant from FEMA through the Department of Emergency Services and Public Protection (DESPP) Division of Emergency Management and Homeland Security (DEMHS). The contents of this plan reflect the views of the Town of New Fairfield and do not necessarily reflect the official views of DEEP or DEMHS. The plan does not constitute a specification or regulation.

ACKNOWLEDGEMENTS AND CONTACT INFORMATION

This plan was updated under the direction of the Town of New Fairfield. The following individual should be contacted with questions or comments regarding the plan:

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This Hazard Mitigation Plan Update could not have been completed without the time and dedication of the additional following individuals at the local level:

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Bob Rzasa, Director of the Public Works Department
Christopher Baldwin, Building Official
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LIST OF ACRONYMS

AEL	Annualized Earthquake Losses or Annual Estimated Loss
ASFPM	Association of State Floodplain Managers
BCA	Benefit Cost Analysis
BCR	Benefit-Cost Ratio
BFE	Base Flood Elevation
BOCA	Building Officials and Code Administrators
CDBG	Community Development Block Grant
CFS	Cubic Feet Per Second
CLEAR	Center for Land Use Education and Research (University of Connecticut)
CRS	Community Rating System
CTDEEP	Connecticut Department of Energy & Environmental Protection
CTDEMHS	Connecticut Division of Emergency Management and Homeland Security
CTDOT	Connecticut Department of Transportation
CTSDC	Connecticut State Data Center
DESPP	Department of Emergency Services and Public Protection
DFIRM	Digital Flood Insurance Rate Map
DMA	Disaster Mitigation Act
DPW	Department of Public Works
EAP	Emergency Action Plan
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
°F	Degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FHBM	Flood Hazard Boundary Map
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
GIS	Geographic Information System
GPS	Global Positioning System
HIRA	Hazard Identification and Risk Assessment
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HURDAT	Hurricane Database (NOAA's)
HURISK	Hurricane Center Risk Analysis Program
HVCEO	Housatonic Valley Council of Elected Officials
KM	Kilometer
KT	Knot
LOMA	Letter of Map Amendment
LOMC	Letter of Map Change
MMI	Milone & MacBroom, Inc.

LIST OF ACRONYMS (continued)

MPH	Miles per Hour
MSL	Mean Sea Level
NCDC	National Climatic Data Center
NESIS	Northeast Snowfall Impact Scale
NFIP	National Flood Insurance Program
NFIRA	National Flood Insurance Reform Act
NIFC	National Interagency Fire Center
NOAA	The National Oceanic and Atmospheric Administration
NRCC	Northeast Regional Climate Center
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
OPM	Office of Policy and Management
PA	Public Assistance Grant Program
PDM	Pre-Disaster Mitigation
Plan	Hazard Mitigation Plan
POCD	Plan of Conservation and Development
RFC	Repetitive Flood Claims
RLP	Repetitive Loss Property
RSI	Regional Snowfall Index
SFHA	Special Flood Hazard Area
SRL	Severe Repetitive Loss
SSURGO	Soil Survey Geographic
STAPLEE	Social, Technical, Administrative, Political, Legal, Economic, and Environmental
TAC	Technical Assistance Contract
Town of New Fairfield	New Fairfield or Town
USACE	United States Army Corps of Engineers
USD	United States Dollars
USDA	United States Department of Agriculture
USDOE	United States Department of Energy
USGS	United States Geological Survey
WestCOG	Western Connecticut Council of Governments

EXECUTIVE SUMMARY

Town of New Fairfield Hazard Mitigation Plan

The primary purpose of a Hazard Mitigation Plan (HMP or "Plan") is to identify natural hazards and risks, existing capabilities, and activities that can be undertaken by a community to prevent loss of life and reduce property damages associated with identified hazards. The Disaster Mitigation Act of 2000 requires local communities to have a Federal Emergency Management Agency (FEMA) approved mitigation plan in order to be eligible to receive Pre-Disaster Mitigation program grants and postdisaster Hazard Mitigation Grant Program funds under the Hazard Mitigation Assistance program. The Town of New Fairfield ("New Fairfield" or "Town") first developed a Plan in 2011.

New Fairfield's original Plan was developed just before a number of severe storms struck the region, resulting in presidential disaster declarations in Connecticut. These include Tropical Storm Irene in August 2011, Winter Storm Alfred in October 2011, "Superstorm" Sandy in August 2012, Winter Storm Nemo in February 2013, and the winter storms of January-February 2015. These storms have tested the resiliency of New Fairfield and have demonstrated the strengths of the Town's capabilities while also prompting improvements to those capabilities.

Nevertheless, the overall hazard mitigation priorities of New Fairfield have not changed since the previous Plan. These priorities are: increase access to and awareness of funding sources; identify mitigation initiatives; connect hazard mitigation to other community planning efforts; improve mechanisms for pre- and post-disaster decision making; improve the ability to implement post-disaster recovery projects; enhance and preserve natural resources; and educate residents and policy-makers.

The varied terrain in New Fairfield makes it vulnerable to an array of natural hazards, including small areas of inland flooding; high winds associated with hurricanes, summer storms, tornadoes, and winter storms; hail and lightning during summer storms; ice and snow during winter storms; earthquakes; dam failure; and wildfires. The Plan discusses each of these natural hazards in detail with the understanding that a particular hazard effect (e.g., high winds) can be caused by a variety of hazard events (e.g., hurricanes and winter storms).

New Fairfield considers its police, fire, governmental, and major transportation arteries to be its critical facilities as well as its churches and educational institutions, which can be used as shelters. None of these critical facilities are regularly impacted by flooding. The New Fairfield High School and Middle School campus located on Gillotti Road is currently the primary shelter. Local and regional power outages due to high winds or precipitation are a primary concern in New Fairfield, and the Town is continually striving to increase its capabilities in mitigating this vulnerability. Since the initial HMP, officials have upgraded the generator at the fire department and purchased two new portable generators. Officials work closely with Eversource Energy, the local electric utility, to prevent and respond to outages. Many of the hazard mitigation strategies and actions proposed in this update relate to strengthening the Town's electric grid.

New Fairfield lies within six subregional watersheds. Approximately 76 percent of the Town eventually drains to the Housatonic River. There are also a number of water bodies in Town including Candlewood Lake, the Squantz Pond, and Margerie Lake. The majority of these areas have defined 100-year floodplains.

The Town has a number of measures in place to prevent flood damage including regulations, codes, and ordinances preventing encroachments and development near floodplains and floodways. Indirect and nuisance flooding occurs near streams and rivers throughout Town due to inadequate drainage and other factors. There are no repetitive loss properties in New Fairfield, and flood damage to structures is limited to a few residential and commercial properties. The majority of flood damage in New Fairfield occurs to Town-owned infrastructure such as culverts and bridges. Margerie North Pond Dam at the southern end of Margerie Reservoir is a high hazard dam just upstream of downtown New Fairfield.

Significant wind damage has occurred as a result of summer storms and winter storms since the previous Plan. Most of this damage has been secondary damage caused by falling tree limbs as opposed to wind shear. Hurricanes, tornadoes, and downbursts are less frequent but represent more extreme wind events. Major winter nor'easters, which produce extreme snowfall and moderate wind damage, have the potential to occur every few years.

No active faults lie within New Fairfield, and earthquake damage is practically nonexistent. While New Fairfield is unlikely to experience a damaging earthquake in any given year, areas underlain with sand and gravel are at increased risk due to amplification of energy and collapse if one should occur.

New Fairfield is at a low risk for wildfires. Those areas at the highest risk are limited access forests and other areas away from water sources where tanker trucks must be relied on to fight a fire. Open pastures, especially the Town landfill, are also considered to be higher risk areas as they could burn quickly during a drought. A significant wildfire burned 28 acres of State Forest within New Fairfield in summer 2015.

A variety of recommendations are included in this Plan for each natural hazard type. Recommendations are summarized in the final section of each chapter, in Sections 10.1 and 10.2, and in Appendix A. Section 10.3 summarizes the highest ranked recommendations on the basis of a STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) analysis. For example, one highly ranked recommendation is to upgrade the emergency notification system to a company that has more capabilities for assisting residents with special needs.

The Plan concludes with a discussion of implementing and updating the Plan. A listing of potential grant sources as well as federal, regional, state, and other resources is provided in Section 10.3 to assist the Town in implementing the Plan. This HMP Update will need to be updated again within 5 years from the date of approval by FEMA in order to be considered current.

1.0 INTRODUCTION

1.1 <u>Background and Purpose</u>

The goal of emergency management activities is to prevent loss of life and property. The four phases of emergency management include Mitigation, Preparedness, Response, and Recovery. Mitigation differs from the remaining three phases in that hazard mitigation is performed with the goal of eliminating or reducing the need to respond. The term <u>*hazard*</u> refers to an extreme natural event that poses a risk to people, infrastructure, or resources. In the context of natural disasters, predisaster 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 predisaster 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. Public safety and property loss reduction are the driving forces behind this Plan. However, careful consideration also much be given to the preservation of history, culture, and the natural environment of the region.

This HMP Update is prepared specifically to identify hazards and potential mitigation measures in the town of New Fairfield, Connecticut ("New Fairfield" or "Town"). The HMP is relevant not only in emergency management situations but also should be used within the Town's land use, environmental, and capital improvement frameworks. The Town's previous HMP was adopted by the Town in June 2011. While an update of the previous HMP, this HMP has been reformatted to be consistent with current FEMA planning requirements.

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 predisaster mitigation and streamline administration of disaster relief.

Mitigation Funding

Applications for hazard mitigation grant funding are administered under the Unified Hazard Mitigation Assistance (HMA) program. More information on this and the following programs can be found at FEMA's website, http://www.fema.gov/

The DMA requires local communities to have a FEMA-approved mitigation plan in order to be eligible to apply for and receive HMA grants. The HMA "umbrella" contains five competitive grant programs designed to mitigate the impacts of natural hazards. This HMP Update was developed to be consistent with the general requirements of the HMA program as well as the specific requirements of the Hazard Mitigation Grant Program (HMGP) for postdisaster mitigation activities as well as the Pre-Disaster Mitigation (PDM) and Flood Mitigation Assistance (FMA) programs. These programs are briefly described below.

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. The "5% Initiative" is a subprogram that provides the opportunity to fund mitigation actions that are consistent with the goals and objectives of the state and local mitigation plans and meet all HMGP requirements but for which it may be difficult to conduct a standard benefit-cost analysis (Section 1.5) to prove cost effectiveness. This Plan Update is funded by the HMGP.

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 predisaster mitigation planning and the implementation of feasible, effective, and cost-efficient mitigation measures. Funding of HMPs and projects is meant to 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.

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. These are Planning, Project, and Technical Assistance grants.

The Biggert-Waters Flood Insurance Reform Act of 2012 eliminated the Repetitive Flood Claims (RFC) and Severe Repetitive Loss (SRL) programs and made the following significant changes to the FMA program:

- The definitions of repetitive loss and SRL properties have been modified.
- Cost-share requirements have changed to allow more federal funds for properties with repetitive flood claims and SRL properties.
- There is no longer a limit on in-kind contributions for the nonfederal cost share.

Effective August 15, 2013, acquisitions and elevations will be considered cost-effective if the project costs are less than $276,000 and $175,000, respectively. Structures must be located in Special Flood Hazard Areas (the area of the 1-percent-annual-chance flood). The benefit-cost analysis (BCA) will not be required.

The NFIP provides the funding for the FMA program. The PDM and FMA programs are subject to the availability of appropriation funding as well as any program-specific directive or restriction made with respect to such funds.

One potentially important change to the PDM, HMGP, and FMA programs is that "green open space and riparian area benefits can now be included in the project benefit cost ratio (BCR) once the project BCR reaches 0.75 or greater." The inclusion of environmental benefits in the project BCR is limited to acquisition-related activities.

Table 1-1 presents potential mitigation project and planning activities allowed under each FEMA grant program described above as outlined in the most recent HMA Unified Guidance document.

TABLE 1-1
Eligible Mitigation Project Activities by Program

Eligible Activities	**HMGP**	**PDM**	**FMA**
Property Acquisition and Structure Demolition or Relocation	X	X	X
Structure Elevation	X	X	X
Mitigation Reconstruction			X
Dry Floodproofing of Historic Residential Structures	X	X	X
Dry Floodproofing of Non-residential Structures	X	X	X
Generators	X	X	
Localized Flood Reduction Projects	X	X	X
Non-Localized Flood Reduction Projects	X	X	
Structural Retrofitting of Existing Buildings	X	X	
Non-structural Retrofitting of Existing Buildings and Facilities	X	X	X
Safe Room Construction	X	X	
Wind Retrofit for One- and Two-Family Residences	X	X	
Infrastructure Retrofit	X	X	X
Soil Stabilization	X	X	X
Wildfire Mitigation	X	X	
Post-Disaster Code Enforcement	X		
Advance Assistance	X		
5% Initiative Projects	X		
Miscellaneous/Other	X	X	X

Source: Table 3 – HMA Unified Guidance document, 2015

Many of the strategies and actions developed in this Plan fall within the above list of eligible activities.

TABLE 1-2
Hazard Event Ranking

Natural Hazards	Location 1 = small 2 = medium 3 = large	Frequency of Occurrence 0 = unlikely 1 = possible 2 = likely 3 = highly likely	Magnitude/ Severity 1 = limited 2 = significant 3 = critical 4 = catastrophic	Rank
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

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

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 1 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 2 weeks; property severely damaged <50% and >25%.
4 = catastrophic: multiple deaths; complete shutdown of facilities for 30 days or more; property severely damaged >50%

TABLE 1-3
Hazard Effect Ranking

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

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

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

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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%.
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3 = critical: Injuries and/or illnesses result in permanent disability; complete shutdown of critical facilities for at least 2 weeks; property severely damaged <50% and >25%.
4 = catastrophic: multiple deaths; complete shutdown of facilities for 30 days or more; property severely damaged >50%

1.2 Hazard Mitigation Goals

The primary goal of this HMP Update has not changed from the initial Plan. It 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 HMP is expected to do the following:

- ***Increase access to and awareness of funding sources for hazard mitigation projects.*** Certain funding sources such as the PDM and HMGP may be available if the HMP 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 that 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 New Fairfield's development through interdepartmental and intermunicipal coordination.
- ***Improve the mechanisms for predisaster and postdisaster 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 postdisaster 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.

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 *2014 Connecticut Natural Hazard Mitigation Plan*, the New York State Hazard Mitigation Plan, and correspondence with local officials, the following have been identified as natural hazards that can potentially affect the Town:

- Flooding
- Hurricanes and Tropical Storms
- Summer Storms (including lightning, hail, and heavy winds) and Tornadoes
- Winter Storms
- Earthquakes
- Dam Failure
- Wildfires

These are the same hazards that were addressed in the initial New Fairfield Hazard Mitigation Plan. They were reviewed during the development of the *2014 Connecticut Natural Hazards Mitigation Plan* (adopted January 2014), and New Fairfield's Plan contributed to the Hazard Identification and Risk Assessment (HIRA) presented in that document. Thus, the plans are consistent. The only hazard given attention in the *2014 Connecticut Natural Hazards Mitigation Plan* but not addressed in the New Fairfield HMP Update is drought; however, this is the lowest-ranked hazard of those discussed in the state's plan, with a medium-low composite risk score for Fairfield County. In addition, the statewide and countywide annual estimated loss (AEL) in the state plan for this hazard is $0. As such, its inclusion was considered not necessary in the New Fairfield HMP Update.

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. See Tables 1-2 and 1-3.

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 New Fairfield's community profile, including the physical setting, demographics, development trends, governmental structure, and sheltering capacity. Next, each chapter of this Plan is dedicated to a particular hazard event and is broken down into six or seven different parts. These are *Setting; Hazard Assessment; Historic Record; Existing Capabilities; Vulnerabilities and Risk Assessment; Potential Mitigation Strategies and Actions; and Status of Mitigation Strategies and Actions.* These parts 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 Capabilities*** gives an overview of the measures that the Town 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 Strategies and Actions*** identifies mitigation alternatives, including those that may be the least cost effective or inappropriate for New Fairfield.

- ❑ ***Status of Mitigation Strategies and Actions*** provides a summary of the recommended courses of action for New Fairfield that are included in the STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) analysis, described in Section 10.2.

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

1.4 Documentation of the Planning Process

New Fairfield developed its initial HMP using Town funds. In 2012, the Housatonic Valley Council of Elected Officials (HVCEO), the regional planning body responsible for New Fairfield and nine other municipalities, secured an HMGP grant from FEMA through the Connecticut Division of Emergency Management and Homeland Security (CT DEMHS). This grant is currently paying for development of initial HMPs for seven member municipalities as well as for HMP updates for three other member municipalities including New Fairfield. In 2014, HVCEO was incorporated into the Western Connecticut Council of Governments (WestCOG), which is completing the grant.

Table 1-4 lists the individuals from the Town who provided information, data, studies, reports, and observations and were involved in the development of the initial Plan and the Plan Update.

TABLE 1-4
Local Plan Development Participants

Name	Department or Commission	Initial Plan	Update
Susan Chapman	First Selectman		x
David Hannon	Deputy Director, WestCOG		x
Jim Vigar	Director, Office of Emergency Management		x
Rob Sachnin	Senior Planner, WestCOG		x
John Hodge	Former First Selectman	x	
Jean Flynn	Former Director, Office of Emergency Management	x	
Joe Rzasa	Highway Foreman, Dept of Public Works	x	
Robert Rzasa	Director of Public Works	x	x
Maria Horowitz	Zoning Enforcement Officer	x	
Christopher Baldwin	Building Official	x	x
Lisa Low	Lisa Low & Associates; Former Member, Town of New Fairfield Grant Administration	x	

Coordination with surrounding communities for the New Fairfield HMP Update is described in Section 1.5.

During the initial Plan development, 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. Plans and documents that proved important to the development of the Plan included the Town's Plan of Conservation and Development (2003); "Changing Land Use in New Fairfield, CT" by the Housatonic Valley Council of Elected Officials (2010); the Flood Study of East Lake Brook (2009); Report of Storm Damage to Town Property from Tropical Storm Floyd (1999); the Emergency Operations Plan; and the Inland Wetland, Subdivision, and Zoning Regulations of the Town of New Fairfield. For this Plan Update, additional data collection was performed to compile information about changes to the status of past hazards and mitigation projects as well as to identify new hazards and mitigation projects. Information from these sources is discussed in the appropriate sections of this Plan. 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 HMP Update.

The following is a list of meetings that were held as well as other efforts to develop the initial HMP and this 2016 Update:

<u>Initial Plan</u>

- ❑ ***A project meeting with Town officials was held August 20, 2010.*** Necessary documentation was collected, and problem areas within the Town were discussed.

- ❑ ***Field inspections were performed on August 20, 2010.*** Observations were made of problem areas within the Town based on preliminary correspondence with local officials.

- ❑ ***Field inspections were performed on August 31, 2010.*** Observations were made of problem areas within the Town with the assistance of Ms. Flynn.

- ❑ ***A public information meeting was held September 7, 2010 at 7:00 p.m.*** The purpose of the meeting was to present preliminary information and solicit feedback.

- ❑ ***An opportunity for public comment was presented at the Board of Selectmen meeting on June 9, 2011 at 7:00 p.m.*** No public comments were received, and the Plan was adopted by the Board of Selectmen.

<u>Initial Public Comment</u>

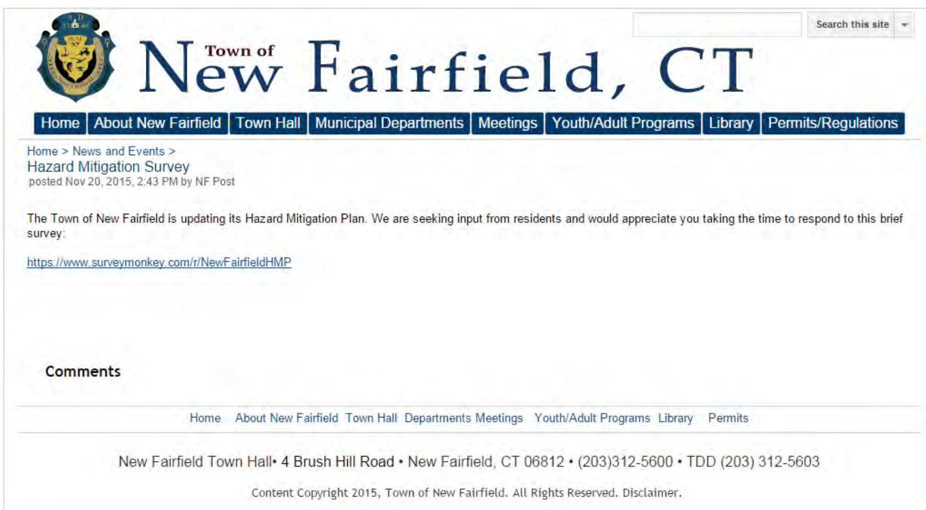
Residents were invited to the public information meeting via the *Citizen News* (the local weekly newspaper) and an announcement by Selectman Susan Chapman at the Board of Selectmen Special Meeting on August 30, 2010. Copies of this announcement and the meeting minutes are included in Appendix B.

Following conditional approval from FEMA, additional opportunities for the public to review the Plan were implemented in advance of the public hearing to adopt this Plan at a Board of Selectmen meeting in June 2011. The final draft sent for FEMA review was posted on the Town website (http://www.newfairfield.org/) to provide opportunities for public review and comment, and a draft was made available in the New Fairfield Public Library. No public comments were received during the public review process, which concluded at the June 9, 2011 meeting.

<u>Updated Plan</u>

- ❑ ***A project meeting with Town officials was held October 29, 2015.*** The update process was described, recent emergency events were reviewed, and ongoing mitigation strategies, actions, and goals were discussed.

- ❑ ***An online survey to solicit public comment was disseminated on November 6, 2015.*** At the October meeting, it was noted that online surveys usually have a larger number of participants than in-person meetings. MMI developed a survey via www.surveymonkey.com. The Town First Selectman posted a link to the survey on the Town's website and announced its presence through her social media outlets and in one of her weekly columns. The survey was closed on December 29, 2015.



Link to the online survey posted on the New Fairfield Town website.

Five residents responded to the survey. Participants indicated that they are located on Route 37, Titicus Mountain Road, Gillotti Road, and Old Bridge Road West.

Three respondents had not been aware that the Town maintains a HMP.

Participants were asked which recent events, if any, have generated awareness of natural hazards. Table 1-5 summarizes the responses.

TABLE 1-5
Contributors to Awareness of Natural Hazards

Events	Number of Participants Selecting
Winter Storm Nemo in February 2013	2
"Superstorm" Sandy in October 2012	5
"Winter Storm" Alfred in October 2011	3
Hurricane/Tropical Storm Irene in August 2011	3
The Virginia earthquake in August 2011	1
The Springfield, Massachusetts tornado of June 2011	1
The snowstorms of January 2011 that caused buildings to collapse	1

A single respondent wrote in that "Snowmaggedon" increased his or her awareness, referring to the October 2011 storm named Winter Storm Alfred.

The next question asked responders to rate hazards on a scale of 1 (low threat) to 3 (high threat) in New Fairfield. Responses are presented in Table 1-6.

TABLE 1-6
Potential Hazard Threat Based on Survey Response

Hazard	Number of Participants Selecting		
	Low Threat	Moderate Threat	High Threat
Flooding	4	1	0
Hurricanes and Tropical Storms	2	3	0
Tornadoes	5	0	0
Severe Thunderstorms (including hail or downbursts)	0	4	1
Winter Storms (including snow or ice) and Blizzards	0	1	4
Earthquakes	4	1	0
Wildfires and Brush Fires	2	3	0
Dam Failure (could be caused by other hazards)	4	1	0

The follow-up question asks which hazards have impacted the participant's selves or businesses. Table 1-7 summarizes these results.

TABLE 1-7
Impact on Responder or on Responder's Business

Hazard	Number of Participants Selecting
None; I have not been impacted.	0
Flooding	0
Hurricanes and Tropical Storms	2
Tornadoes	0
Severe Thunderstorms (including hail or downbursts)	2
Winter Storms (including snow or ice) and Blizzards	5
Earthquakes	0
Wildfires and Brush Fires	0
Dam Failure (could be caused by other hazards)	0

None of the participants entered an answer when asked if any specific areas of New Fairfield were vulnerable to any of the above hazards.

The next question asked if responders had noticed an increase in maintenance in New Fairfield due to increased pressure on utility companies to harden utility lines and manage vegetation following the wind and snow events of 2011. Three participants answered yes, one answered no, and one skipped the question.

Specific examples of utility maintenance included the following:

- Tree Trimming
- Lewis Tree [Lewis Tree Service, a vegetation management company] left a door tag at our home describing the work that needed to be done for Eversource [Eversource Energy, the regional energy provider, formerly Connecticut Light & Power] and a contact number if we had questions.

Due to potential increases in flood insurance premiums nationwide, responders were asked what their thoughts on flood insurance were. The results are presented in Table 1-8.

TABLE 1-8
Concerns with Flood Insurance Rates

Actions	Number of Participants Selecting
I do not have flood insurance and have no opinions about it.	4
I currently have flood insurance and am not concerned about changes in the Premium.	0
I currently have flood insurance and will be looking for ways to reduce my premium, such as elevating my home.	0
I would be supportive of looking for ways to reduce flood insurance policies for all policyholders.	1

When asked "What are the most important things that your municipal government and leaders can do to help residents and businesses be prepared for a disaster and become more resilient over time?", responses were as presented in Table 1-9.

TABLE 1-9
Most Important Community Mitigation Measures Based on Survey Results

	Number of Participants Selecting
Provide outreach and education to residents, businesses, and organizations to help them better understand risks and be prepared.	3
Provide technical assistance to residents, businesses, and organizations to help them reduce losses from hazards and disasters.	2
Conduct projects in the community, such as drainage and flood control projects, to mitigate for hazards and minimize impacts from disasters.	3
Make it easier for residents, businesses, and organizations to take their own actions to mitigate for hazards and become more resilient to disasters.	4
Improve warning and response systems to improve disaster management	3
Enact and enforce regulations, codes, and ordinances such as zoning regulations and building codes.	0

Responders were asked if they have taken any steps to reduce risks to their family homes or businesses. The results are summarized in Table 1-10.

TABLE 1-10
Personal Mitigation Measures Taken Based on Survey Response

	Number of Participants Selecting
Elevated my home or business to reduce food damage	0
Floodproofed my business to reduce flood damage	2
Installed storm shutters or structural/roof braces to reduce wind damage	0
Took measures to reduce snow buildup on roofs	4
Cut back or removed vegetation from my overhead utility lines or roof	3
Replaced my overhead utility lines with underground lines	1
Managed vegetation to reduce risk of wildfire reaching my home or business	1
Developed a disaster plan for my family, home, or business	2
Maintain a disaster supply kit for my family, home, or business	3
Participated in public meetings to discuss the Plan of Conservation and Development or open space plans	0
Participated in public meetings to discuss or approve changes to zoning or subdivision regulations	0
I have not taken any of these actions.	0

Participants were asked what one action could be taken in New Fairfield to reduce risks of hazards and disasters; responses included the following:

- Bury power lines, bring gas, water and sewer lines into residential areas. Then they'd still work if power went out.

- I think New Fairfield is well prepared for these hazards. The biggest problem has been the failure of the utility companies to maintain power as a result of these hazards.

When asked to provide any additional comments or questions to be addressed as the Town updates its HMP, one respondent stated "Maybe New Fairfield could have an emergency text or call system to notify residents of potential developing hazards." We note here that New Fairfield does have such a system, so perhaps public awareness of this system can be improved.

One participant provided additional contact information for follow-up.

Overall, the survey revealed that New Fairfield residents see severe thunderstorms and winter storms as having the highest threat and impacting their own homes the most. Residents are primarily concerned with risks to power lines and overhead utilities during winter and wind storms and desire stronger utility systems and faster response from utility companies. Residents seem most interested in being empowered to take their own actions to mitigate disasters.

1.5 Coordination with Neighboring Communities

The Town has coordinated with neighboring municipalities in the past relative to hazard mitigation and emergency preparedness and will continue to do so.

The monthly HVCEO and WestCOG meetings have provided a continuing forum for the member municipalities to collaborate and share thoughts about hazards that may span municipal boundaries. In 2014, a letter was mailed to the hazard mitigation planning contacts for all local jurisdictions surrounding the former HVCEO planning region. Representatives from Putnam County (NY), Westchester County (NY), the Northwest Hills Council of Governments (CT), Greater Bridgeport Regional Council (CT), and Council of Governments Central Naugatuck Valley (CT) were copied on this correspondence.

Because MMI was under contract for developing the initial HMPs for New Fairfield, Danbury, and Sherman and because the Plans were developed concurrently (from autumn 2010 through spring 2011), coordination between the three communities was maximized when the initial plans were developed. In particular, with the Town located between Sherman (to the north) and Danbury (to the south) and all three communities sharing Candlewood Lake, the process of developing each plan was beneficial for the others. Consider the following three examples:

- The First Light Emergency Action Plan for Candlewood Lake was provided by the Town of Sherman and helped advise portions of the Sherman, New Fairfield, and Danbury plans.
- The Danbury and New Fairfield Offices of Emergency Management work together closely and communicated about the planning processes in each community, such as how to provide notices for the public meetings.
- Field reconnaissance conducted by MMI was coordinated such that similar areas in the three communities were viewed during specific rain events.

The following is a list of nearby communities, the state of their own HMPs, and whether or not coordination was sought for plan development.

TABLE 1-11
Municipalities Near New Fairfield

Town	Hazard Mitigation Plan Status	Coordination
Former HVCEO Municipalities (incorporated into WestCOG, 2014)		
Sherman	2015 Update in Progress	Yes
New Milford	Adopted 2015	Yes
Brookfield	Adopted 2014	Yes
Bridgewater	Adopted 2014	Yes
Danbury	2015 Update in Progress	Yes
Bethel	Adopted 2014	Yes
Newtown	Adopted 2014	Yes
Ridgefield	Adopted 2014	Yes
Redding	Adopted 2014	Yes
Municipalities Adjacent in New York State		
Dover	Dutchess County 2015 HMP Update in Progress	Input Sought
Pawling	Dutchess County 2015 HMP Update in Progress	Input Sought
Patterson	Putnam County 2015 HMP Update in Progress	Input Sought
Southeast	Putnam County 2015 HMP Update in Progress	Input Sought
North Salem	Westchester County 2015 HMP Update Complete, awaiting Adoption	Input Sought
Former South Western Regional Planning Agency Municipalities (incorporated into WestCOG, 2014)		
Wilton	2016-2021 HMP Update for South Western Region in Progress	No
Weston	2016-2021 HMP Update for South Western Region in Progress	No
Westport	2016-2021 HMP Update for South Western Region in Progress	No
Norwalk	2016-2021 HMP Update for South Western Region in Progress	No
New Canaan	2016-2021 HMP Update for South Western Region in Progress	No
Darien	2016-2021 HMP Update for South Western Region in Progress	No
Stamford	2016-2021 HMP Update for South Western Region in Progress	No
Greenwich	2016-2021 HMP Update for South Western Region in Progress	No

2.0 COMMUNITY PROFILE

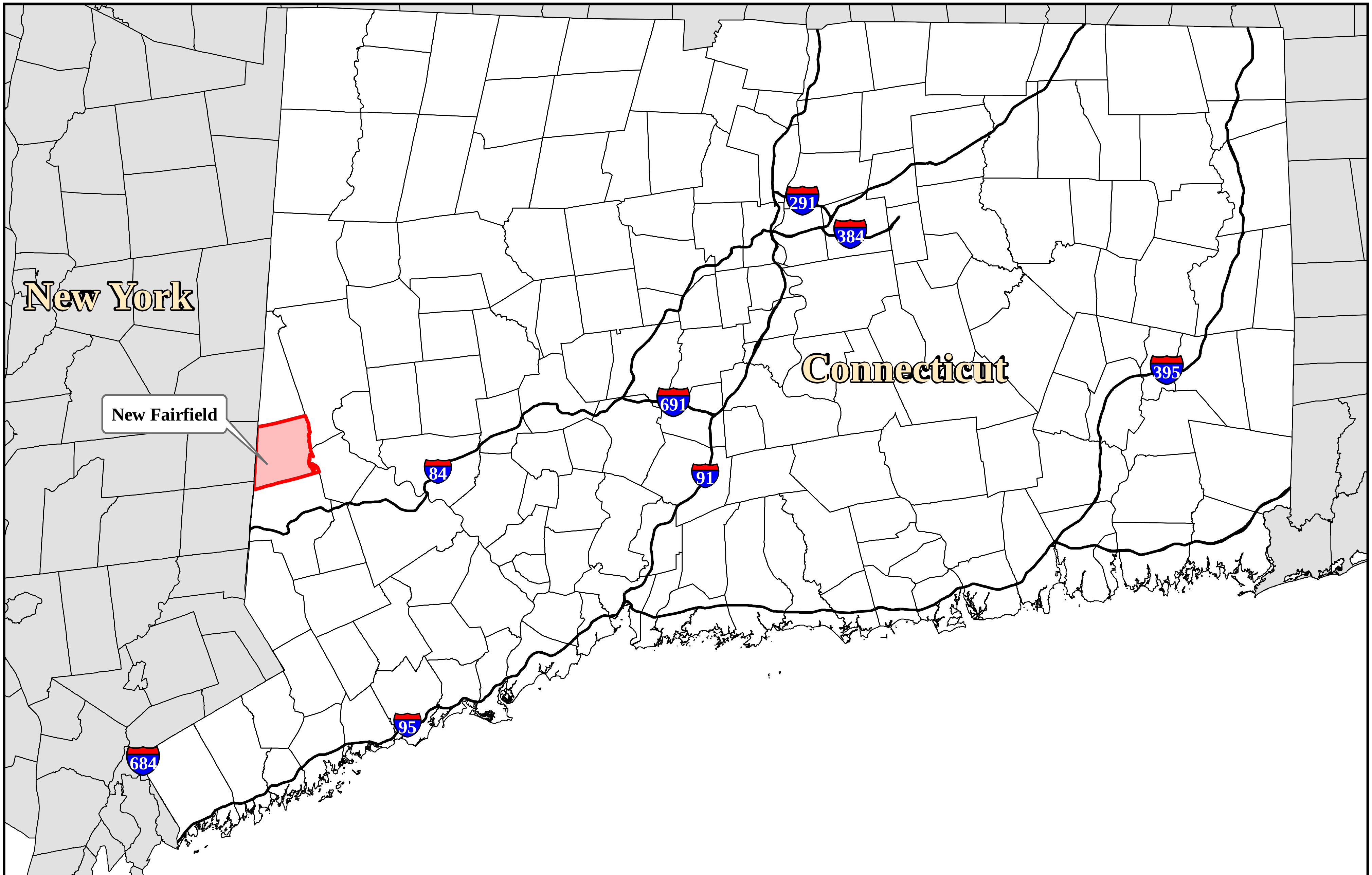
2.1 Physical Setting

New Fairfield is located in northern Fairfield County along the New York state border. The Town is bordered by the Connecticut municipalities of Sherman to the north, New Milford and Brookfield to the east (from north to south), and to the south by the city of Danbury. It is bordered to the west (from north to south) by the municipalities of Patterson and Southeast, New York. Figure 2-1 illustrates the Town's regional location.

New Fairfield is located in the Western Highlands of Connecticut. The topography is characterized as semimountainous terrain with upland ridges intermingled with lower mountains, especially in the southwest section. In addition, peaks in central and northern New Fairfield reach elevations over 1,000 feet above mean sea level (msl) including Beaver Bog Mountain at 1,178 feet above msl and Pond Mountain at 1,200 feet above msl. The eastern third of the Town is dominated by Lake Candlewood, Connecticut's largest lake. Over 40 miles of the lake's shoreline are located in the Town, dividing that section into bays, coves, peninsulas, and small islands. The varying terrain of New Fairfield makes the Town vulnerable to an array of natural hazards. The Town does not include any coastline or tidally influenced watercourses, removing hazards from storm surges or predicted sea level rise.

2.2 Existing Land Use

New Fairfield is a suburban town characterized by medium population density and limited commercial development. The lack of sanitary sewer service and presence of only small public water systems limit density throughout the community. In general, medium-density residential uses are located around Candlewood Lake and Ball Pond and along the major transportation corridors through New Fairfield, State Routes 37 and 39. A small Town hub with commercial, municipal, and institutional land uses is located at the junction of Routes 37 and 39 in the center of New Fairfield.



Engineering, Landscape Architecture and Environmental Science MILONE & MACBROOM® 99 Realty Drive Cheshire, CT 06410 Phone: (203) 271-1773 Fax: (203) 272-9773	Natural Hazard Pre-Disaster Mitigation Plan Town of New Fairfield, Connecticut		Location: New Fairfield, CT
	MMI#: 2534-09 MXD: H:\Fig2-1_Location_Map.mxd Sources: CT DEP, MassGIS, NYS GISC	Location Map	Date: October, 2010 Scale: 1" = 60,000' Sheet: Figure 2-1

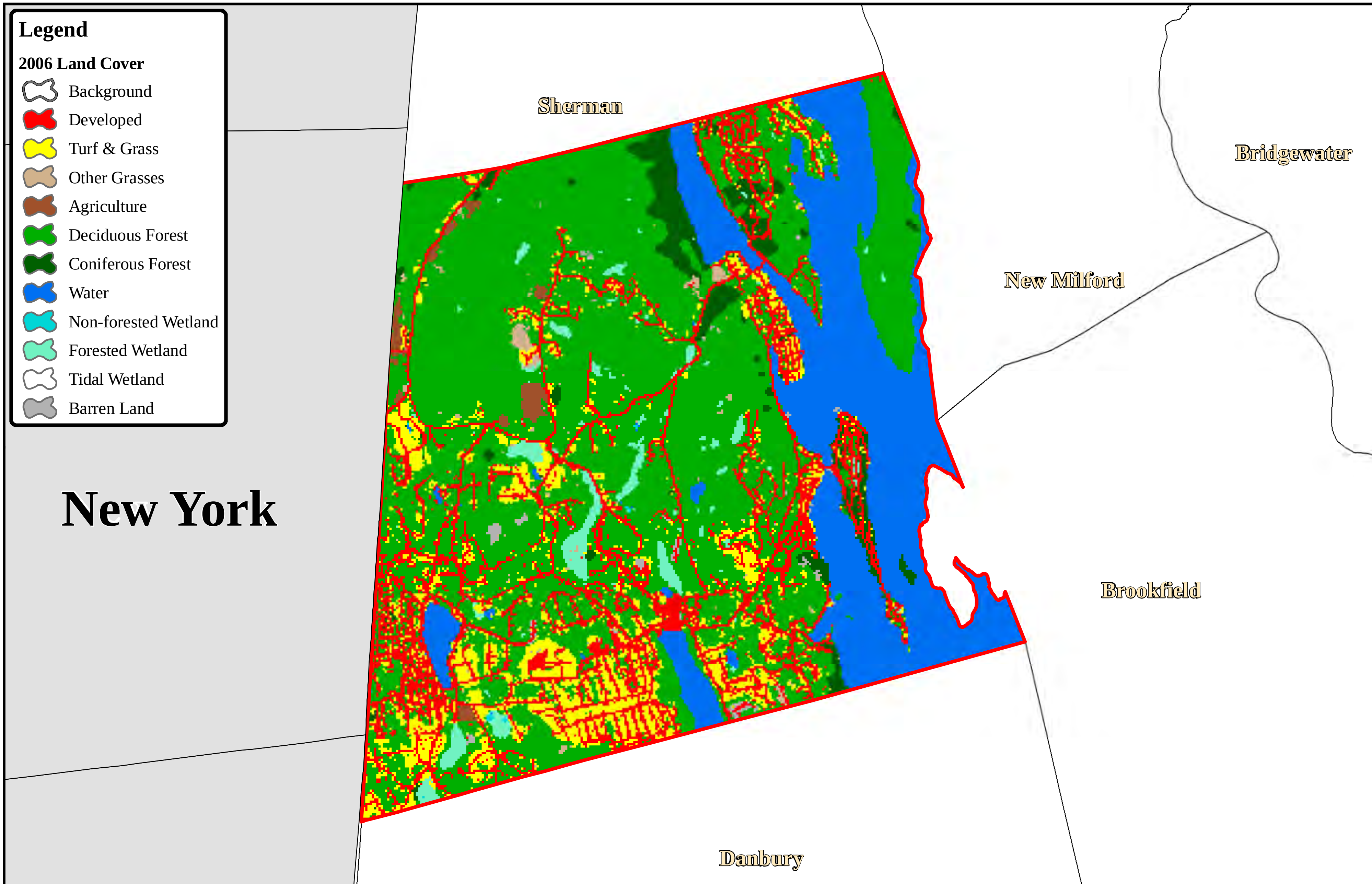
Table 2-1 summarizes 2006 land cover data, which was derived from satellite imagery. According to this data, about 70 percent of the Town's approximately 25.2 square miles is forested, and about 15 percent is developed.

TABLE 2-1
New Fairfield 2006 Land Cover by Area

Land Cover	**Area (acres)**	**Percent of Town**
Deciduous Forest	8,145	50.6%
Water	3,173	19.7%
Developed	2,356	14.6%
Turf & Grass	1,294	8.0%
Coniferous Forest	556	3.5%
Forested Wetland	319	2.0%
Agricultural Field	111	0.7%
Other Grasses	80	0.5%
Barren	61	0.4%
Non-Forested Wetland	6	0.0%
Undefined	0	0.0%
Utility (Forest)	0	0.0%
Total	**16,101**	**100%**

Source: UCONN Center for Land Use Education and Research (CLEAR)

Figure 2-2 presents generalized land uses based on the 2006 land cover data. Areas shown as turf and grass are maintained grasses such as residential and commercial lawns or golf courses. The northwestern and far northern parts of New Fairfield are predominantly forested. Residential use is interspersed through the southern half of the community, with higher density residential uses around Candlewood Lake, east of Squantz Pond, on Vaughn's Neck, and around Ball Pond.



Engineering, Landscape Architecture and Environmental Science MILONE & MACBROOM® 99 Realty Drive Cheshire, CT 06410 Phone: (203) 271-1773 Fax: (203) 272-9773	**Natural Hazard Pre-Disaster Mitigation Plan** **Town of New Fairfield, Connecticut**		Location: **New Fairfield, CT**
	MMI#: 2534-09 MXD: H:\Fig2-2_Land_Cover.mxd Source: UConn CLEAR, CT DEP, NYS GISC	**Land Cover**	Date: October, 2010 Scale: 1" = 6,000' Sheet: **Figure 2-2**

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 New Fairfield. The following discussion highlights New Fairfield's geology at several regional scales. Geologic information discussed in this section was acquired in GIS (Geographic Information System) format from the United States Geological Survey (USGS) and the Connecticut Department of Energy & Environmental Protection (DEEP).

In terms of North American bedrock geology, the Town is located in the northeastern part of the Appalachian Orogenic Belt also known as the Appalachian Highlands. The Appalachian Highlands extend from Maine south into Mississippi and Alabama and were formed during the orogeny that occurred when the supercontinent Pangea assembled during the late Paleozoic era. The region is generally characterized by deformed sedimentary rocks cut through by numerous thrust faults.

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.

The bedrock beneath the Town of New Fairfield is part of the Proto-North American (Continental) Terrane, comprised of Early Paleozoic and Proterozoic metamorphosed and sedimentary and igneous rocks. This terrane formed when part of present-day South America collided with present day New York. Some of the formations were later modified by collisions with formations related to the Iapetos Ocean (the precursor to the Atlantic Ocean).

In terms of New England bedrock geology, the Town lies within the Eugeosyncline Sequence and the Grenville Shelf Sequence. Bedrock formations belonging to the Eugeosyncline Sequence are typically deformed, metamorphosed, and intruded by small to large igneous plutons while bedrock belonging to the Grenville Shelf Sequence consists primarily of metamorphic, pelitic, and carbonate rock.

The Town's bedrock consists primarily of Early Paleozoic metasedimentary and metaigneous schists of the Taconic Allochthons (displaced Iapetos Terrane) in the west; metamorphic marble, schist, and quartzite of an Early Paleozoic continental shelf sequence in the north; and granitic gneiss of the "Grenville" basement from the Proterozoic Y age (approximately one billion years old). The bedrock alignment trends generally southeast to north through the Town. Table 2-2 and Figure 2-3 present the bedrock geology in the Town.

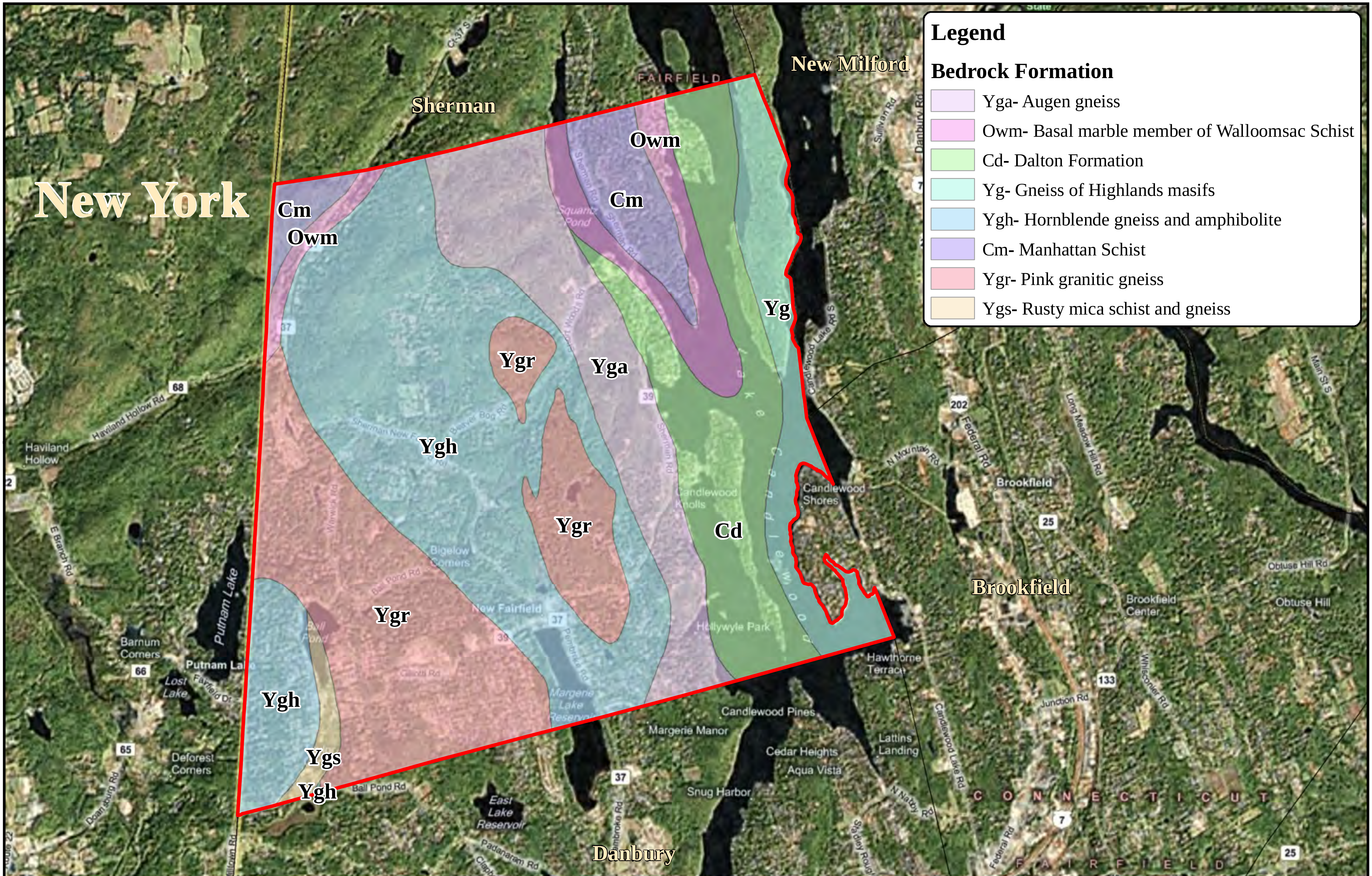
TABLE 2-2
Bedrock Geology

Formation	Area (acres)	Percent of Town
Hornblende gneiss and amphibolite	5,236	32.5
Pink granitic gneiss	3,628	22.5
Dalton Formation	2,175	13.5
Augen gneiss	2,033	12.6
Gneiss of Highlands massifs	1,152	7.2
Basal marble member of Walloomsac Schist	904	5.6
Manhattan Schist	802	5.0
Rusty mica schist and gneiss	173	1.1
Total	**16,103**	**100%**

Source: Connecticut Department of Environmental Protection GIS Data

The four primary bedrock formations in the Town (from west to east) are Pink Granitic Gneiss, Hornblende Gneiss and Amphibolite, Augen Gneiss, and Dalton Formation.

- The Pink Granitic Gneiss is a light-pink to gray granitic gneiss (metamorphic rock, similar composition as granite).
- The Hornblende Gneiss and Amphibolite are dark-gray, fine- to medium-grained amphibolite (metamorphic rock composed of silicate minerals) and gneiss.
- The Augen Gneiss is gray to spotted fine- to medium-grained lineated granitic gneiss.
- Dalton formation is comprised of gray, tan-weathering feldspathic quartzite, gneiss, and schist.



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	MMI#: 2534-09 MXD: H:\Fig2-3_Bedrock.mxd Source: CT DEP, NYS GISC N **Bedrock Geology**	Map By: JBH Date: October, 2010 Scale: 1" = 6,000' Sheet: **Figure 2-3**

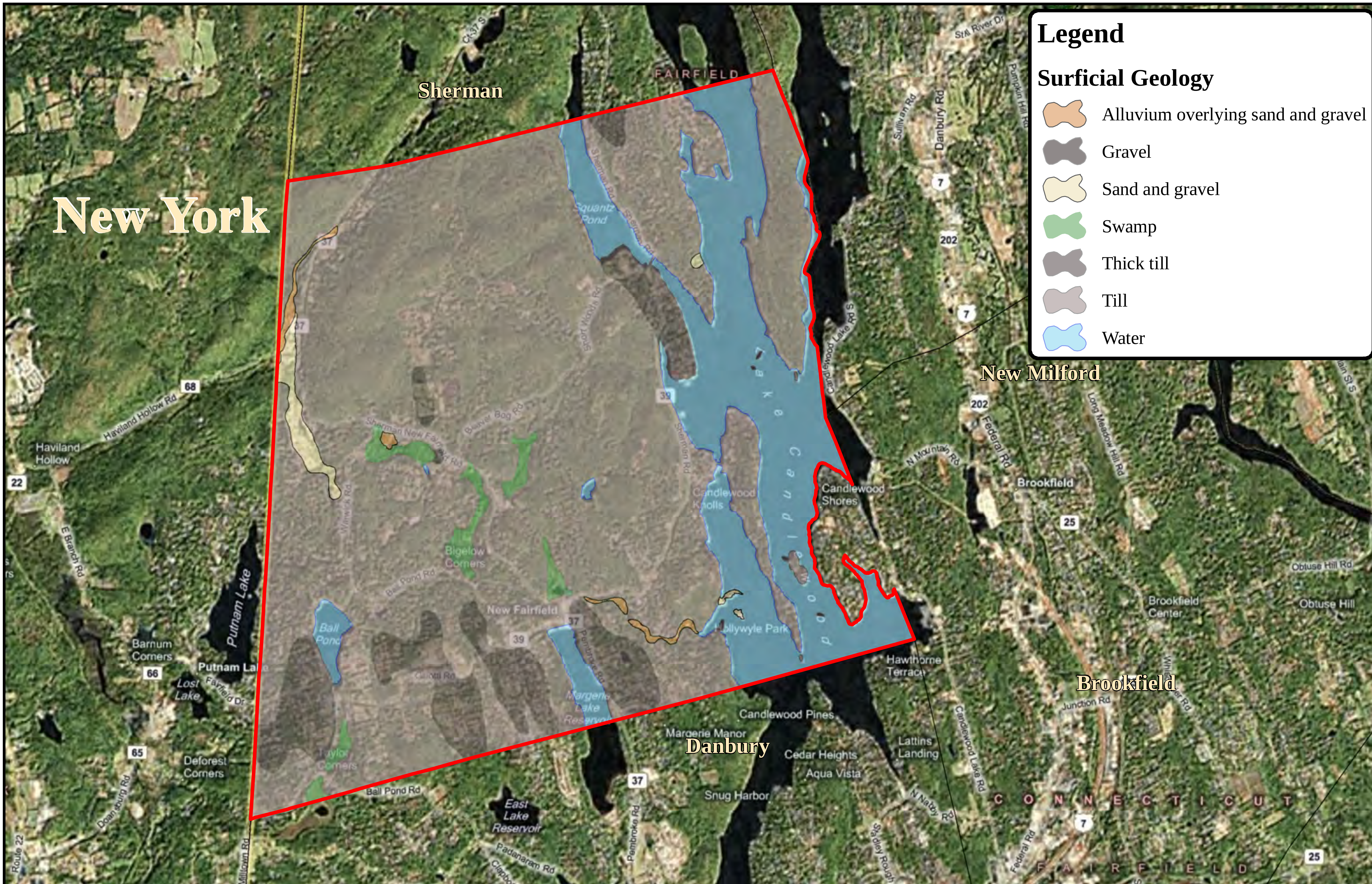
Continental ice sheets moved across Connecticut at least twice in the late Pleistocene. As a result, the surficial geology is characteristic of the depositional environments that occurred during glacial and postglacial periods. Refer to Table 2-3 and Figure 2-4 for a depiction of surficial geology.

TABLE 2-3
New Fairfield Surficial Geology

Surficial Material	Area (acres)	Percent of Town
Till	11,206	69.59
Water	2,991	18.57
Thick Till	1,436	8.92
Swamp or Tidal Marsh Deposits	242	1.51
Deposits of Ice Dammed Ponds	132	0.82
Floodplain Alluvium	75	0.47
Undifferentiated Meltwater Deposits	21	0.13
Total	**16,103**	**100**

Source: Connecticut Department of Environmental Protection GIS Data

New Fairfield is covered primarily by glacial till and water related to the various water bodies in Town. Tills contain an unsorted mixture of clay, silt, sand, gravel, and boulders deposited by glaciers as a ground moraine. Till is present throughout New Fairfield, with stratified drift deposits concentrated near Quaker Brook in northwestern New Fairfield and around the lower parts of Ball Pond Brook as it nears the outlet at Candlewood Lake.



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Natural Hazard Pre-Disaster Mitigation Plan
Town of New Fairfield, Connecticut

Location: New Fairfield, CT

MMI#: 2534-09

MXD: H:\Fig2-4_Surficial_Geology.mxd

Source: CT DEP, NYS GISC

Surficial Geology

Date: October, 2010

Scale: 1" = 6,000'

Sheet: Figure 2-4

In terms of soil types, approximately 62 percent of New Fairfield contains Hollis-Chatfield-Rock outcrop complex; Charlton-Chatfield complex; Ridgebury, Leicester and Whitman Soils; and the Woodbridge-Urban Land (Table 2-4). The remainder of the Town has soil types consisting primarily of rocky soils, various sandy loams, silt loams, wetland soils, and urban land. The following soil descriptions are taken in part from the official series descriptions from the United States Department of Agriculture (USDA) website.

The amount of stratified drift present in the town is important as areas of stratified materials are generally coincident with inland floodplains. These materials were deposited at lower elevations by glacial streams, and these valleys were later inherited by the larger of our present-day streams and rivers. However, the smaller glacial till watercourses throughout New Fairfield can also cause flooding.

The amount of stratified drift also has bearing on the relative intensity of earthquakes and the likelihood of soil subsidence in areas of fill.

- Hollis-Chatfield-Rock outcrop complex soils are characterized as being 35 percent Hollis soils, 30 percent Chatfield soils, 15 percent rock outcrop, and 20 percent minor components.
  - Hollis soils are well-drained or somewhat excessively drained, gently sloping to steep soils that are very shallow or shallow over crystalline bedrock, including schist or gneiss. Their permeability is moderate or moderately rapid.
  - Chatfield soils are moderately deep, well-drained, and somewhat excessively drained soils formed in till. They are nearly level through very steep and occur on convex bedrock-controlled glaciated upland landscapes.
  - Rock outcrops are mapped in areas where exposed bedrock occupies more than 50 percent of the surface. Most of the exposed rock is schist, gneiss, and granite. Slopes are gentle to hilly or steep.

TABLE 2-4
Soil Classifications

Soil Type	Area (acres)	Percentage of Town
Hollis-Chatfield-Rock Outcrop Complex	3,164	19.7
Water	3,011	18.7
Charlton-Chatfield Complex	2,478	15.4
Canton and Charlton Soils	1,973	12.3
Ridgebury, Leicester, and Whitman Soils	1,194	7.4
Woodbridge-Urban Land Complex	1,095	6.8
Paxton and Montauk fine Sandy Loams	855	5.3
Other Silty and Sandy Loams	654	4.1
Various Urban Land Complex Soils	530	3.3
Rock Outcrop-Hollis Complex	505	3.1
Stockbridge-Urban Land Complex	397	2.5
Other Soils	229	1.4
Total	**16,086**	**100**

Source: 2007 Soil Survey Geographic (SSURGO) database for the State of Connecticut

- The Charlton-Chatfield complex consists of moderately deep to deep, well-drained, and somewhat excessively drained soils formed in glacial till. They are very nearly level to very steep soils on glaciated plains, hills, and ridges. The soil is often stony or very stony. Slope ranges from 3% to 45%. Crystalline bedrock is at depths of 20 to 40 inches. Saturated hydraulic conductivity is moderately high to high in the mineral soil.

- Ridgebury, Leicester and Whitman soils are generally poorly drained and derived from granite, gneiss, and schist although formation varies among the three series.

  - The Ridgebury series consists of very deep, somewhat poorly and poorly drained soils formed in till derived mainly from granite, gneiss, and schist. They are nearly level to gently sloping soils in low areas in uplands.
  - The Leicester series consists of very deep, poorly drained loamy soils formed in friable till. They are nearly level or gently sloping soils in drainageways and low-lying positions on hills.
  - The Whitman series consists of very deep, very poorly drained soils formed in lodgement till derived mainly from granite, gneiss, and schist. These soils are nearly level or gently sloping soils in depressions and drainageways on uplands.

- The Woodbridge-Urban Land Complex is the Woodbridge soil series heavily impacted by development in the form of leveling or paving. The Woodbridge series consists of moderately well drained loamy soils formed in lodgement till. They are nearly level through moderately steep soils on till plains, hills, and drumlins. Slope ranges from 0 through 25 percent.

2.4 Current Climate Conditions and Climate Change

The climate in New Fairfield is characterized by moderate but distinct seasons. The mean annual temperature, measured at a weather station at Bulls Bridge in Litchfield, is approximately 48.9 degrees Fahrenheit (°F). The mean maximum annual temperature is 60.1°F, and the mean minimum annual temperature is 37.6°F. Summer temperatures rise into the mid 80s, and winter temperatures dip into the upper 20s to mid 30s as measured in Fahrenheit. Extreme conditions raise summer temperatures to near 100 degrees and winter temperatures to below zero.

In the initial HMP, median snowfall was reported as just less than 40 inches per year. Mean annual precipitation was reported as 44.7 inches spread evenly over the course of a year. By comparison, average annual statewide precipitation based on more than 100 years of record was reported as nearly the same at 45 inches.

Climate Change

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 New Fairfield 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.

Like many communities in the United States, New Fairfield experienced a population boom following World War II. This population increase led to concurrent increases in impervious surfaces and the amount of drainage infrastructure. Many postwar storm drainage systems and culverts were likely designed using rainfall data published in "Technical Paper No. 40" by the

U.S. Weather Bureau (now the National Weather Service) (Hershfield, 1961). The rainfall data in this document dates from the years 1938 through 1958. These values are the standard presented in the Connecticut Department of Transportation (DOT) *Drainage Manual* (2000) and have been the engineering standard in Connecticut for many years. According to these data, the 24-hour rainfall amount for a 50-percent-annual-chance storm in Fairfield County is 3.3 inches.

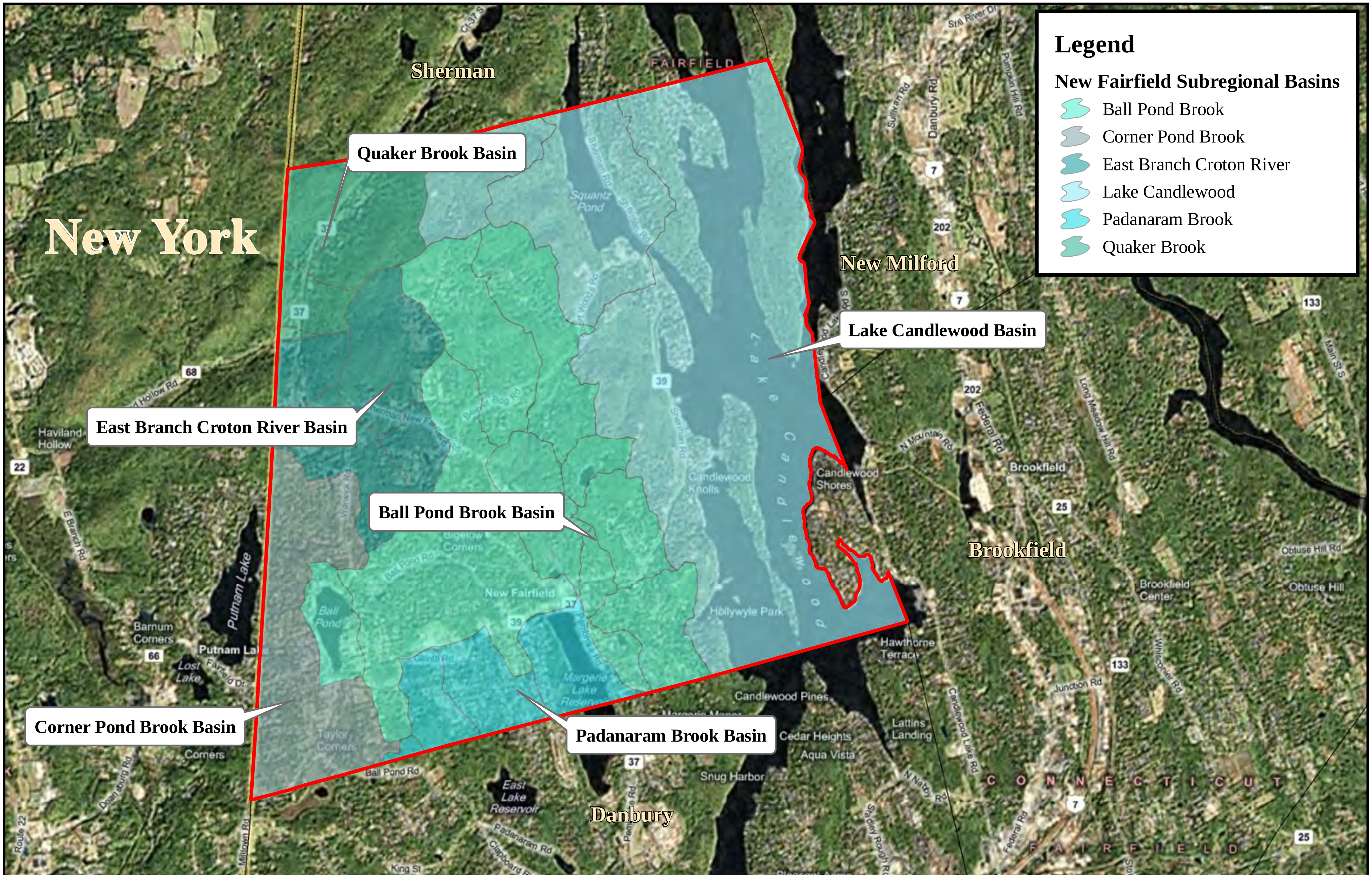
This engineering standard was based on the premise that extreme rainfall series do not change through time such that the older analyses reflect current conditions. Recent regional and state-specific analyses have shown that this is not the case as the frequency of 2-inch rainfall events has increased, and storms once considered a 1-percent-annual-chance event are now likely to occur twice as often. As such, the Northeast Regional Climate Center (NRCC) has partnered with the Natural Resources Conservation Service (NRCS) to provide a consistent, current regional analysis of rainfall extremes (http://precip.eas.cornell.edu/) for engineering design. The availability of updated data has numerous implications for flood hazard mitigation as it can be used to reevaluate drainage systems, culverts, and bridges. This dataset lists the 24-hour rainfall amount for a 50-percent-annual-chance storm in New Fairfield as 3.35 inches.

On November 3, 2015, the Connecticut Department of Transportation (CT DOT) Office of Engineering put out a bulletin (number EB-2015-2) directing that updated precipitation frequency estimates from the *NOAA Atlas 14* released on September 30, 2015 be used in planning and design. This newest data puts the 24-hour rainfall amount for a 50-percent-chance annual storm in New Fairfield at 3.51 inches.

Clearly, precipitation, temperature, and other climatic features have been changing over time in the Town. As climate continues to change, HMP updates must take into account this new information.

2.5 Drainage Basins and Hydrology

New Fairfield is divided among six subregional watersheds, including Lake Candlewood, as shown on Figure 2-5 and in Table 2-5. Subregional watersheds on the west side of New Fairfield, Corner Brook, East Branch Croton River, and Quaker Brook drain to the Hudson River Basin in New York State. The remaining subregional basins drain to the Housatonic River. The largest subregional basin in New Fairfield (aside from Candlewood Lake) belongs to Ball Pond Brook, which drains toward the Housatonic River via Candlewood Lake.



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Natural Hazard Pre-Disaster Mitigation Plan
Town of New Fairfield, Connecticut

Location: New Fairfield, CT

MMI#: 2534-09
MXD: H:\Fig2-5_Subregional_Watersheds.mxd
Source: CT DEP, NYS GISC, FEMA

Sub-Regional Basins

Date: October, 2010

Scale: 1" = 6,000'

Sheet: Figure 2-5

TABLE 2-5
New Fairfield Subregional Drainage Basins

SUBREGION	Area (acres)	% of Town
Lake Candlewood	6,633	41
Ball Pond Brook	4,714	29
East Branch Croton River	1,472	9
Corner Pond Brook	1,332	8
Quaker Brook	998	6
Padanaram Brook	954	6
Total	**16,102**	**100**

Source: Connecticut Department of Environmental Protection GIS Data

Candlewood Lake

The Candlewood Lake watershed comprises 40 percent of the Town's land area. Candlewood Lake is the country's first pump-storage reservoir and, at 5,400 acres, is the largest lake in Connecticut. The reservoir was constructed to support power generation at the Rocky River power station in New Milford. Beginning in 1926, water has been diverted from the Housatonic River as needed and pumped uphill into the lake. During low-flow conditions on the Housatonic River, water is released from Candlewood Lake to run the generation turbines, and hence, this water is returned to the Housatonic River.

Housatonic River

The Housatonic River originates in western Massachusetts with its main stem forming at the confluence of the west and southwest branches in Pittsfield. From there, the river flows 132 miles through western Massachusetts and Connecticut to its mouth at Long Island Sound at Milford Point in Connecticut. The Housatonic River watershed covers 1,948 square miles in three states (Connecticut, Massachusetts, and New York). The Housatonic River has several hydroelectric power dams and diversions within the state of Connecticut. The watershed for the Housatonic River and its tributaries covers 76 percent of the land area of New Fairfield.

Ball Pond Brook

Ball Pond Brook originates at Ball Pond located in southwestern New Fairfield and flows southeast through New Fairfield, is joined by Short Woods Brook (confluence Route 37 at Mill Road), and ends at Candlewood Lake. The Ball Pond Brook watershed covers 7.58 square miles (29 percent of New Fairfield land area) and is contained entirely in New Fairfield. The watershed is approximately 30 percent developed and 64 percent forested.

Padanaram Brook

Padanaram Brook originates in Danbury at the Padanaram Reservoir. The Padanaram Brook watershed is 7.27 square miles of which approximately 50 percent is developed and 40 percent is forested. The portion of the Padanaram Brook watershed in New Fairfield (about 20 percent) includes Margerie Reservoir (a City-of-Danbury water supply reservoir), covers 6 percent of New Fairfield, and drains from the southeastern section of the Town into the Padanaram Reservoir.

Hudson River

The Hudson River originates at Lake Tear of the Clouds on Mount Marcy in the Adirondack Mountains in northern New York State. From its headwaters, the Hudson River flows 315 miles south to its mouth at Upper New York Bay (New York Harbor). The Hudson River watershed covers 13,400 square miles, with 93 percent of the watershed within New York State. Small parts of the watershed are also located in Vermont, Massachusetts, New Jersey, and Connecticut.

The Hudson River is managed for commercial traffic from Hudson Falls to Albany, and the lower half of the river is a tidal estuary, with tidal water influence as far north as Troy, New York. Several reservoirs within the Hudson River basin (including the Croton River discussed below) contribute to the New York City water supply system, supplying water for approximately eight million people. The watershed for the Hudson River and its tributaries, including the East Branch Croton River, Quaker Brook, and Corner Pond Brook watersheds, cover 23 percent of the land area of New Fairfield.

East Branch Croton River

The East Branch Croton River originates in the Great Swamp, a 6,000-acre wetland area of high conservation value in Dutchess and Patterson Counties in New York State. The watershed covers 8.45 square miles, of which 27 percent is in the western half of New Fairfield bordering New York (covering 9 percent of New Fairfield land area, with unnamed tributaries in New Fairfield). The East Branch Croton River is a tributary of the Croton River, which feeds the Croton Reservoir, a component of the New York City water supply watersheds to the east of the Hudson River.

Corner Pond Brook

Corner Pond Brook is a tributary to the Croton River, which is included in the Hudson River Basin. Similar to Padanaram Brook and East Branch Croton River, Corner Pond brook does not flow through New Fairfield but has contributing watershed area in the southwest corner of the Town. The Corner Pond Brook watershed is 4.89 square miles, with 43 percent in New Fairfield (covering 8 percent of New Fairfield land area).

Quaker Brook

Quaker Brook flows southwest through New Fairfield, Connecticut and then west into Patterson, New York. It eventually joins the East Branch of the Croton River and the Croton Reservoir, which serves as a public water supply source for New York. Approximately 6 percent of the land area in New Fairfield drains to this brook in the northwestern portion of Town.

2.6 Population and Demographic Setting

New Fairfield had a population of 13,881 people, or 552 persons per square mile, in 2010 according to the U.S. Census Bureau. This put the Town at 81st out of 169 municipalities in Connecticut for overall population size in 2010. As noted in Table 2-6, New Fairfield is the fifth most densely populated municipality in the region.

TABLE 2-6
Population by Municipality, Region, and State, 2000 – 2010

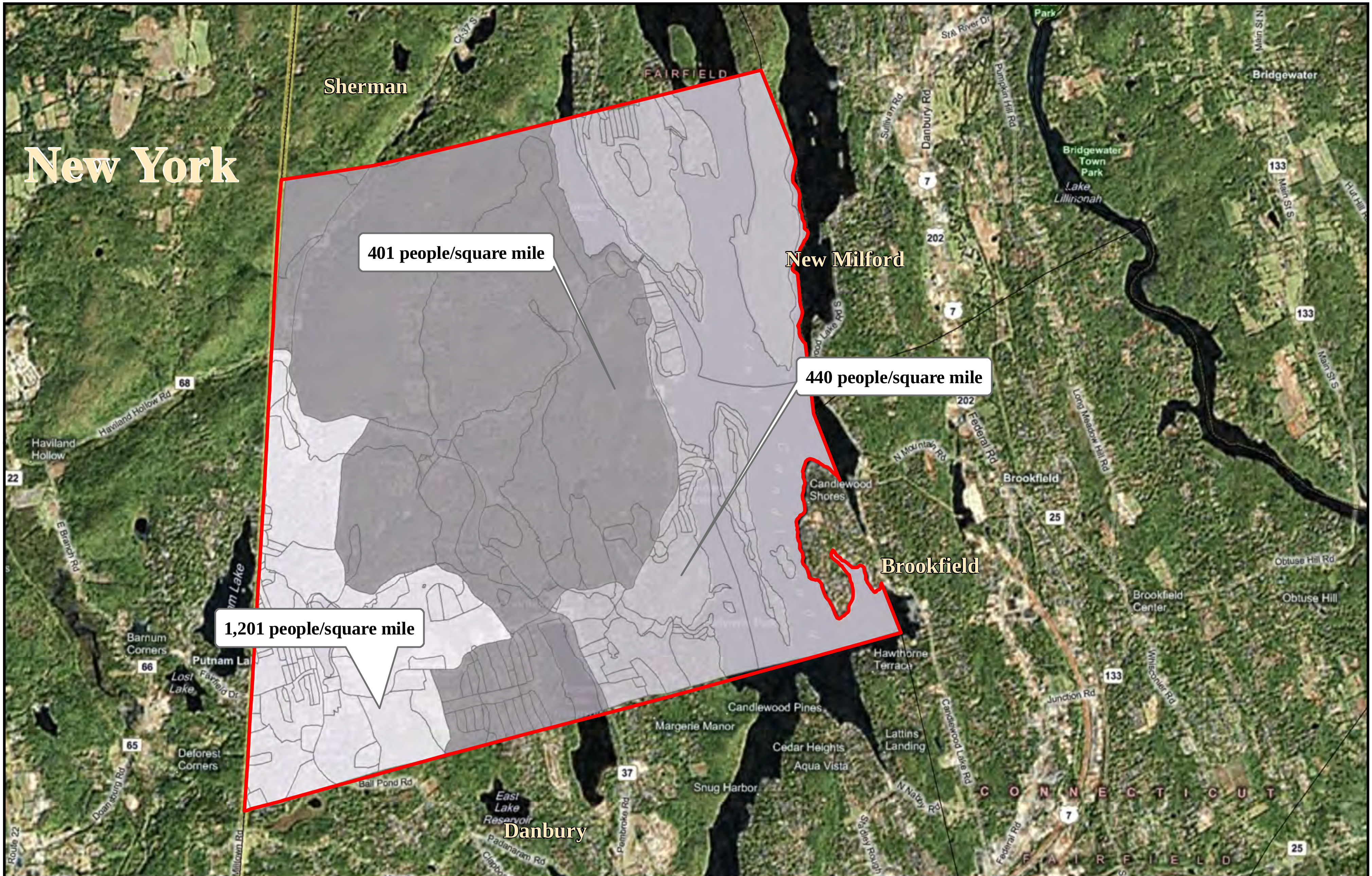
Municipality	Land Area (sq. miles)	Population 2000	Pop. Density 2000	Population 2010	Pop. Density 2010
Bethel	16.94	18,067	1,067	18,584	1,097
Bridgewater	17.36	1,824	105	1,727	99
Brookfield	20.37	15,664	769	16,452	808
Danbury	43.93	74,848	1,704	80,893	1,841
New Fairfield	25.16	13,953	555	13,881	552
New Milford	63.88	27,121	425	28,142	441
Newtown	58.90	25,031	425	27,560	468
Redding	32.03	8,270	258	9,158	286
Ridgefield	34.86	23,643	678	24,638	707
Sherman	23.39	3,827	164	3,581	153
HVCEO Region	336.82	212,248	630	224,616	667
Connecticut	4844.80	3,405,565	703	3,574,097	738

Source: United States Census Bureau Census 2000 Summary File 1 100-Percent Data, Total Population; 2010 Census Summary File 1, Total Population. From <factfinder.census.gov>

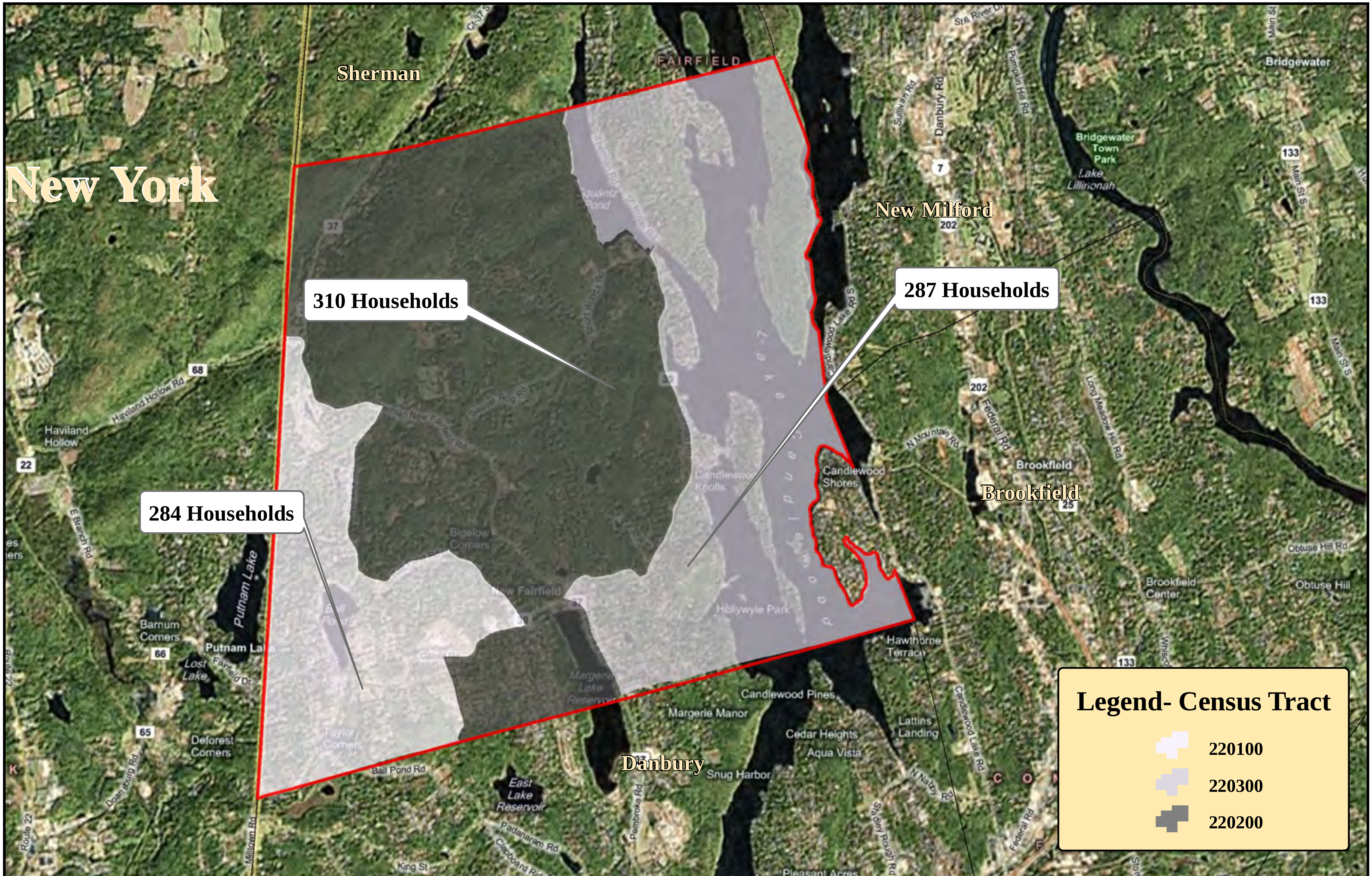
Figure 2-6 compares 2000 population densities among New Fairfield's three census block groups. Most residents of New Fairfield live in the southwestern corner of the Town, particularly in the vicinity of Ball Pond.

In 1930, New Fairfield had a population of 434. Subsequently, the Town's population almost doubled every decade to reach 6,991 in 1970. Continued growth led to a 2000 population of 13,953. The Connecticut State Data Center's (CTSDC) 2007 projection predicted continued population growth in New Fairfield over the next 30 years but after the 2010 national census revised its predictions. The CTSDC's most recent projections predict a continued decrease in population, with an estimated 12,912 people living in the Town in 2025. Population projections developed by the CT DOT, on the other hand, show population increasing to 15,434 people in New Fairfield in 2030. Future changes in New Fairfield population will likely be relatively minor and gradual, are not expected to lead to significant development in hazardous areas, and are not expected to change the hazard profile for the Town.

New Fairfield has small populations of people who are elderly and/or possess disabilities. These are depicted by the three census blocks in New Fairfield in Figures 2-7 and 2-8. Not surprisingly, the more populated census block groups include a higher percentage of individuals who may require special assistance or different means of notification before and during natural hazards. These needs will be discussed in subsequent sections.



Engineering, Landscape Architecture and Environmental Science MILONE & MACBROOM® 99 Realty Drive Cheshire, CT 06410 Phone: (203) 271-1773 Fax: (203) 272-9773	**Natural Hazard Pre-Disaster Mitigation Plan** **Town of New Fairfield, Connecticut**		Location: **New Fairfield, CT**
	MMI#: 2534-09 MXD: H:\Fig2-6_Population_Density.mxd Source: http://www.census.gov, CT DEP, NYS GISC	**Population Density (per 2000 Census)**	Date: October, 2010 Scale: 1" = 6,000' Sheet: **Figure 2-6**



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Town of New Fairfield, Connecticut

Location: New Fairfield, CT

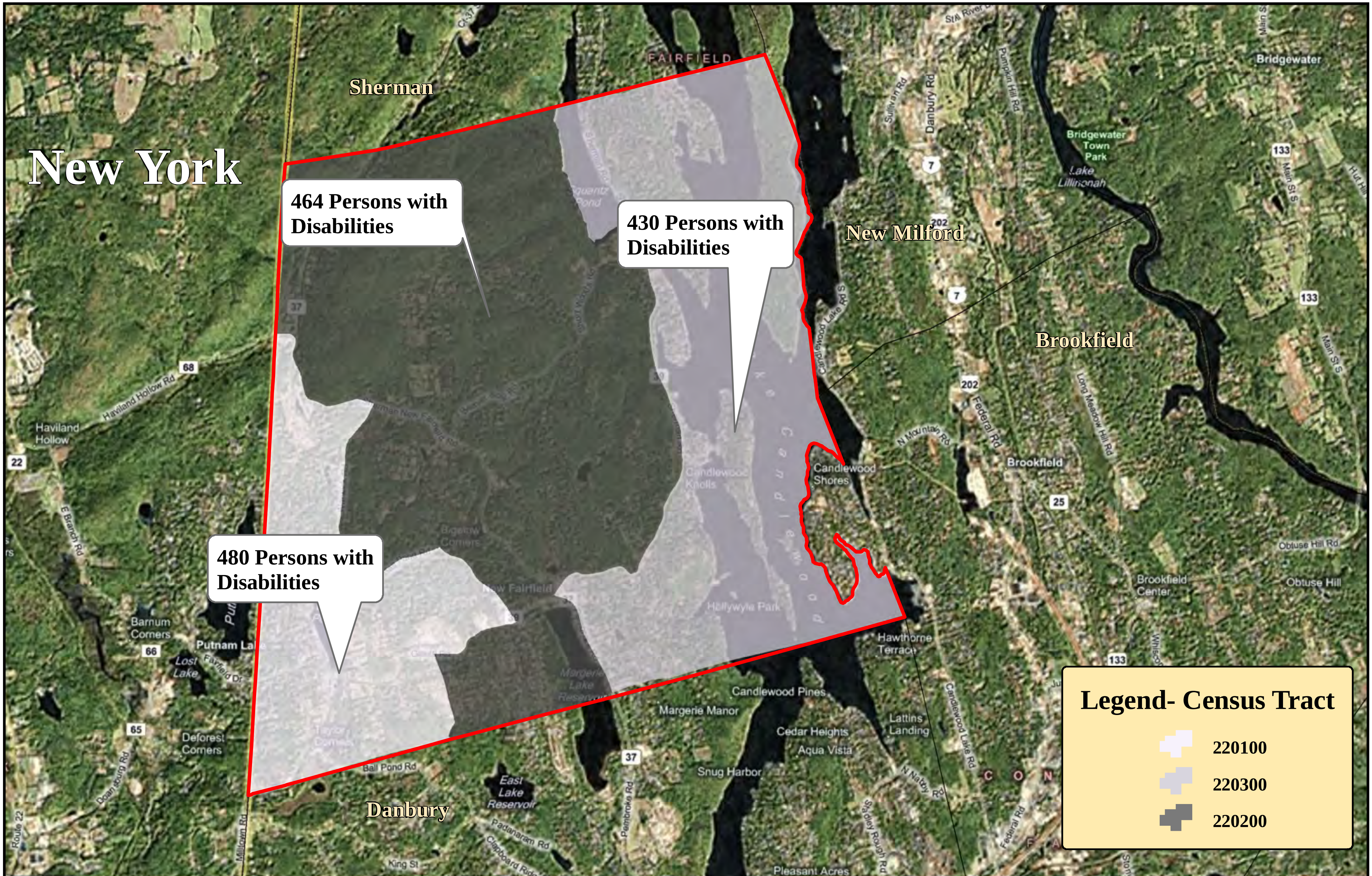
MMI#: 2534-09
MXD: H:\Fig2-7_Elderly_Population.mxd
Source: http://www.census.gov, CT DEP, NYS GISC

Elderly Population (Households with one or more people 65 years and over per 2000 U.S. Census)

Date: October, 2010

Scale: 1" = 6,000'

Sheet: Figure 2-7



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Natural Hazard Pre-Disaster Mitigation Plan
Town of New Fairfield, Connecticut

Location: New Fairfield, CT

MMI#: 2534-09
MXD: H:\Fig2-8_Disabled_Population.mxd
Source: http://www.census.gov, CT DEP, NYS GISC

Persons with Disabilities (Population 5 years and over per 2000 U.S. Census)

Date: October, 2010
Scale: 1" = 6,000'

Sheet: **Figure 2-8**

2.7 Governmental Structure

The Town is governed by a Selectmen-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.

In addition to Board of Selectmen and the Town Meeting, there are boards, commissions, and committees providing input and direction to Town administrators while 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 Commission, the Zoning Commission, the Zoning Board of Appeals, the Conservation Inlands/Wetlands Commission, the Parks and Recreation Department, the New Fairfield Volunteer Fire Department, the Public Works Department, the Office of Emergency Department, and the New Fairfield Resident Trooper Office.

The Public Works Department is the principal municipal department that responds to problems caused by natural hazards. Town policy is to route complaints related to Town maintenance issues to the Public Works Department, which investigates and remediates them as necessary.

2.8 Development Trends

History

The founding residents of New Fairfield purchased the land from Chief Squantz of the Schaticooke tribe in the late 1600s and first settled in the area around Ball Pond in the 1720s. The Town was incorporated as a municipality by the Connecticut General Assembly in 1740 with the establishment of the First Congregational Church (which acted as the government center until 1759).

For the following century, New Fairfield's economy was dependent on local natural resources. According to the New Fairfield Plan of Conservation and Development, the semimountainous terrain and thin topsoil supported only subsistence agriculture and did not facilitate development of a Town center. Instead, development in early New Fairfield was characterized by scattered farm sites and mills clustered near waterways.

The population of New Fairfield reached a peak of 956 persons in the mid 19th century. At this time, New Fairfield residents had established several saw and grist mills, two carriage and wagon factories, a grocery store and post office, a comb shop, a tannery, a blacksmith shop, and three churches. However, like many small east coast communities, the New Fairfield population contracted throughout the following hundred years as agricultural operations expanded westward and industrial opportunities in major cities lured people for job opportunities. All of the small enterprises had collapsed, and farmland was being abandoned and converted to forest. Population had declined to 434 persons by 1930.

After World War I, beginning in the 1920s, infrastructure investments in the community started to affect patterns of development. By 1930, Route 37 had been constructed to connect the town of Sherman to the city of Danbury via New Fairfield. Route 37 intersected State Route 39 in the center of New Fairfield. The completion of Route 37 made Ball Pond accessible by automobile, attracting settlement of seasonal cottages in the area. By 1940, there were about 30 residences along the lakefront road surrounding Ball Pond and about 20 more in close proximity to the lake.

From 1927 to 1929, the Connecticut Light & Power Company constructed Candlewood Lake, which brought both electricity and recreational opportunities to New Fairfield. Private development continued throughout the 1930s and 1940s, including the communities of Knollcrest, Bogus Hill, Joycland, Hollywyle Park, and present-day Vaughn's Neck. According to HVCEO's *Changing Land Use in New Fairfield, Connecticut*, renovation of old farmhouses paired with development of new homes made New Fairfield's countryside desirable for artists, writers, and those whose work required only occasional trips to urban centers. At mid century, New Fairfield was more a seasonal and rural residential retreat than a backwoods farming community.

After World War II, New Fairfield experienced rapid residential growth due to the attractiveness of Candlewood Lake, the proximity to New York City, and the prosperity of Danbury located directly to the south. During this period, the population of New Fairfield went from 608 persons in 1940 to 6,991 in 1970. During this period, zoning regulations were developed that designated most of the older subdivided area as Residential R-44 (one-acre lots) and other area as R-88 (two-acre lots). After the arrival of Connecticut's 1973 wetlands protection law, development potential in New Fairfield was significantly reduced as the approximately 8 percent of municipal land area defined as wetland was largely excluded from development.

By 1990, the town's population had increased to 12,911, and development focused on residential lot half-acre developments around Ball Pond, with the remaining lot sizes throughout Town 2 acres or larger, shaped and limited by natural features throughout New Fairfield.

<u>Recent Development</u>

The Town had fewer than 10 new construction permits per year between 2000 and 2012. Since the adoption of the initial HMP in 2011, development has continued to be minor. The only significant development is of a subdivision currently underway off State Route 37. Current plans for this subdivision, called Barn Brook, are for the number of units to be in the 20s, but the developer may go as high as 40. Additionally, there have been about four buildings in Town that have been torn down or rebuilt in the last 5 years, mostly in the area of Candlewood Lake.

Because the pace of development is minimal in New Fairfield, and because this minimal development will not increase any specific risks to hazards, there was no need to revise this plan due to development trends or patterns. Instead, revisions in this update are mainly focused on explaining enhanced capabilities.

Given the patterns of development associated with Ball Pond as well as other areas within New Fairfield as described above, numerous homeowner and residential associations exist within the Town. Many of these associations are charged with paying for projects such as road maintenance within their boundaries. As this Plan will discuss in subsequent sections, the presence of so many small associations presents a unique set of challenges relative to natural hazard mitigation.

2.9 Critical Facilities and Sheltering Capacity

The Town has an Emergency Operations Plan (EOP) that guides its response to emergencies. To that end, the Town considers its police, fire, governmental, and major transportation arteries to be its most important critical facilities for these are needed to ensure that emergencies are addressed while day-to-day management of New Fairfield continues. Educational institutions and churches are also included as critical facilities as these can be used as shelters or supply distribution centers.

Elderly housing facilities or assisted facilities are not present in the town. Populations of individuals that would require special assistance during an emergency are scattered throughout the Town.

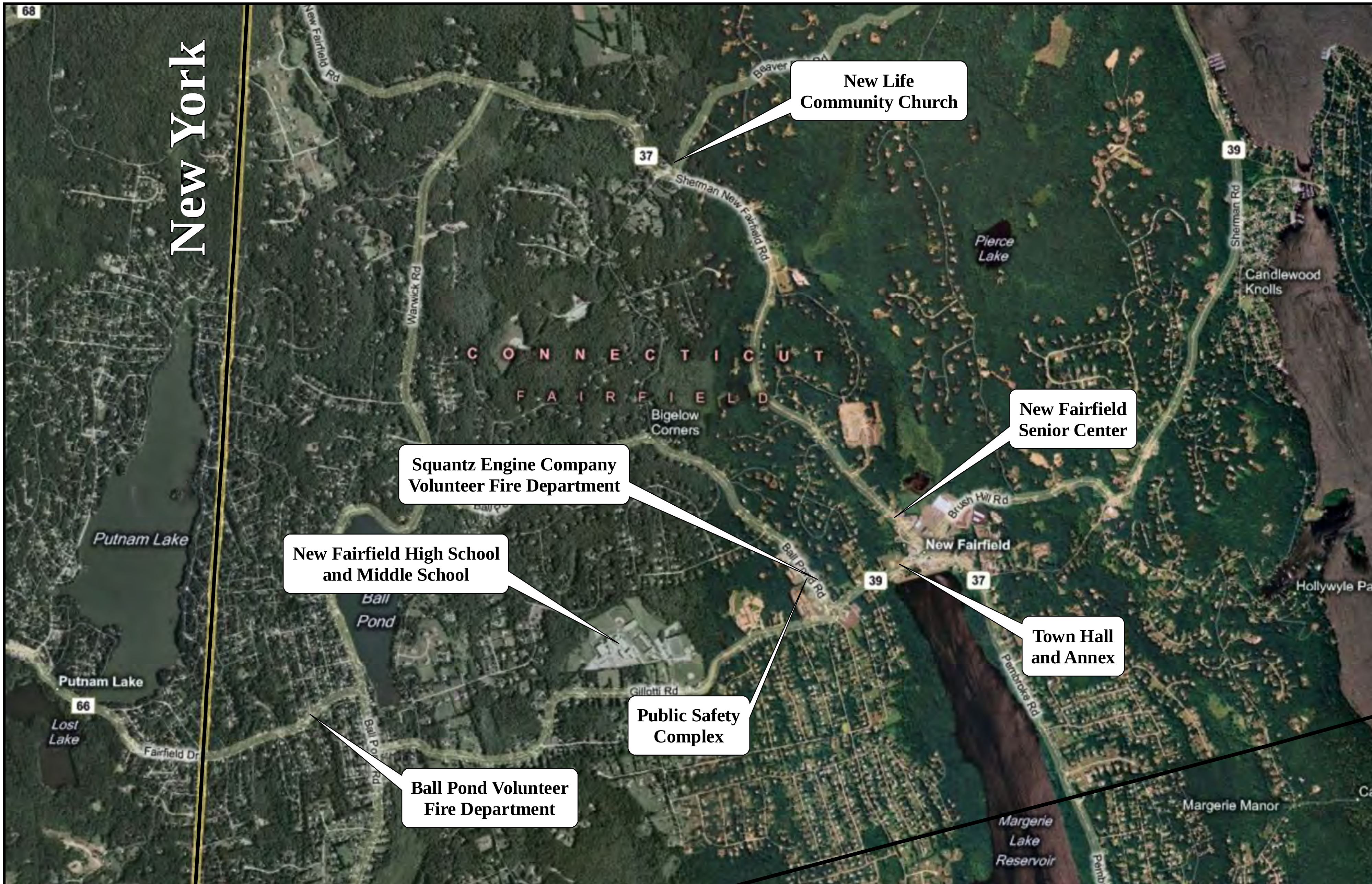
A map of the critical facilities in New Fairfield is shown in Figure 2-9, and a list of the critical facilities is provided in Table 2-7. Each critical facility and the Town's emergency response capabilities are described in more detail below along with a summary of the potential for these facilities to be impacted by natural hazards.

TABLE 2-7
Critical Facilities in New Fairfield

Type	Name	Address	Located in SFHA?
School/Shelter	New Fairfield High School and Middle School	54 Gillotti Road	No
Shelter	New Fairfield Senior Center	33 Route 37 North	No
Shelter	New Life Community Church	1 Beaver Bog Road	No
Government	Town Hall and Annex	4 Brush Hill Road	No
Police/Fire	Public Safety Complex (Police Department, Fire Station, and Emergency Operation Center)	302 Ball Pond Road	No
Fire	Ball Pond Volunteer Fire Department	7 Fairfield Drive	No
Fire	Squantz Engine Company Volunteer Fire Department	255 Route 39	No

Source: Town of New Fairfield

SFHA = Special Flood Hazard Area



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Town of New Fairfield, Connecticut

Location: **New Fairfield, CT**

MMI#: 2534-09
MXD: H:\Fig2-9_CritFac.mxd
Source: CT DEP, Microsoft Virtual Earth

N

Critical Facilities

Map By: JBH
Date: October, 2010
Scale: 1" = 3,000'

Sheet: **Figure 2-9**

Shelters

New Fairfield High School and Middle School Campus.

Emergency shelters are an important subset of critical facilities as they are needed in most large-scale emergency situations. The Town has designated two American Red Cross emergency shelters with additional facilities that can be used as needed. The New Fairfield High School and Middle School campus is currently the primary shelter facility. It has a 200-person capacity, a feeding capacity for 1,500 persons, and handicap access to lavatory facilities. It is equipped with a 125-kilowatt diesel generator and two portable generators that can be brought to other facilities during an emergency.

The New Fairfield Senior Center is the second emergency shelter; it is handicap enabled (including a single handicap-accessible shower) and also has a 200-person capacity with a 150-person feeding capacity.

These buildings have been designated as public shelter facilities by meeting specific American Red Cross guidelines. The New Fairfield Police Department and the New Fairfield Volunteer Fire Department staff the shelters according to protocols established by the EOP. 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.

The Town's other critical facilities include the New Life Community Church, the Town Hall and Annex, the Public Safety Complex, the Ball Pond Volunteer Fire Department, and the Squantz Engine Company Volunteer Fire Department. The Public Safety Complex is the current Emergency Operations Center and is equipped with a new anchored generator purchased in 2014.

Emergency Response Capabilities

The Office of Emergency Management coordinates emergency preparedness in the Town. The office provides training for emergency response personnel, supports state and local emergency response exercises, and provides technical assistance to state and local emergency response agencies and public officials. Its goal is to provide citizens with the highest level of emergency preparedness before, during, and after disasters or emergencies.

New Fairfield participates in the Resident State Trooper program and supplements this program with additional officers dedicated to service in only New Fairfield. Resident State Trooper program benefits include access to all services provided within the Connecticut State Police Department. According to the Town website, at least two troopers or officers are on duty at all times. The New Fairfield police force provides a large variety of services including criminal investigations, accident investigations, safety programs, building tours, and informational talks. They have a full-time dedicated sergeant from the State Police in Town as well as six additional resident troopers dedicated to Town 24 hours a day 7 days a week. The Town also employs six full-time New Fairfield officers.

The Town previously used the AlertNow emergency communication system to notify its residents quickly for such things as a utility outage, evacuation notice, chemical or gas spill, major road closure, public health emergency, or shelter information. AlertNow has updated to *Blackboard Connect* and is contracted by the Town to provide the same services. When a notification occurs, enrolled citizens receive a recorded message or email with all of the pertinent information for the situation that is occurring. Residents have the option of being notified via home phone, cellular phone, and email (or all three). The Town is considering moving to a different emergency alert communication system that has more capabilities to help residents with special needs.

The New Fairfield Volunteer Fire Department provides fire-fighting and ambulance services for the residents of New Fairfield. Fire Department equipment includes two ambulances, 14 fire trucks (including six fire engines, two tanker trucks, and a brush truck), and 10 private cars equipped with radios for emergency response communication. The Fire Department also has two rescue boats available at the Squantz Engine Company station. Access to a rescue boat is important because during some emergencies it is easier and faster to access some lakeside communities by water than by land.

New Fairfield Volunteer Fire Department: Squantz Engine Company Facility

After Tropical Storm Irene in 2011, the Town found that delivery of emergency supplies from the CT DEMHS to the Town was hindered by a lack of transportation vehicles and personnel. The Town then purchased a new tractor trailer, which will aid future distribution of supplies.

After Winter Storm Alfred in 2011 and the subsequent power outage, many businesses and homeowners purchased small-scale private generators, potentially decreasing the Town's overall vulnerability to power failure.

<u>Transportation</u>

The Town does not have any hospitals or medical centers. Instead, residents use the nearby facilities in New Milford or Danbury. As a means of accessing these facilities, New Fairfield residents travel along Route 37 and Route 7 in New Milford or south along Route 37 into Danbury.

There is no regional emergency/evacuation plan. Routes 37 and 39 are the two major transportation arteries out of Town, with both routes connecting New Fairfield with New Milford to the east and Danbury to the south. Route 55 also provides access to Dover, New York to the west in the northern part of Town. New Fairfield residents must use Route 37 to access Interstate 84 in Danbury.

New Fairfield has many dead-end roads, and many are relatively long and/or private, with some of these owned and maintained by homeowner associations. Emergency services can be cut off by fallen trees or washed out culverts during emergencies. The Office of Emergency Management has provided education to the private communities about road and tree maintenance to help ensure adequate access while the Town tree warden maintains trees along public roads.

The most difficult emergency response problem in New Fairfield is poor access to the private lake communities and homeowner associations. These roads are narrow, often one lane, and have steep grades that impede access by modern fire-fighting and rescue equipment. New public and private roads are regulated by the Town through the subdivision process such that emergency access is not an issue moving forward.

Potential Impacts from Natural Hazards

Critical facilities are rarely impacted by flooding in the Town as none are located within floodplains. None of the critical facilities in New Fairfield are any more susceptible to wind, summer storms, winter storms, or earthquakes than structures in the rest of the Town. The only critical facility that is within a potential dam failure inundation area is the New Fairfield Town Hall, downstream of the Margerie Lake North Dam. The hazard class of this dam was undefined at the time the initial HMP was adopted and has since been defined as a class C hazard dam by the CT DEEP. This vulnerability and potential mitigation actions and strategies are discussed further in Section 8.

The following sections will discuss each natural hazard in detail and include descriptions of vulnerable populations and areas as well as mitigation capabilities and strategies.

Summary of Policies and Programs

New Fairfield's existing capabilities include the training and technical assistance programs of its Office of Emergency Management (OEM), its participation in the Resident State Trooper program, its application of the Blackboard Connect emergency notification system, the tree maintenance program carried out by its DPW, and its established policy of routing Town maintenance complaints to the DPW. Other Town authorities, policies, programs, and resources will be discussed in the following sections of the Plan.

3.0 FLOODING

3.1 Setting

According to FEMA, most municipalities in the United States have at least one clearly recognizable floodprone 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). Floodprone 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 can include ponding, poor drainage, inadequate storm sewers, clogged culverts or catch basins, sheet flow, obstructed drainageways, sewer backup, or overbank flooding from small streams.

In general, flooding affects a few small areas of New Fairfield with moderate to frequent regularity. The areas impacted by overflow of river systems are generally limited to river corridors and floodplains. Indirect flooding that occurs outside floodplains and localized nuisance flooding along tributaries are more common problems in the Town. This type of flooding occurs particularly along roadways as a result of inadequate drainage and other factors. The frequency of flooding in New Fairfield is considered likely for any given year, with flooding damage potentially having significant effects during extreme events.

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. According to FEMA, there are several different types of flooding as follows:

- **Riverine Flooding**: Also known as overbank flooding, it occurs when channels receive more rain or snowmelt from their watershed than normal, or the channel becomes blocked by an ice jam or debris. Excess water spills out of the channel and into the channel's floodplain area.

- **Flash Flooding:** A rapid rise of water along a water channel or low-lying urban area, usually a result of an unusually large amount of rain and/or high velocity of water flow (particularly in hilly areas) within a very short period of time. Flash floods can occur with limited warning.

- **Shallow Flooding:** Occurs in flat areas where a lack of a water channel results in water being unable to drain away easily. The three types of shallow flooding include the following:

- **Sheet Flow:** Water spreads over a large area at uniform depth.
- **Ponding:** Runoff collects in depressions with no drainage ability.
- **Urban Flooding:** This occurs when man-made drainage systems are overloaded by a larger amount of water than the system was designed to accommodate.

Flooding presents several safety hazards to people and property. Floodwaters can 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, deteriorate municipal drainage systems, and divert municipal staff and resources.

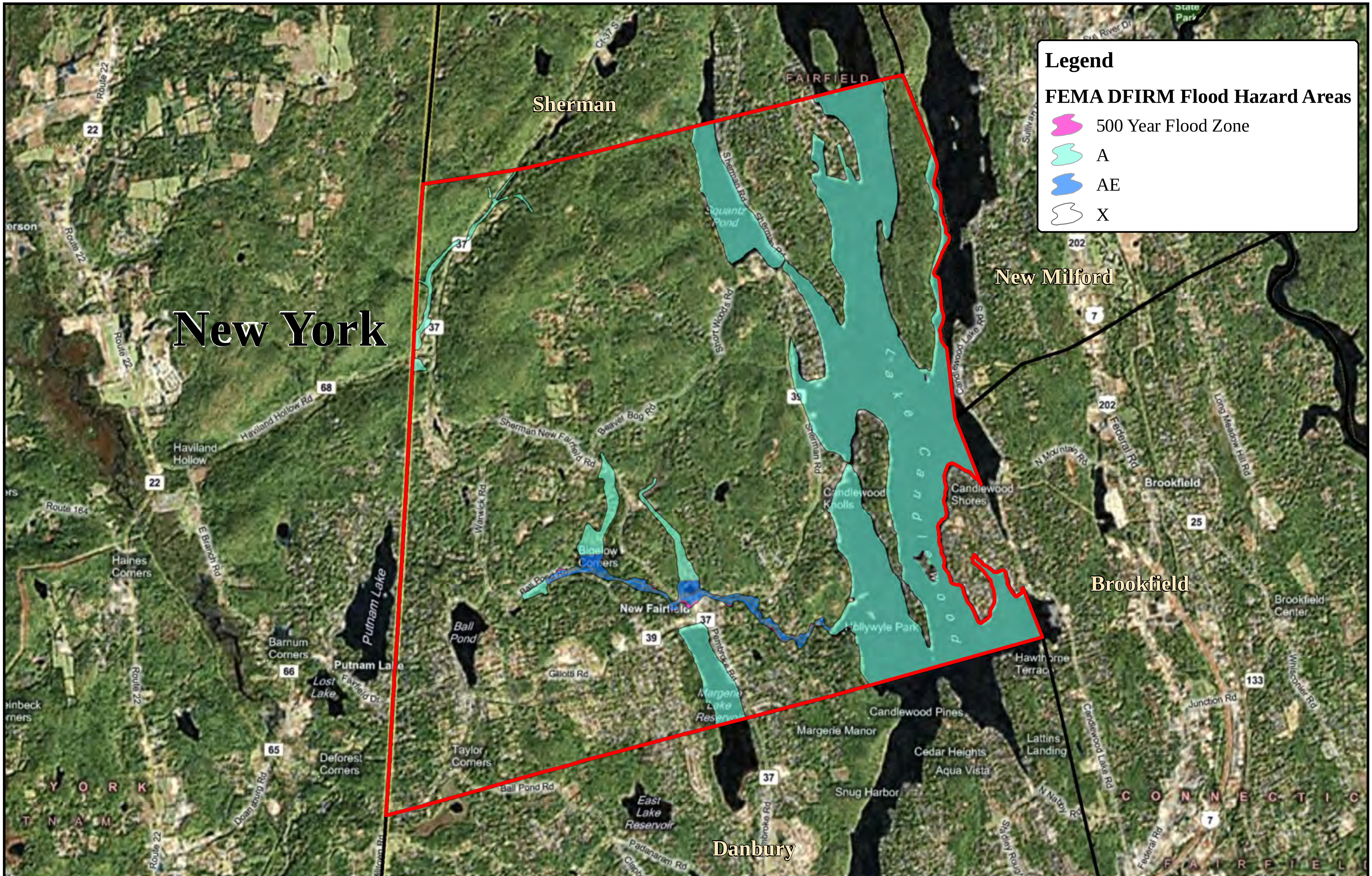
Furthermore, damp conditions trigger the growth of mold and mildew in flooded buildings, contributing to allergies, asthma, and respiratory infections. Snakes and rodents are forced out of their natural habitat and into closer contact with people, and ponded water following a flood provides a breeding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

> ***Floodplains*** ***are lands along watercourses that are subject to periodic flooding;*** ***floodways*** ***are those areas within the floodplains that convey the majority of flood discharge. Floodways are subject to water being conveyed at relatively high velocity and force. The*** ***floodway fringe*** ***contains those areas of the 1-percent-annual-chance floodplain that are outside the floodway and are subject to inundation but do not convey the floodwaters at a high velocity.***

In order to provide a national standard without regional discrimination, the 1-percent-annual-chance flood (previously known as 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. The risk of having a flood of this magnitude or greater increases when periods longer than 1 year are considered. For example, FEMA notes that a structure located within the 1-percent-annual-chance floodplain has a 26 percent chance of suffering flood damage during the term of a 30-year mortgage. The 0.2-percent-annual-chance floodplain (previously known as the "500-year" floodplain) indicates areas of moderate flood hazard.

SFHAs in New Fairfield are delineated on a Flood Insurance Rate Map (FIRM) and in a Flood Insurance Study (FIS). The FIRM delineates areas within New Fairfield that are vulnerable to flooding. The initial Flood Hazard Boundary Map (FHBM) is dated January 31, 1975, and the initial FIRM is dated February 15, 1984. The Town of New Fairfield FIS was originally published on August 15, 1983. Updates to both the FIRM and the FIS were published most recently on October 16, 2013 as part of the Fairfield County FIS update. The Town intends to continue participating in the NFIP.

The majority of the watercourses in New Fairfield are mapped as Zone A while Ball Pond Brook has some area mapped as 0.2-percent annual-chance floodplain. Refer to Figure 3-1 for the areas of New Fairfield susceptible to flooding based on FEMA flood zones. Table 3-1 describes the various zones depicted on the FIRM panel for New Fairfield.



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Natural Hazard Pre-Disaster Mitigation Plan
Town of New Fairfield, Connecticut

Location: **New Fairfield, CT**

MMI#: 2534-09
MXD: H:\Fig3-1_FEMA.mxd
Source: CT DEP, NYS GISC, FEMA

N

FEMA Flood Zones

Map By: JBH
Date: October, 2010
Scale: 1" = 6,000'

Sheet: **Figure 3-1**

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. This area may include a mapped floodway.
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.

Flooding can occur in some areas with a higher frequency than those mapped by FEMA. This nuisance flooding occurs from heavy rains with a much higher frequency than those used to calculate the 1-percent-annual-chance flood event 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 (see Sections 3.3 and 3.5).

During large storms, the expected-frequency level of a flood discharge on a tributary tends to be lower than the expected frequency level of the flood discharge on the main channel downstream. In other words, a 1-percent-annual-chance flood event on a tributary may only contribute to a 2-percent annual-chance event downstream. This is due to the distribution of rainfall throughout large watersheds during storms 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 expected frequency level of a precipitation event also generally differs from the expected frequency level of the associated flood. An example would be Tropical Storm Floyd in 1999, which caused rainfall on the order of a 0.4-percent-annual-chance event while flood levels were slightly greater than those of a 10-percent-annual-chance event on the Naugatuck River in Beacon Falls, Connecticut. 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

The Town has experienced various degrees of flooding in every season of the year throughout its recorded history. Melting snow combined with early spring rains has 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 or periods of rainfall on frozen ground. Other flood events have been caused by excessive rainfalls upon saturated soils, yielding greater-than-normal runoff.

According to the 1987 FEMA FIS, at least 26 major storms occurred in the Housatonic River basin since 1693. Significant floods occurred in November 1927, March 1936, September 1938, January 1949, August 1955, and October 1955. In terms of damage to the Town, the most severe of these was damage associated with Hurricane Diane in August 1955, which had a return period of 100 years. Flood discharge on the Housatonic River at nearby Gaylordsville, Connecticut recorded a peak discharge of 51,800 cubic feet per second (cfs). This flood was the result of high-intensity rainfall falling on saturated ground.

In general, there are few flooding problems in New Fairfield that result in damage to structures. This is due to the lightly developed suburban and rural nature of the area, proactive mitigation measures managed by the Public Works Department, and the local floodplain regulations.

According to the National Climatic Data Center (NCDC) Storm Events Database, since 1993 there have been 52 flooding events and 30 flash flood episodes in Litchfield County (the county on the north and east sides of New Fairfield), 20 flooding and 60 flash flooding episodes in Fairfield County, and 25 flooding and 21 flash flooding events in Dutchess County, New York (the county on the west side of New Fairfield). The following are descriptions of more recent examples of floods in and around the Town as described in the NCDC Storm Events Database and based on correspondence with municipal officials.

- August 21, 1994: Flash flooding caused approximately $5 million in property damage in the adjacent Litchfield County, Connecticut.

- October 21, 1995: A flood caused $20,000 in damage in the adjacent Dutchess County, New York.

- January 19, 1996: An intense area of low pressure over the mid-Atlantic region produced unseasonably warm temperatures, resulting in the rapid melting of 1 to 3 feet of snow. This melting combined with 1 to3 inches of rainfall to produce flooding across Litchfield County and Dutchess County, particularly along small streams. This flooding caused $7,000,000 in property damage in Dutchess County, resulting in a presidential disaster declaration. Half of the roads in neighboring Pawling, New York to the west and many other roads near small streams throughout the county were washed out. In Litchfield County, the storm caused approximately $300,000 in property damage.

- July 13, 1996: The remnants of Hurricane Bertha tracked northeast over Connecticut and eastern New York, producing 3 to 5 inches of rain across Litchfield County and Dutchess County. The storm resulted in minimal property damage in Connecticut but caused flooding in several roads and streams, and the strong winds accompanying the storm caused scattered power outages when water-laden tree branches were downed on wires. Approximately $60,000 in property damage was reported in Dutchess County.

- September 16, 1999: Torrential record rainfall preceding the remnants of Tropical Storm Floyd caused widespread urban, small stream, and river flooding. Fairfield County was declared a disaster area, along with Litchfield and Hartford Counties. Initial cost estimates for damages to the public sector were $1.3 million for Fairfield County, $204,254 for Hartford County, and $53,000 for Litchfield County. These estimates do not account for damages to the private sector and are based on information provided by the Connecticut Office of Emergency Management. Total damage was approximated at $1.1 million for Litchfield County.

  Serious widespread 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.

Dutchess County experienced $900,000 in property damage and one death from significant flooding on smaller tributary streams. Route 7 washed out in several areas in New Milford. See Section 3.3.1 for a description of the flooding damage to New Fairfield as a result of this storm. Appendix C contains a report recording damage, repair costs, and photos from Tropical Storm Floyd.

- December 17, 2000: Unseasonably warm and moist air tracked northward from the Gulf of Mexico, bringing a record-breaking rainstorm to Litchfield County and Dutchess County. The storm produced 2 to 4 inches of rain in addition to strong winds and combined with melting snow to produce flooding conditions. The bulk of the rainfall occurred in a short interval of time, with some localities receiving an inch per hour. $75,000 in property damage was reported in Litchfield County. At the height of the storm, 50 roads were closed in Dutchess County, and one death was reported due to the flood.

- September 8, 2004: The remnants of Hurricane Frances produced torrential rainfall across western Connecticut, with total rainfall amounts ranging from 1 to 6 inches. The rainfall produced flash flooding of many roads in Fairfield County.

- October 2005: Although the consistent rainfall of October 7-15, 2005 caused flooding and dam failures in most of Connecticut (most severely in northern Connecticut), the precipitation intensity and duration was such that only moderate flooding occurred in New Fairfield. A total of 7.15 inches of rain was reported in neighboring New Fairfield from October 8 to October 9, with an additional 7.50 inches reported from October 11 to October 14. Urban flooding of low-lying and poor drainage areas occurred throughout the region. The Housatonic River at Gaylordsville crested at 2.38 feet above flood stage on October 9. On October 14, roads were washed out, and some homes were inundated with debris flows in the nearby town of Kent.

- April 15-18, 2007: A combination of storms caused widespread flooding across New York and Connecticut. Three to eight inches of rain fell in Dutchess County resulting in $5,700,000 in flooding damages and a disaster declaration. $750,000 in flooding damage was reported in Litchfield County. In neighboring New Milford, Cross Road and Youngsfield Road were flooded and closed, and a mudslide was reported at Grove Street that resulted in the evacuation of five homes. The heavy rainfall resulted in moderate flooding on the Housatonic River, with the river cresting at Gaylordsville at 4.97 feet above flood stage on April 16. One of the storms, a spring nor'easter, produced up to almost 8 inches of rain in parts of Fairfield County.

- September 6, 2008: The remnants of Tropical Storm Hanna produced rainfall amounts of 3 to 3 inches across Dutchess County, causing flooding. Game Farm Road in neighboring Pawling, New York was washed out. The storm caused approximately $32,000 in damages in Fairfield County, and flash flooding caused one death. Many roads in the adjacent city of Danbury were beneath 1 to 3 feet of water, including the roads near Western Connecticut State University. At least $100,000 in damages was reported due to heavy rainfall in Litchfield County. Route 7 in neighboring New Milford flooded resulting in several cars stalling in floodwaters.

- August 12, 2009: Heavy rainfall caused Saw Mill Road near Route 39 in New Fairfield to be closed due to flash flooding.

- March 30, 2010: A Nor'easter produced an extended period of heavy rainfall across southern Connecticut as it tracked very slowly to the northeast. This caused widespread flooding across portions of southern Connecticut and upwards of $4 million of damage in the state. In New Fairfield, super-saturated ground caused a tree to fall on a house on Hudson Drive, taking down utility wires.

- March 7, 2011: Heavy rainfall from a slow-moving cold front caused flooding along the Still River in Brookfield and Danbury, closing roads and forcing the evacuation of a number of car dealerships.

- August 28, 2011: Tropical Storm Irene moved northward over western Connecticut and eastern New York. Rainfall amounts averaged 5 to 10 inches in Litchfield County concentrated in a 12-hour period. Numerous roads were closed due to flooding. This event will be discussed more in the Tropical Cyclone section.

- September 2, 2013: Scattered thunderstorms dropped between 2 and 2½ inches of rain in a short period, causing flash flooding in Fairfield County. Damages were seen in the town of West Redding.

- January 9, 2014: A coastal storm passing to the southeast of the region caused strong winds and heavy rain. Isolated flooding occurred around southern Connecticut, including an episode in nearby Bethel that forced closure of an intersection.

3.3.1 Tropical Storm Floyd

As with many towns in Connecticut, flooding associated with Tropical Storm Floyd came to represent the storm of record in New Fairfield. Total rainfall amounts measured nearly 11 inches in Town as reported by the NCDC. The following is a summary of the damage to public infrastructure reported in 1999 dollars. A total of $138,520 in damage was reported to Town-owned public infrastructure. Below are some examples of the damage caused in New Fairfield. The *Report of Storm Damage to Town Property* prepared for the Board of Selectmen by Dale Cote and Jackie Thayer includes a complete list of damages.

Damages Caused by Ball Pond Brook:

- A culvert overtopped at Musket Ridge Road #13, washing out the drainage structure and the road. The estimated cost of the damage was $3,000.

Damages Caused by Short Woods Brook (tributary to Ball Pond Brook):

- Road and shoulders washed out in numerous locations along Rocky Hill Road, undermining the pavement. The estimated cost of the damage was $2,100.

- There were major road failures at both Short Woods Brook stream crossings on Beaver Bog Road with an estimated cost of damage of $11,000.

Damages Caused by East Lake Brook:

- East Lake Brook overtopped culverts on Smoke Hill Drive and Old Farm Road washing out lanes of pavement, shoulders, and retaining walls with an estimated damage cost of $3,800.

- Washed out gutters and a collapsed catch basin at four locations along Indian Hill Road and Indian Hill Lane due to flow in East Lake Brook led to damages estimated to cost $3,400.

3.4 Existing Capabilities

The Town has in place a number of measures to prevent flood damage. These include regulations, codes, and ordinances preventing encroachment and development near floodways. The New Fairfield Zoning Department has a stated purpose of guiding the "development of the Town of New Fairfield so as to promote beneficial and convenient relationships among… areas within the town, considering the suitability of each area for such uses" (from the Town website). The department relies on commissions to implement and administer the various regulations and programs necessary for accomplishing its policy of "considering the suitability of each area." Regulations, codes, and ordinances that apply to flood hazard mitigation in conjunction with and in addition to NFIP regulations include the following:

- ***Inland Wetlands and Watercourses Regulations***. This document defines in detail the Town's regulations regarding development near wetlands, watercourses, and water bodies that are sometimes coincident with floodplains.
  - Section 2 defines "Regulated Activities" covered by the Regulations.
  - Section 6 states that no person may conduct or maintain a regulated activity without obtaining a permit.
  - Section 7 outlines the application requirements.

- ***Subdivision Regulations.*** The Town Subdivision Regulations (Appendix B of the New Fairfield Code of Ordinances) address floodplain protection and flooding mitigation in many sections.

  - Section 1.3(a) states that "land subject to flooding… shall not be subdivided for residential purposes."
  - Section 1.3(e) requires that reserved open spaces be graded to dispose of surface water.
  - Section 1.3(g) and (h) of the regulations outlines the responsibility of any subdivision to protect important features including prevention of pollution of wetlands, watercourses, and waterbodies; protection of quality and quantity of water supplies; and minimization of flood damage.
  - Section 3.03 specifically addresses SFHAs specifying protective flood control measures for floodprone areas.
  - Section 1.5(e)2 specifically addresses storm drainage design requirements for new subdivisions. These regulations require that any drainage infrastructure or culverts within the subdivision must have capacity for a 50-year storm.
  - Section 1.5(e)3 gives the Board of Selectmen and the Town Engineer both the authority and the responsibility to mandate stormwater runoff management methods in subdivisions "where it is anticipated that the additional runoff incident to the development of the subdivision will overload an existing downstream drainage facility during a fifty-year storm."

- ***Zoning Regulations***. Section 5.1 of the New Fairfield Zoning Regulations details the use requirements of the Floodplain Overlay District as established by FEMA in 1983. This includes definitions, permitted uses, special permit uses in the floodplain (open space preserves, water supply systems, sanitary sewage systems, bridges, etc.), and special permit uses in the flood fringe (basement elevation requirements above base flood elevation, etc.).

New Fairfield has programs in place to execute each of these regulations. The intent of these regulations is to promote public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas of the Town by the establishment of standards designed to do the following:

- ❑ Protect human life and public health.
- ❑ Minimize expenditure of money for costly flood control projects.
- ❑ Minimize the need for rescue and relief efforts associated with flooding.
- ❑ Minimize prolonged business interruptions.
- ❑ Minimize damage to public facilities and utilities such as water and gas mains; electric, telephone, and sewer lines; and streets and bridges located in floodplains
- ❑ To maintain a stable tax base by providing for the sound use and development of floodprone areas in such a manner as to minimize flood blight areas
- ❑ Ensure that purchasers of property are notified of special flood hazards.
- ❑ Ensure the continued eligibility of owners of property in New Fairfield for participation in the NFIP.

The Town of New Fairfield Zoning Enforcement Officer serves as the NFIP administrator and oversees the enforcement of NFIP regulations. The degree of flood protection established by this ordinance meets the minimum reasonable for regulatory purposes under the NFIP. New Fairfield currently has no plans to enroll in the Community Rating System program, which would require surpassing NFIP minimum flood protection requirements.

The Town of New Fairfield Planning Commission and the Town of New Fairfield Zoning Commission use the 1-percent-annual-chance flood lines from the FIRM delineated by FEMA to determine floodplain areas. Site plan standards require that all proposals be consistent with the need to minimize flood damage, public facilities and utilities be located and constructed to minimize flood damage, and adequate drainage is provided. The New Fairfield Inland Wetlands Agency also reviews new developments and existing land uses on and near wetlands and watercourses.

Additionally, New Fairfield protects against flood damage through the following measures: requiring that all new buildings are designed and graded to direct drainage away from the building; encouraging developers to consider detention or retention of stormwater when it is the best option for reducing peak flows downstream of a project; and providing a checklist of individual municipal departments engaged in flood mitigation to be contacted by applicants proposing development projects.

<u>Flood Control and Drainage Projects</u>

The New Fairfield Department of Public Works (DPW) is in charge of the maintenance of the Town's drainage systems and performs clearing of bridges and culverts and other maintenance as needed. Drainage complaints are routed to the DPW and recorded. The Town uses these documents to identify potential problems and plan for maintenance and upgrades. The Town can also access the Automated Flood Warning System to monitor precipitation

The Town of New Fairfield 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.*

totals. The CT DEEP installed the Automated Flood Warning System in 1982 to monitor rainfall totals as a mitigation effort for flooding throughout the state.

The East Lake Flood Study and Candlewood Corners Flood Study commissioned in 2009 addressed flooding concerns and proposed improvements to these chronic flood locations, and those suggestions were included in the initial HMP as potential mitigation actions. Since adoption of that Plan, drainage projects have begun or been completed at those sites and have been reclassified as capabilities.

The East Lake Brook Crossings project focused on five roads that were regularly overtopped during flood events. Culvert upgrades were recommended prior to the initial HMP. Six culverts that have since been replaced now have greater flow capacities. The Candlewood Corners project will address regular flooding from a tributary to Ball Pond Brook. Replacement of the current drainage system will take place in 2016. Both projects will reduce flooding in nearby neighborhoods and are described in more detail in Sections 3.6.6 and 3.7.

A third project is taking place at Bigelow Corners, where Ball Pond Brook has been known to flood Route 39. This project is being overseen by the state. More details are provided in Sections 3.6.6 and 3.7.

Emergency Services

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 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, are highly likely to flood, or when flooding is imminent. Additionally, the Town can access the National Oceanic and Atmospheric Administration (NOAA) Automated Flood Warning System to monitor precipitation totals.

Summary

In summary, many of New Fairfield's capabilities to mitigate for flooding and prevent loss of life and property have improved since the initial HMP was adopted. Its policies and programs include the following: current participation and a policy of continued future participation in the NFIP; requiring that developers submit site plans to the relevant municipal commissions prior to new construction; requiring that all new buildings direct drainage away from the building; encouraging developers to consider the downstream impacts of detention versus retention of stormwater on new subdivisions; providing a list of municipal departments involved in flood mitigation to developers; monitoring and clearing of drainage systems, culverts, and bridges by the DPW; and reviewing drainage complaints to identify problem locations (performed by the DPW).

The Town continues to restrict building activities inside floodprone areas and control construction of bridges, culverts, and drainage systems. These processes are carried out by the Planning, Zoning, and Inland Wetlands Commissions. All watercourses are to be encroached minimally or not at all to maintain the existing flood-carrying capacity. These regulations rely primarily on the FEMA-defined 100-year flood elevations to determine flood areas.

Additionally, the Town has completed an important drainage improvement project at East Lake Brook, which has protected five roads that were regularly flooded. The Town is also in the process of upgrading a culvert at Candlewood Corners that will decrease flood risk from Ball Pond Brook.

3.5 Vulnerabilities and Risk Assessment

This section discusses specific areas at risk of flooding within the Town. Major land use classes and critical facilities within these areas are identified. According to the FEMA FIRMs, 3,389 acres of land in New Fairfield are located within the 100-year flood boundary. In addition, indirect and nuisance flooding occurs near streams and rivers in a few locations throughout New Fairfield due to inadequate drainage and other factors such as beaver dams.

3.5.1 Vulnerability Analysis of Repetitive and Severe Repetitive Loss Properties

Based on correspondence with the State of Connecticut NFIP Coordinator, repetitive loss properties (RLP) are not located in the Town.

3.5.2 Vulnerability Analysis of Areas along Watercourses

The primary waterways in the Town are Ball Pond Brook and its tributary, Short Woods Brook. The remaining waterways in New Fairfield are mostly small streams. Candlewood Lake and Ball Pond are significant recreational resources. Recall from Figure 3-1 that floodplains with elevations are delineated for Ball Pond Brook while the majority of the smaller brooks and streams, including the major water bodies, have floodplains delineated by approximate methods. All of these delineated floodplains are generally limited to the areas adjacent to the streams.

The 2010 Fairfield County Digital Flood Insurance Rate Map (DFIRM) was utilized with the 2004 leaf-off aerial photography mosaic available from the CT DEEP to determine the number of structures within SFHAs. Results are shown in Table 3-2 below.

TABLE 3-2
Structures within SFHAs

SFHA	Brook	Number of Structures in SFHA
100-year Zone A	Ball Pond Brook and tributary	9
	Candlewood Lake	53[1]
	Quaker Brook and tributary	3
	Short Woods Brook	3
100-year Zone AE	Ball Pond Brook	21[2]
100-year Floodway in Zone AE	Ball Pond Brook	8[3]
500-year Zone X	Ball Pond Brook	4[4]

[1]Two buildings appear to be large association clubhouses.
[2]Three buildings appear to be nonresidential.
[3]One building appears to be nonresidential.
[4]One building appears to be commercial.

Based on the information in Table 3-2, there are 97 structures within the 100-year floodplain in New Fairfield, with 92 of the structures being residential homes. According to AOL Real Estate, the average market value for a home in New Fairfield, CT for July 2010 was $355,322. Thus, the estimated value of the homes within the 100-year floodplain is $32,689,624.

Assessment data from Vision Appraisal was utilized to determine the value of the remaining properties in the 100-year floodplain. Assessments were completed in 2009. The appraised value of each property is summarized below:

- 55 Lake Drive North: Clubhouse was appraised at $1,372,600 (Zone A).
- 180 Route 39: Town Park was appraised at $744,500 (Zone A).
- 126 Route 37: Commercial building was appraised at $315,300 (Zone AE Floodway).
- 25 Route 39: Stop & Shop (previously Shaw's Supermarket; a commercial building) was appraised at $10,342,400 (Zone AE).
- 5 Route 39: Office building (commercial) was appraised at $2,059,200 (Zone AE).
- 8 Dunham Drive: Industrial building was appraised at $388,200 (Zone AE).
- 100 Route 37 – Commercial building was appraised at $2,647,000 (Zone X – 500-year floodplain).

Thus, the total estimated value of properties within the 100-year floodplain in the Town is $47,911,824.

Review of Reported Flooding Occurrences

Due to the steep topography surrounding the major watercourses and Candlewood Lake, wide-scale flooding does not occur frequently in New Fairfield. On the other hand, specific areas susceptible to flooding were identified by Town personnel and observed by MMI staff during field inspections as described in Section 1.5. Most flooding occurs due to large amounts of rainfall. Chronic flooding areas are limited in extent and described below:

- East Lake Brook Crossings: East Lake Brook is not associated with a SFHA. The brook has five road crossings in New Fairfield: Gillotti Road, Indian Hill Road, Williams Road, Old Farms Road, and Smoke Hill Drive. Results of the flood frequency model run for the East Lake Brook Flood Study show that all of these crossings except Gillotti Road are overtopped for flows between the 2-year and 25-year floods. The only dwelling affected by this flooding is the Zackeo residence at 14 Williams Road, where a 10-year storm event floods the lower level of the house. Significant damages have occurred to this structure in the past. In addition, the routine road closures and poststorm cleanup that are necessary are significant issues of concern to the Town.

  The replacement of the culverts at the five road crossings with upgraded culverts that have greater flow capacities will decrease flooding at this site. See Sections 3.4, 3.6.6, and 3.7.

- Candlewood Corners: This flooding is due to undersized culverts draining the watershed above Route 39 at the intersection with Sawmill Road. The watercourse is not associated with a SFHA. Flooding at this intersection has caused damage to several commercial properties and the roads despite the lack of a mapped floodplain.

  The construction of a larger replacement culvert, to be completed in 2016, will decrease flooding at this site.

- Beaver Bog Road: Flooding (and icing) at Beaver Bog Road is due to an undersized culvert for conveyance of Short Woods Brook (a tributary of Ball Pond Brook) on a steep slope.

- Sawmill Road: Ball Pond Brook floods a residential pond at the intersection with Sawmill Road due to an undersized culvert. The area of flooding is within the SFHA.

- Bigelow Corners: Ball Pond Brook floods Route 37 at the intersection with Bigelow Road via a divergence upstream of Route 37, pictured to the right. This flooding has caused damage to Route 37. The area of flooding is within the SFHA.

  Improvement of the drainage system at this site through a construction project being overseen by the State of Connecticut should decrease flood risk here.

- Galloping Hill Road: A section of Galloping Hill Road is flooded by a concentrated drainage flow due to an undersized culvert.

New Fairfield has many dead-end roads, and many of these roads cross a watercourse near the intersection end. These areas could potentially be cut off from emergency services during a severe flooding event. Bridge scour and overtopping from spring floods are also recurring problems on some of these roads, particularly when culverts become blocked by debris. New Fairfield does not currently regulate the number of homes located on dead-end streets.

3.5.3 Vulnerability Due to Projected Sea Level Change

According to the NOAA Technical Report OAR CPO-1, the worst-case scenario for sea level rise by 2100 is a global average increase of 6.6 feet above the 1992 msl. In the coastal Connecticut area, sea level has risen between 0 and 2 feet per century since 1854. The entire Town is above 6.6 feet of elevation and does not include any tidally influenced watercourses. Therefore, this community is unlikely to be affected by sea level rise through 2100.

3.5.4 Critical Facilities and Emergency Services

Critical facilities are not regularly impacted by flooding in the Town. Routes 37 and 39, the main thoroughfares through and out of New Fairfield, have sections within FEMA mapped flood zones and at risk of being impassable during flooding from Ball Pond Brook, Candlewood Lake, and other waterways during severe storms.

3.5.5 *HAZUS-MH* Analysis

The FEMA program *HAZUS-MH* provides nationally applicable, standardized methodologies for estimating potential wind, flood, and earthquake losses on a regional basis. *HAZUS-MH* utilizes Census 2000 data to perform its analysis of various damage estimates. Ball Pond Brook is the only watercourse in the Town that has a 100-year floodplain with elevations defined. *HAZUS-MH* was utilized to generate potential damages to structures along Ball Pond Brook. The FIT extension of *HAZUS-MH* was utilized in *ArcGIS* to process available flood data from the 2010 Fairfield County FIS. However, due to discrepancies between the published FIS data and USGS elevation data, the FIT module could not be utilized successfully. The flood elevations provided by the FIS are different by as much as 10 feet along some areas of the brook. The Town is currently in the process of developing a new HEC-RAS model to generate corrected flood elevations for Ball Pond Brook.

As an alternative analysis, *HAZUS-MH* was run without using the FIS data. Hydrology and hydraulics for the Ball Pond Brook and Short Woods Brook were generated utilizing the USGS's National Elevation Dataset. The summary report is included in Appendix D. The following paragraphs discuss the results of the *HAZUS-MH* analysis.

The FEMA default values were used for each census tract in the *HAZUS* simulation. A summary of the default building counts and values is shown in Table 3-3. Approximately $240 million of building value (lower than the assessed values discussed above) was estimated to exist within the floodplains of Ball Pond Brook and Short Woods Brook in the Town.

TABLE 3-3
***HAZUS-MH* Flood Scenario – Basic Information**

Occupancy	Dollar Exposure (x 1000) (2006 USD)
Residential	$200,026
Commercial	$27,848
Other	$12,279
Total	**$240,153**

The *HAZUS-MH* simulation estimates that during a 100-year flood event structures within the floodplain of the two brooks will only experience minor damage from flooding. Moderate or substantial damage to buildings is not anticipated, and essential facilities (schools, fire stations, or police departments) will not be affected.

The *HAZUS-MH* simulation estimated that a total of 546 tons of debris would be generated by flood damage for the *HAZUS-MH* 100-year flood scenario. It is estimated that 22 truckloads (at approximately 25 tons per truck) will be required to remove the debris. The breakdown of debris is as follows:

- Finishes (drywall, insulation, etc.) comprise 34 percent of this total.
- Structural material (wood, brick, etc.) comprise 39 percent of the total.
- Foundation material (concrete slab, concrete block, rebar, etc.) comprise 27 percent of the total.

HAZUS-MH calculated the potential sheltering requirement for the 100-year flood event along Ball Pond Brook and Short Woods Brook. The model estimates that 43 households will be displaced due to flooding, and 26 people will seek temporary shelter in public shelters. The predicted sheltering requirements for flood damage are relatively minimal and can be addressed through the use of the Town's existing shelter facilities.

HAZUS-MH also calculated the predicted economic losses due to the 100-year flood event. A total of $5.53 million of building-related losses are expected. Property damage loss estimates include the subcategories of building, contents, and inventory damages. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building or its contents. Residential losses total $3.62 million, commercial losses total $1.76 million, and other (municipal and industrial) losses total $0.17 million.

A total of $50,000 of business interruption losses is expected. Business interruption loss estimates include the subcategories of lost income, relocation expenses, and lost wages. The business interruption losses are associated with the inability to operate a business due to the damage sustained during a flood and also include temporary living expenses for those people displaced from their home because of the flood. Commercial interruption losses are 20 percent of this total, with industrial and municipal losses being the remainder.

A comparison was performed to contrast the results of the *HAZUS-MH* simulation against the known assessor's data listed above. As approximately $12.1 million in residential structures and $13.7 million of commercial and industrial structures are located within the 1-percent-annual-chance floodplain of Ball Pond Brook and its tributaries, the projected damages to building and inventory ($5.58 million) are reasonable (though likely conservatively high) to use for planning purposes until corrected elevations are available.

3.5.6 Summary

In summary, based on (1) historic records and observations along watercourses located outside SHFAs, and (2) *HAZUS-MH* simulations of the 100-year flood events, areas within SFHAs and areas that are not within SFHAs are vulnerable to flooding damages. Damages can include direct structural damage, transportation network damage, interruptions to business and commerce, emotional impacts, and injury.

3.6 Potential Mitigation Strategies and Actions

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. These are usually administered by building, zoning, planning, and/or code enforcement offices; through capital improvement programs; and through zoning, subdivision, and wetland ordinances.

Municipal departments should identify areas for acquisition to maintain flood protection.

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 change.

Acquisition of heavily damaged structures after a flood may be an economical and practical means to accomplish this. The Town should consider partnering with the land trusts in New Fairfield to identify properties worth acquiring as much of the open space in Town is owned by the Naromi Land Trust.

Although RLPs are not located in the Town, structures are located in or adjacent to floodplains, including commercial properties in New Fairfield center. 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 and subdivision ordinances regulate development in flood hazard areas. Flood hazard areas should reflect a balance of development and natural areas although ideally they will be free from development.

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 drainageways
- A requirement that developers dedicate open space for 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 a minimum follow the requirements of the NFIP for subdivision and building codes. These could be included in the ordinances for subdivisions and building codes or could be addressed in a separate ordinance.

One recommendation for many municipalities could be to consider using more detailed town topographic maps, if available, to develop a more accurate regulatory flood-hazard map using the published FEMA flood elevations. According to 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 USGS quadrangle maps with 10-foot contour intervals, but many municipalities today have contour maps of 1- or 2-foot intervals that show more recently constructed roads, bridges, and other anthropologic features. The *MapMod* program has largely attempted to address these problems although discrepancies still exist. 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. 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. Implementation of this recommendation may be difficult for New Fairfield as some of its floodplains lack flood elevation data. The FEMA Region I office has more information on this topic; contact information can be found in Section 11.

Reductions in floodplain area or revisions of a mapped floodplain can only be accomplished through revised FEMA-sponsored engineering studies or Letters of Map Change (LOMC). A Letter of Map Amendment (LOMA) is currently in the submittal process under the LOMC program for the Town.

<u>Stormwater Management Policies</u>: Development and redevelopment policies to address the prevention of flood damage 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, postdevelopment stormwater should not leave a site at a rate higher than under predevelopment 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 to 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 topography, New Fairfield is situated in the upper and 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 based on the position of each project site in the surrounding watershed. New Fairfield Subdivision Regulations give the Board of Selectmen and the Town Engineer both the authority and the responsibility to mandate stormwater runoff management methods in subdivisions "where it is anticipated that the additional runoff incident to the development of the subdivision will overload an existing downstream drainage facility during a fifty-year storm" (New Fairfield Code of Ordinances Appendix B:1.5(e)3). Shifting the obligation of analyzing the downstream effects of subdivision construction from the Board of Selectmen and Town Engineer to the Developer, or more explicitly requiring such analysis in the Code of Ordinances, may improve application of this practice.

<u>Drainage System Maintenance</u>: An effective drainage system must be continually maintained to ensure 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 GIS technology can greatly aid the identification and location of problem areas. The Town should continue to complete regularly scheduled drainage system maintenance.

<u>Education and Awareness</u>: 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 New Fairfield Inland Wetlands Agency administers the wetland regulations, and the New Fairfield Zoning Commission administers the zoning regulations. The regulations simultaneously restrict development in floodplains, wetlands, and other floodprone areas. The Land Use Enforcement Officer is charged with ensuring that development follows the zoning regulations and inland wetlands regulations.

One previously recommended preventative mitigation measure was that the Town develop a checklist that cross-references the bylaws, regulations, and codes related to flood damage prevention that may be applicable to a proposed project and make this list available to potential applicants. The Town did not feel such a checklist was the best approach but instead created a list of each individual municipal department involved with flood mitigation so that potential applicants can both ensure they are following regulations and have the Town be aware of their project.

3.6.2 Property Protection

A variety of steps can be taken to protect existing public and private properties from flood damage. Performing such measures for RLPs would provide the greatest benefit to residents and the NFIP. Potential measures for property protection include the following:

- ***Relocation of structures at risk for flooding to a higher location on the same lot or to a different lot outside of the floodplain***. Moving an at-risk structure to a higher elevation can reduce or eliminate flooding damages to that property.

- ***Elevation of the structure***. Building elevation involves the removal of the building structure from the basement and elevating it on piers to a height such that the first floor is located above the 1-percent-annual chance flood level. The basement area is abandoned and filled to be no higher than the existing grade. All utilities and appliances located within the basement must be relocated to the first-floor level. The area below the first floor may only be used for building access and parking.

- ***Construction of localized property improvements such as barriers, floodwalls, and earthen berms***. Such structural projects can be used to prevent shallow flooding and are described in Section 3.3.6.

- ***Performing structural improvements to mitigate flooding damage***. Such improvements can include the following:

    - ***Dry floodproofing of the structure to keep floodwaters from entering***. Walls may be coated with compound or plastic sheathing. Openings such as windows and vents would be either permanently closed or covered with removable shields. Flood protection should extend only 2 to 3 feet above the top of the concrete foundation because building walls and floors cannot withstand the pressure of deeper water.

> ***Dry floodproofing** refers to the act of making areas below the flood level watertight.*
>
> ***Wet floodproofing** refers to intentionally letting floodwater into a building to equalize interior and exterior water pressures.*

    - ***Wet floodproofing of the structure to allow floodwaters to pass through the lower area of the structure unimpeded***. Wet floodproofing should only be used as a last resort above the first-floor level. If considered, furniture and electrical appliances should be elevated above the 1-percent-annual-chance flood elevation.

- ⇨ ***Performing other potential home improvements to mitigate damage from flooding***. FEMA suggests several measures to protect home utilities and belongings, including the following:
  - Relocating valuable belongings above the 1-percent-annual-chance flood elevation to reduce the amount of damage caused during a flood event;
  - Relocate or elevate water heaters, heating systems, washers, and dryers to a higher floor or to at least 12 inches above the high water mark (if the ceiling permits). A wooden platform of pressure-treated wood can serve as the base.
  - Anchor the fuel tank to the wall or floor with noncorrosive metal strapping and lag bolts.
  - Install a septic backflow valve to prevent sewer backup into the home.
  - Install a floating floor drain plug at the lowest point of the lowest finished floor.
  - Elevate the electrical box or relocate it to a higher floor and elevate electric outlets to at least 12 inches above the high water mark.

- ❑ ***Encouraging property owners to purchase flood insurance under the NFIP and to make claims when damage occurs***. While having flood insurance will not prevent flood damage, it will help a family or business put things back in order following a flood event. Property owners should be encouraged to submit claims under the NFIP whenever flooding damage occurs in order to increase the eligibility of the property for projects under the various mitigation grant programs.

All of the above *property protection* mitigation measures may be useful for New Fairfield residents and business owners to prevent damage from inland and nuisance flooding. The Building Official should consider outreach and education in these areas where appropriate.

3.6.3 Emergency Services

A HMP 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 the following:

- ❑ 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 EOP outlining procedures for the mobilization and position of staff, equipment, and resources to facilitate evacuations and emergency floodwater control
- ❑ 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

Many of these mitigation measures are already in practice in the Town. Based on the above guidelines, a number of specific proposals for improving *emergency services* are recommended to prevent damage from flooding. These are common to all hazards in this Plan and are listed in Section 10.1.

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 *public education* may be considered to prevent damage from inland and nuisance flooding. These are common to all hazards in this Plan, and those explored by the Town 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 floodwaters, 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 nonpoint 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 the following:

- ❑ *Adoption of floodplain regulations to control or prohibit development that will alter natural resources*
- ❑ *Development and redevelopment policies focused on resource protection*
- ❑ *Information and education for both community and individual decision makers*
- ❑ *Review of community programs to identify opportunities for floodplain preservation*

Projects that improve the natural condition of areas or restore diminished or destroyed resources can reestablish an environment in which the functions and values of these resources are again optimized. Acquisitions of floodprone property with conversion to open space are the most common of these types of projects. Acquisition of heavily damaged structures (particularly RLPs) after a flood may be an economical and practical means to accomplish this. In some cases, it may be possible to purchase floodprone properties adjacent to existing recreation areas, which will allow for the expansion of such recreational use or the creation of floodplain storage areas. Administrative measures that assist such projects include the development of land reuse policies focused on resource restoration and review of community programs to identify opportunities for floodplain restoration.

Based on the above guidelines, the following specific *natural resource protection* mitigation measures may be considered to help prevent damage from flooding:

- ❑ Pursue additional open space properties in floodplains by purchasing floodprone structures and converting the parcels to open space.

- Pursue the acquisition of additional municipal open space properties as discussed in the Plan of Conservation and Development.
- Selectively pursue conservation objectives listed in the Plan of Conservation and Development and/or more recent planning studies and documents.
- Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains.
- Work with local land trusts to identify undeveloped properties (or portions thereof) worth acquiring that are within or adjacent to floodplains.

3.6.6 Structural Projects

Structural projects involve construction of new structures or modification of existing structures (e.g., floodproofing) to lessen the impact of a flood event. They may include the following:

- Stormwater controls such as drainage systems, detention dams and reservoirs, and culverts could 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.
- Individuals can protect private property by raising structures and constructing walls and levees around structures.

Care should be taken when using these techniques to ensure that problems are not exacerbated in other areas of the impacted watersheds. Given the increasing rainfall rates in Connecticut (Section 2.4), a long-term recommendation of this Plan is for the Town to reevaluate the drainage computations on the various roads in Town. The Town should also encourage the owners of private roads to reconsider their drainage computations as well. Should it appear that a culvert or crossing is undersized, the Town or the private entity should pursue funding to resize the infrastructure.

Three specific structural improvement projects were suggested in the initial Plan with the goal of accommodating high flow levels without damage to property and infrastructure.

The East Lake Brook Crossings project focused on five culverts that carried the river under Gillotti Road, Indian Hill Road, Williams Road, Old Farms Road, and Smoke Hill Drive. These roads were regularly overtopped during flood events, causing routine road closures and poststorm cleanup. A Flood Study was performed for this section of stream, and culvert upgrades were recommended as follows: replace the Indian Hill Road culvert with a 36-inch reinforced concrete pipe; the Williams Road culvert with a 10-foot-wide by 4-foot-high reinforced concrete box culvert; the two Old Farms Road culverts with a 10-foot-wide by 5-foot-high box culvert; and the two Smoke Hill Drive culverts with twin 10-foot-wide by 4-foot-high box culverts. During the Plan Update process, municipal staff reported that all of these culverts have since been upgraded.

The Candlewood Corners project was suggested due to reports from WMC Engineers that 25-percent-annual-chance storm events led to the overtopping of one culvert at this site while a second was overtopped even during storms that are more frequent than the annual event. The tributary to Ball Pond Brook causing this flooding does not have a mapped floodplain. Town officials report that replacement of the current drainage system with a 4-foot box culvert designed to convey 1-percent-annual-chance flood flows is being pursued and will take place in 2016.

At Bigelow Corners, Ball Pond Brook flows under Bigelow Road at its intersection with State Route 39. The brook has flooded Route 39. In the initial Plan, replacing the undersized and buried culvert with a traditional and appropriately sized box culvert was recommended. This is a state-owned road, and municipal officials were not able to report on the progress of this project.

3.7 Status of Mitigation Strategies and Actions

The prior mitigation strategies and actions for addressing riverine, drainage-related, and nuisance flooding are listed below with commentary regarding the status of each.

TABLE 3-4
Status of Previous Strategies and Actions

Project	Status
Prevention	
Regulate activities within SFHAs.	*This strategy is incorporated into Town ordinances and regulations and has been redefined as a capability.*
Require buildings constructed in floodprone areas to be protected to the highest recorded flood level even if not located within a defined SFHA.	*Town Building Official deemed this to be unnecessary because all new buildings already need to be reviewed and follow a variety of other codes.* *Action is retired from the HMP.*
Ensure that new buildings be designed and graded to shunt drainage away from the building.	*This strategy is incorporated into Town ordinances and regulations and has been redefined as a capability.*
Require developers to support whether detention or retention of stormwater is the best option for reducing peak flows downstream of a project.	*Most new developments construct detention and retention systems. These systems are privately maintained. A suggested strategy moving forward is to require developers to perform the analysis of downstream impacts themselves rather than having the responsibility be on the Town.*
Compile checklist that cross-references bylaws, regulations, and codes related to flood damage prevention that may be applicable to a proposed project. Make this list available to potential applicants.	*New projects must be approved by a number of municipal departments prior to planning. Applicants are provided with a checklist of departments to contact. This alteration to the originally suggested action was made to lessen the burden placed on applicants. Because this checklist is provided, this action has been redefined as a capability.*
Property and Natural Resource Protection	
In conjunction with the land trusts in Town, pursue the acquisition of additional municipal open space inside SFHAs and set it aside as greenways, parks, or other nonresidential, noncommercial, or nonindustrial use.	*This strategy has not yet been pursued and will be carried over as an action moving forward.*

Project	Status
Selectively pursue conservation recommendations listed in the Plan of Conservation and Development and other studies and documents.	*The Town has made progress relative to this action: Subdivision regulations require a portion of the property to be left as open land.* *An area called Barn Brook was acquired by the Town.* *A new land trust, the New Fairfield Land Trust, has begun to operate in the Town.* *Due to this progress and the activity of the Land Trust, this action is retired from the HMP.*
Regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains.	*This strategy is incorporated into Town ordinances and regulations and has been redefined as a capability.*
Structural Projects	
Pursue/allocate funding to upgrade and/or repair each of the East Lake Brook road crossings discussed in the East Lake Brook Flood Study completed in 2009.	*Completed in 2015.* *This action has been redefined as a capability.*
Pursue/allocate funding to construct the improved box culvert conveyance design for the Candlewood Corners road drainage site.	*In design, to be completed in 2016.* *This action has been redefined as a capability.*
Pursue/allocate funding to upgrade the Ball Pond Brook road crossing at Bigelow Corners.	*Project status is unknown. The Town will need to coordinate with the CT DOT.* *Because Town officials are not certain of the state of this action, it is being carried forward.*

One new strategy has been identified through the process of updating this Plan:

- ❑ Require developers to perform an analysis of downstream impacts of development and determine whether stormwater retention or detention is the best option at a given site rather than having the responsibility of analysis be on the Town. Determinations would be subject to approval by the Town Engineer.

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

4.0 HURRICANES

4.1 Setting

Hazards associated with tropical storms and hurricanes include winds, heavy rains, and inland flooding. While only some of the areas of New Fairfield are susceptible to flooding damage caused by hurricanes, wind damage can occur anywhere in the Town. Hurricanes therefore have the potential to affect any area within the Town. A hurricane striking New Fairfield is considered a possible event each year and could cause critical damage to the Town, its critical facilities, and its infrastructure.

4.2 Hazard Assessment

Hurricanes are a class of tropical cyclones that are defined by the National Weather Service as nonfrontal, 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 (one-minute average) surface wind near the center of the storm. These categories are: Tropical Depression (winds less than 39 miles per hour [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.

The Saffir/Simpson Scale

> ***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 Hurricane Scale" was used prior to 2009 to categorize hurricanes based upon wind speed, central pressure, and storm surge, relating these components to damage potential. In 2009, the scale was revised and is now called the "Saffir-Simpson Hurricane Wind Scale." The modified scale is more scientifically defensible and is predicated only on surface wind speeds. The following descriptions are from the *2014 Connecticut Natural Hazard Mitigation Plan Update*.

- ❑ **Category One Hurricane:** Sustained winds 74-95 mph (64-82 knots [kt] or 119-153 kilometers per hour [km/hr]). *Damaging winds are expected*. Some damage to building structures could occur primarily to unanchored mobile homes (mainly pre-1994 construction).

Some damage is likely to occur to poorly constructed signs. Loose outdoor items will become projectiles, causing additional damage. Persons struck by windborne debris risk injury and possibly death. Numerous large branches of healthy trees will snap. Some trees will be uprooted, especially where the ground is saturated. Many areas will experience power outages with some downed power poles.

- **Category Two Hurricane:** Sustained winds 96-110 mph (83-95 kt or 154-177 km/hr). *Very strong winds will produce widespread damage*. Some roofing material, door, and window damage of buildings will occur. Considerable damage to mobile homes (mainly pre-1994 construction) and poorly constructed signs is likely. A number of glass windows in high-rise buildings will be dislodged and become airborne. Loose outdoor items will become projectiles, causing additional damage. Persons struck by windborne debris risk injury and possibly death. Numerous large branches will break. Many trees will be uprooted or snapped. Extensive damage to power lines and poles will likely result in widespread power outages that could last a few to several days.

- **Category Three Hurricane:** Sustained winds 111-130 mph (96-113 kt or 178-209 km/hr). Dangerous winds will cause extensive damage. Some structural damage to houses and buildings will occur with a minor amount of wall failures. Mobile homes (mainly pre-1994 construction) and poorly constructed signs are destroyed. Many windows in high-rise buildings will be dislodged and become airborne. Persons struck by windborne debris risk injury and possibly death. Many trees will be snapped or uprooted and block numerous roads. Near total power loss is expected with outages that could last from several days to weeks.

- **Category Four Hurricane:** Sustained winds 131-155 mph (114-135 kt or 210-249 km/hr). Extremely dangerous winds causing devastating damage are expected. Some wall failures with some complete roof structure failures on houses will occur. All signs are blown down. Complete destruction of mobile homes (primarily pre-1994 construction). Extensive damage to doors and windows likely. Numerous windows in high-rise buildings will be dislodged and become airborne. Windborne debris will cause extensive damage, and persons struck by the wind-blown debris will be injured or killed. Most trees will be snapped or uprooted. Fallen trees could cut off residential areas for days to weeks. Electricity will be unavailable for weeks after the hurricane passes.

- **Category Five Hurricane:** Sustained winds greater than 155 mph (135 kt or 249 km/hr). Catastrophic damage is expected. Complete roof failure on many residences and industrial buildings will occur. Some complete building failures with small buildings blown over or away are likely. All signs blow down. Complete destruction of mobile homes. Severe and extensive window and door damage will occur. Nearly all windows in high-rise buildings will be dislodged and become airborne. Severe injury or death is likely for persons struck by wind-blown debris. Nearly all trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months.

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	Damage Potential
	Millibars	Inches of Hg	MPH	Knots	Feet	
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	920-644	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 New Fairfield, the coastline assumption is not applicable.

According to Connecticut's *2014 Natural Hazard Mitigation Plan Update*, a moderate Category 2 hurricane is expected to strike Connecticut once every 10 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 the present. These records are compiled in NOAA's Hurricane database (HURDAT), which contains historical data recently reanalyzed to current scientific standards as well as the most current hurricane data.

During HURDAT's period of record (1851-2014), three Category Three Hurricanes, five Category Two Hurricanes, nine Category One Hurricanes, 30 tropical storms, and three tropical depressions have passed within a 150-nautical-mile radius of New Fairfield. The representative storm strengths were measured as the peak intensities for each individual storm passing within the 150-mile radius. The 17 hurricanes noted above occurred in July through October as noted in Table 4-1.

TABLE 4-2
Tropical Cyclones by Month within 150 Miles of New Fairfield Since 1851

Category	May	June	July	August	September	October	Nov
TD	None	1	None	2	None	None	None
TS	1	1	2	9	13	3	1
One	None	None	1	3	3	2	None
Two	None	None	None	2	3	None	None
Three	None	None	None	None	3	None	None
Total	**1**	**2**	**3**	**16**	**22**	**5**	**1**

A summary of some of the historic hurricanes near New Fairfield follows:

1. The most devastating hurricane to strike Connecticut, and believed to be the strongest hurricane to hit New England in recorded history, is believed to have been a Category 3 hurricane at its peak. 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 as a Category 2 storm.

   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 130 mph 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).

2. The "Great Atlantic Hurricane" hit the Connecticut coast in September 1944. This storm was a Category 3 hurricane at its peak intensity but was a Category 2 storm when it reached Connecticut. The storm brought rainfall in excess of 6 inches to most of the state and rainfall in excess of 8 to 10 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.

3. Another Category 2 hurricane, Hurricane Carol, struck in late August 1954 shortly after high tide and produced storm surges of 10 to 15 feet in southeastern Connecticut. This storm was also a Category 3 at peak intensity. Rainfall amounts of 6 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.

4. 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 1955, producing heavy rainfall of 4 to 6 inches across the state.

5. The saturated soil conditions exacerbated the flooding caused by Diane 5 days later, the wettest tropical cyclone on record for the Northeast. While Diane had reduced to a tropical storm before reaching Connecticut, the storm 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 floodwaters resulted in over 100 deaths, left 86,000 unemployed, and caused an estimated $200 million in damages (1955 USD). To put this damage value in perspective, consider that the total property taxes levied by all Connecticut municipalities in 1954 amounted to $194.1 million.

6. In September 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 6 inches of rain in some areas and heavy winds that damaged structures and uprooted trees. Over 500,000 people suffered significant power outages.

7. Hurricane Bob, a Category 2 hurricane that made 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).

8. Tropical Storm Floyd struck Connecticut in 1999. Floyd is discussed in more detail in Section 3.3. The winds associated with Tropical Storm Floyd caused power outages throughout New England and at least one death in Connecticut.

9. Tropical Storm Irene in August 2011 produced 5 to 10 inches of rainfall across western Connecticut resulting in widespread flash flooding and river flooding. Local wind gusts exceeded 60 mph. The combination of strong winds and saturated soil led to numerous downed trees and power outages throughout the region. Ninety percent of New Fairfield lost power during this event, and power was not completely restored for 6 to 7 days afterward. The Town opened its primary shelter during and after this event, providing residents with food, water, showers, and supplies. The Senior Center was used to house about 15 residents. FEMA Public Assistance funding to the Town came to $106,796.61.

10. Hurricane Sandy struck the Connecticut shoreline as a Category 1 Hurricane in late October 2012, causing power outages for 600,000 customers and at least $360 million in damages in Connecticut. Damages in New Fairfield were minor, with only a small number of power outages reported. The High School shelter was open for 4 to 5 days to provide residents with supplies and services. FEMA paid out $161,840.16 in public assistance funding to New Fairfield.

4.4 Existing Capabilities

Existing mitigation measures appropriate for inland flooding have been discussed in Section 3. These include the ordinances, codes, and regulations that have been enacted to minimize flood damage. In addition, various structures exist to protect certain areas, including dams and riprap.

Wind loading requirements are addressed through the state building code. The 2005 Connecticut State Building Code was adopted on December 31, 2005. Amendments were made in 2007, 2009, 2011, and 2013. The code specifies the design wind speed for construction in all 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 as of the 2013 code update, the design wind speed for New Fairfield is 100 mph, up from the original value of 90 mph. A new State Building Code is planned for adoption in October 2016. Design wind speed values for New Fairfield in the "Final Draft for Public Comment" of this new Plan have been lowered to 90 mph again. New Fairfield has adopted the Connecticut Building Code as its building code and remains up-to-date on changes.

Connecticut is located in FEMA Zone II in regard to maximum expected wind speed. The maximum expected wind speed for a 3-second gust is 160 mph. This wind speed could occur as a result of either a hurricane or a tornado in western Connecticut and southeastern New York. The American Society of Civil Engineers recommends that new buildings be designed to withstand this peak 3-second gust.

Parts or all of tall and older trees may fall during heavy wind events, potentially damaging structures, utility lines, and vehicles. Eversource Energy (formerly Connecticut Light & Power), the local electric utility, provides tree maintenance near its power lines. Eversource has provided a liaison to the Town to assist with communication and coordination, which Town officials have indicated to be a positive effort. Nonetheless, officials have indicated that the response time for outages has increased since Eversource took over. Despite the liaison, officials feel that Eversource has not been forthcoming with information that would help pinpoint outage hotspots during emergencies. Officials also note that New Fairfield is at the end of the transmission system, so power often takes an especially long time to be restored.

The Town has a tree warden who encourages residents to cut trees that can be dangerous to power lines. The tree warden is also responsible for maintenance along Town roads and advises private associations and the Public Works Department regarding potentially hazardous trees on private roads. Thus, landowners and community associations are primarily responsible for conducting tree maintenance on private property. In addition, all utilities in new subdivisions must be located underground whenever possible in order to mitigate storm-related damages. Town officials cite their tree-maintenance program as successful and estimate that the annual cost for the program is around $15 thousand, down from an estimated $40 thousand to $50 thousand a year 10 years ago.

During emergencies, the Town currently has two designated emergency shelters available as well as the New Life Community Church as a backup shelter facility (Section 2.9). As hurricanes generally pass an area within a day's time, additional shelters can be set up after the storm as needed for long-term evacuees.

The Town relies on radio, television, area newspapers, and the internet to spread information on the location and availability of shelters. It is understood that several of these information sources can be cut off due to power failure, so emergency personnel can also pass this information on manually. The local newspaper is printed too infrequently to reliably publish shelter information prior to most hazard events although it can be used for those hazards with a long lead time such as hurricanes. Prior to severe storm events, the Town ensures that warning/notification systems and communication equipment are working properly and prepares for the possible evacuation of impacted areas.

<u>Summary</u>

New Fairfield's hurricane-mitigation capabilities are centered on a strong tree-limb maintenance program designed to prevent damage to utilities, roads, and residents. This program includes designating a Town Tree Warden, noting and encouraging residents to cut dangerous trees on their properties, and cutting dangerous trees on public roads and rights-of-way. Since the initial HMP, officials have revisited this program and found it to be sufficient. Active coordination with the regional power company has improved since Connecticut Light and Power was taken over by Eversource and the Eversource liaison program was initiated. Post-event road closures due to fallen trees or power lines are addressed in person by the Town First Selectman. An additional capability that has improved since the initial HMP is the number and distribution of both municipal and privately-owned power generators.

Other municipal policies related to tropical storm mitigation include the following: the most up-to-date Connecticut State Building Code is implemented in Town; landowners are responsible for maintaining trees on their properties; utilities must be placed underground in new developments. Finally, the Town has a program for ensuring that emergency communication systems are operational prior to forecasted storm events.

The Town has also identified the need for other actions to improve the overall capability to mitigate and respond to high-wind-related hazards and damages, explored further in Sections 4.6 and 4.7.

4.5 Vulnerabilities and Risk Assessment

It is impossible to predict exactly when and where a hurricane will occur. NOAA reports that "hurricane landfalls are largely determined by the weather patterns in places the hurricane approaches, which are only predictable within several days of the storm making landfall." NOAA does issue an annual hurricane outlook to provide a general guide to each upcoming hurricane season based on various climatic factors.

NOAA has utilized the National Hurricane Center Risk Analysis Program (HURISK) to determine return periods for various hurricane categories at locations throughout the United States. As noted on the NOAA website, hurricane return periods are the frequency at which a certain intensity or category of hurricane can be expected within 75 nautical miles of a given location. For example, a return period of 20 years for a particular category storm means that on average during the previous 100 years a storm of that category passed within 75 nautical miles of that location five times. Thus, it is expected that similar category storms would pass within that radius an additional five times during the next 100 years.

Table 4-2 presents return periods for various category hurricanes to impact Connecticut. The nearest two HURISK analysis points were New York City and Block Island, Rhode Island; for this analysis, these data are assumed to represent western Connecticut and eastern Connecticut, respectively.

TABLE 4-3
Return Period in Years for Hurricanes to Strike Connecticut

Category	New York City (Western Connecticut)	Block Island, RI (Eastern Connecticut)
One	17	17
Two	39	39
Three	68	70
Four	150	160
Five	370	430

The previous New Fairfield HMP noted that "it is generally believed that New England is long overdue for another major hurricane strike." At the time, the last major hurricane to impact Connecticut was Hurricane Bob in 1991. Subsequent to the adoption of the Plan, Tropical Storm Irene and Superstorm Sandy struck Connecticut and neighboring states in 2011 and 2012, respectively. While both events were relatively low-category tropical cyclones, each caused widespread damage, and each was a reminder that hurricanes do track close to Connecticut.

The *2014 Connecticut Natural Hazard Mitigation Plan Update* notes that some researchers have suggested that the intensity of tropical cyclones has increased over the last 35 years, with some believing that there is a connection between hurricanes and climate change. While most climate simulations agree that greenhouse warming enhances the frequency and intensity of tropical storms, models of the climate system are still limited by resolution and computational ability. However, given the past history of major storms and the possibility of increased frequency and intensity of tropical storms due to climate change, it is prudent to expect that there will be hurricanes impacting Connecticut in the near future that may be of greater frequency and duration than in the past.

According to the *2014 Connecticut Natural Hazard Mitigation Plan Update*, hurricanes have the greatest destructive potential of all natural disasters in Connecticut due to the potential combination of high winds, storm surge and coastal erosion, heavy rain, and flooding that can accompany the hazard. The Town is vulnerable to hurricane damage from wind and flooding and from any tornadoes accompanying the storm. In fact, most of the damage to the Town from historical tropical cyclones has been due to the effects of flooding. Areas of known and potential flooding problems are discussed in Section 3, and tornadoes will be discussed in Section 5. Fortunately, the Town is less vulnerable to hurricane damage than coastal towns in Connecticut because it does not need to deal with the effects of storm surge.

Hurricane-force winds can easily destroy poorly constructed buildings and mobile homes although there are currently no mobile home parks in the Town. New Fairfield's housing stock consists of historic buildings greater than 50 and sometimes 100 years old, relatively younger buildings built before 1990 when the building code changed to mitigate for wind damage, and relatively recent buildings that utilize the new code changes. Since most of the existing housing stock in the Town predates the recent code changes, many structures are highly susceptible to roof and window damage from high winds.

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 causes considerable disruption for residents. Streets may be flooded or blocked by fallen branches, poles, or trees, preventing egress. Downed power lines from heavy winds can also start 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.

As the Town is not affected by storm surge, hurricane sheltering needs have not been calculated by the U.S. Army Corps of Engineers. The Town determines sheltering need based upon areas damaged or needing to be evacuated 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 percent to 20 percent of the affected population of the Town will relocate while most will stay in their homes until power is restored. In the case of a major (Category Three or above) hurricane, it is likely that the Town will depend on state and federal aid to assist sheltering displaced populations until normalcy is restored.

HAZUS-MH Analysis

HAZUS-MH simulations were run for historical and probabilistic storms for the three census tracts located in New Fairfield. For the historical simulations, the results estimate the potential maximum damage that would occur in the present day (based on year 2000 data) given the same storm track and characteristics of each event. The probabilistic storms estimate the potential maximum damage that would occur based on wind speeds of varying return periods. Note that the simulations calculate damage for wind effects alone and not damages due to flooding. Thus, the damage and displacement estimates presented below are likely lower than would occur during a storm with severe rainfall. Results are presented in Appendix D and summarized in this subsection.

Figure 4-1 shows the spatial relationship between the two historical storm tracks used for the *HAZUS* simulations (Hurricane Gloria in 1985 and the 1938 hurricane) and the Town. These two storm tracks produced the highest winds to affect New Fairfield out of all the historic hurricanes included in the *HAZUS-MH* software.

Figure 4-1: Historical Hurricane Storm Tracks

The FEMA default values were used for each census tract in the *HAZUS* simulations. A summary of the default building counts and values is provided in Table 4-3. Approximately $1.2 billion of building value was estimated to exist in the Town.

TABLE 4-4
***HAZUS-MH* Hurricane Scenarios – Basic Information**

Occupancy	Building Count	Dollar Exposure (x 1,000) (2006 USD)
Residential	5,247	1,093,784
Commercial	239	90,957
Other	143	42,783
Total	**5,629**	**1,227,524**

The *HAZUS-MH* Hurricane Model Technical Manual outlines various damage thresholds to classify buildings damaged during hurricanes. The five classifications are summarized below:

- No Damage or Very Minor Damage: Little or no visible damage from the outside. No broken windows or failed roof deck. Minimal loss of roof cover, with no or very limited water penetration.
- Minor Damage: Maximum of one broken window, door, or garage door. Moderate roof cover loss that can be covered to prevent additional water entering the building. Marks or dents on walls requiring painting or patching for repair.
- Moderate Damage: Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water.
- Severe Damage: Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water. Limited, local joist failures. Failure of one wall.
- Destruction: Essentially complete roof failure and/or more than 25 percent of roof sheathing. Significant amount of the wall envelope opened through window failure and/or failure of more than one wall. Extensive damage to interior.

Table 4-4 presents the peak wind speeds during each wind event simulated by *HAZUS* for the Town. The number of expected residential buildings to experience various classifications of damage is presented in Table 4-4, and the total number of buildings expected to experience various classifications of damage is presented in Table 4-5. Minimal damage is expected to buildings for wind speeds less than 70 mph, with overall damages increasing with increasing wind speed.

TABLE 4-5
***HAZUS-MH* Hurricane Scenarios – Number of Residential Buildings Damaged**

Return Period or Storm	Peak Wind Gust (mph)	Minor Damage	Moderate Damage	Severe Damage	Total Destruction	Total
10 Years	38-39	0	0	0	0	0
20 Years	52-53	0	0	0	0	0
50 Years	69-70	10	0	0	0	10
Gloria (1985)	76	34	1	0	0	35
100 Years	81	107	3	0	0	110
Unnamed (1938)	90	334	18	0	1	353
200 Years	91-92	428	32	1	1	458
500 Years	103-104	1,163	214	15	17	1,409
1,000 Years	112	1,757	562	85	79	2,422

TABLE 4-6
***HAZUS-MH* Hurricane Scenarios – Total Number of Buildings Damaged**

Return Period or Storm	Minor Damage	Moderate Damage	Severe Damage	Total Destruction	Total
10 Years	0	0	0	0	0
20 Years	0	0	0	0	0
50 Years	12	0	0	0	12
Gloria (1985)	37	1	0	0	38
100 Years	114	3	0	0	117
Unnamed (1938)	362	20	0	1	383
200 Years	451	32	1	1	485
500 Years	1,227	214	19	17	1,477
1,000 Years	1,850	562	102	80	2,594

The *HAZUS* simulations consider a subset of critical facilities termed "essential facilities," which are important during emergency situations. As shown in Table 4-6, minimal damage to essential facilities is expected for wind speeds less than 100 mph. Minor damage to the remaining essential facilities occurs for all greater wind events, with the expectation that the essential facilities have a loss of service greater than 1 day for the highest wind events.

TABLE 4-7
***HAZUS-MH* Hurricane Scenarios – Essential Facility Damage**

Return Period or Storm	Fire Stations (1)	Police Stations (1)	Schools (5)
10 Years	None or Minor	None or Minor	None or Minor
20 Years	None or Minor	None or Minor	None or Minor
50 Years	None or Minor	None or Minor	None or Minor
Gloria (1985)	None or Minor	None or Minor	None or Minor
100 Years	None or Minor	None or Minor	None or Minor
Unnamed (1938)	None or Minor	None or Minor	None or Minor
200 Years	None or Minor	None or Minor	None or Minor
500 Years	Minor damage, loss of use > 1 day	Minor damage, loss of use > 1 day	All schools have minor damage, loss of use > 1 day
1,000 Years	Minor damage, loss of use > 1 day	Minor damage, loss of use > 1 day	All schools have minor damage, loss of use > 1 day

Table 4-7 presents the estimated tonnage of debris that would be generated by wind damage during each *HAZUS* storm scenario. As shown in Table 4-7, minimal debris is expected for storms less than the 50-year event, and reinforced concrete and steel buildings will not generate debris for any of the wind events simulated. Much of the debris that is generated is tree related.

TABLE 4-8
***HAZUS-MH* Hurricane Scenarios – Debris Generation (Tons)**

Return Period or Storm	Brick/Wood	Reinforced Concrete/Steel	Tree Debris	Total	Estimated Cleanup Truckloads (25 Tons/Truck)
10 Years	None	None	None	None	None
20 Years	None	None	None	None	None
50 Years	39	None	None	39	2
Gloria (1985)	82	None	374	456	3
100 Years	254	None	1,155	1,409	10
Unnamed (1938)	640	None	5,179	5,819	25
200 Years	818	None	5,475	6,293	33
500 Years	2,984	None	9,988	12,972	120
1,000 Years	7,825	None	22,273	30,098	311

Table 4-8 presents the potential sheltering requirements based on the various wind events simulated by *HAZUS*. The predicted sheltering requirements for wind damage are relatively minimal even for the largest wind events and can be addressed through the use of the existing shelter facilities. However, it is likely that hurricanes will also produce heavy rain and flooding that will increase the overall sheltering need in the Town.

TABLE 4-9
***HAZUS-MH* Hurricane Scenarios – Shelter Requirements**

Return Period or Storm	Number of Displaced Households	Short-Term Sheltering Need (Number of People)
10Years	0	0
20 Years	0	0
50 Years	0	0
Gloria (1985)	0	0
100 Years	0	0
Unnamed (1938)	0	0
200 Years	0	0
500 Years	0	0
1,000 Years	14	2

Table 4-9 presents the predicted economic losses due to the various simulated wind events. Property damage loss estimates include the subcategories of building, contents, and inventory damages. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building or its contents. Business interruption loss estimates include the subcategories of lost income, relocation expenses, and lost wages. The business interruption losses are associated with the inability to operate a business due to the damage sustained during a hurricane and also include temporary living expenses for those people displaced from their home because of the storm.

TABLE 4-10
***HAZUS-MH* Hurricane Scenarios – Economic Losses (x 1,000 dollars)**

Return Period or Storm	Residential Property Damage Losses	Total Property Damage Losses	Business Interruption (Income) Losses
10 Years	0	0	0
20 Years	0	0	0
50 Years	906	922	0
Gloria (1985)	1,707	1,742	4
100 Years	2,949	3,024	166
Unnamed (1938)	5,799	6,033	293
200 Years	7,005	7,322	314
500 Years	24,105	25,786	2,645
1,000 Years	70,364	75,780	9,257

Losses are minimal for storms with return periods of less than 50 years (70 mph) but increase rapidly as larger storms are considered. For example, a reenactment of the 1938 hurricane would cause approximately $6.3 million in wind damages to the Town.

In summary, hurricanes are a very real and potentially costly hazard to the Town. Based on the historic record and *HAZUS-MH* simulations of various wind events, the entire Town is vulnerable to wind damage from hurricanes. These damages can include direct structural damages, interruptions to business and commerce, emotional impacts, and injury or death.

4.6 Potential Mitigation Strategies and Actions

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 prevent any storm-caused damage.

Roadside forest maintenance is essential to avoiding road closures and utility failure during storm events and allowing evacuation, emergency response, communication systems, and electricity to function during an emergency situation. Traditional tree limb pruning may not be sufficient. The University of Connecticut Extension's "Stormwise" Vegetation Management Program (www.stormwise.uconn.edu) uses techniques from arboriculture and silviculture to develop healthy, storm-resistant roadside forests. The Town should collaborate with the "Stormwise" project; participate in education, management, and research efforts; and implement the "Stormwise" framework on forests adjacent to key roads such as State Routes 37 and 39 or Beaver Bog Road.

Another way to prevent loss of power during storm events would be to develop a microgrid at some scale within the Town. According to the United States Department of Energy (US DOE), "a microgrid is a local energy grid with control capability, which means it can disconnect from the traditional grid and operate autonomously." This would allow the Town to keep power on during regional power outages as long as the local microgrid itself has not been damaged. According to Town officials, there are a significant number of private generators in New Fairfield as well as Town-owned generators that would help support this action. The Town might also install solar panels on municipal buildings to provide an additional source of local electricity in the event of a regional power outage.

The initial HMP also listed burial of utility lines, continued tree-limb inspection and maintenance, and consideration of tree-fall hazards prior to planting roadside forest buffers, as potential prevention measures.

The following list summarizes activities that have been identified as potential damage-prevention measures for consideration by New Fairfield:

- ❑ The Town should consider potential implications to emergency response before enacting the *2005 Natural Resources Inventory Report and Recommendations* suggestion of planting buffer areas near roadways for all lots in new subdivisions. Fallen trees across long private driveways will hinder emergency response efforts.
- ❑ Locate utilities underground in new developments or as related to redevelopment.
- ❑ Perform Townwide tree limb inspection and maintenance programs to ensure that the potential for downed power lines is diminished.
- ❑ Implement the UConn "Stormwise" Vegetation Management framework to decrease tree-fall.
- ❑ Develop a microgrid within the Town to mitigate power outages.

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 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. These structural projects are further described in Section 4.6.5. 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 EOP of the Town 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, which is accomplished by placing this information on the Town website and by creating informational displays in local municipal buildings and messages on radio and television stations and in local newspapers. The Town should continue to review its mutual aid agreements and update as necessary to ensure that help is available as needed. The Town should also continue to review the currently enacted EOP for the Town and update when necessary.

4.6.5 Structural Projects

Structural projects for wind damage mitigation include the installation of shutters, load path projects, roof projects, and code plus projects.

- Shutter mitigation projects protect all windows and doors of a structure with shutters, lamentations, or other systems that meet debris impact and wind pressure design requirements. All openings of a building are to be protected, including garage doors on residential buildings, large overhead doors on commercial buildings, and apparatus bay doors at fire stations.
- Load path projects improve and upgrade the structural system of a building to transfer loads from the roof to the foundation. This retrofit provides positive connection from the roof framing to the walls, better connections within the wall framing, and connections from the wall framing to the foundation system.
- Roof projects involve retrofitting a building's roof by improving and upgrading the roof deck and roof coverings to secure the building envelope and integrity during a wind or seismic event.
- Code plus projects are those designed to exceed the local building codes and standards to achieve a greater level of protection.

Given the relative rarity of hurricane wind damage in the Town, it is unlikely that any structural projects for extreme wind damage would be cost effective unless a shelter or emergency services facility were involved. The Town should encourage the above measures in new construction and require them for new critical facilities.

4.7 Status of Mitigation Strategies and Actions

Strategies and actions described in Section 3.7 for the mitigation of flooding are also pertinent to mitigating tropical storm or hurricane related flooding and are not repeated here. The prior mitigation strategies and actions for mitigation of hurricane and tropical storm winds are listed below with commentary regarding the status of each. Many of the strategies and actions listed in the initial HMP have been reclassified as capabilities and are not included below.

TABLE 4-11
Status of Previous Strategies and Actions

Project	Status
Prevention	
Perform tree limb maintenance and inspections, especially along state roads and other evacuation routes.	*This action is part of the Town's standard operations and has been recategorized as a capability.*
Increase inspections of trees on private property near power lines and Town rights-of-way.	*Town officials feel the current inspection regime is sufficient and will continue it into the future. The current regime has been classified as a capability. The action of increasing inspections has been retired from the HMP.*
Require that utilities be placed underground in new developments and pursue funding to place them underground in existing developed areas.	*New developments are required to place utilities underground, and that aspect of this action has been reclassified as a capability.* *Town officials hope to secure funding for burial of utilities in developed areas. That aspect is being carried forward into this HMP update. This action addresses all hazards and has been moved to section 10.1.*
Review potential evacuation plans to ensure timely migration of people seeking shelter in all areas of New Fairfield and post evacuation and shelter information on the Town website and in municipal buildings.	*Currently, the First Selectman drives the evacuation routes after an event to determine the best passable route. Evacuation and shelter information is posted. This action has been reclassified as a capability; however, officials are not satisfied with the current situation. The matter of evacuation planning is addressed further in Section 10.1.*
Review and update the Town's EOP as necessary.	*Required by FEMA. Reclassified as a capability.*
Property and Natural Resource Protection	
Provide for the Building Department to have literature available regarding design standards for wind.	*Complete. Town requires compliance with the Amended Connecticut Building Code for Wind Speeds. Action has been reclassified as a capability.*
Structural Projects	
Encourage the use of structural techniques related to mitigation of wind damage in new structures to protect new buildings to a standard greater than the minimum building code requirements.	*Require compliance with Amended Connecticut Building Code for Wind Speeds (updated in February 2014 to 100 mph). This has been reclassified as a capability.*

New strategies have been identified through the process of updating this Plan:

- Collaborate with the Stormwise project; participate in education, management, and research efforts; and implement the Stormwise framework on forests adjacent to key roads.
- Develop a microgrid within the Town using both private and Town-owned generators.
- Evaluate the cost effectiveness of installing solar panels on Town buildings to provide an additional source of local electricity in the event of a regional power outage.

Important recommendations that apply to all hazards are listed in Section 10.1. The strategies listed above apply to many hazards aside from hurricanes but address vulnerabilities (loss of power) that are often associated with high wind and precipitation events. They are referenced, but not repeated, in other relevant sections of this HMP.

5.0 SUMMER STORMS AND TORNADOES

5.1 Setting

Like hurricanes and winter storms, summer storms and tornadoes have the potential to affect any area within the Town. 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 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 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 Fairfield County each year that could cause significant damage to a small area.

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 was covered in Section 3.0 of this Plan and will not be discussed in detail here.

Tornadoes

NOAA defines a tornado as "a violently rotating column of air extending from a thunderstorm to the ground." The two types of tornadoes include those that develop from supercell thunderstorms and those that do not. While the physics of tornado development are fairly well understood, there are many unknowns still being studied regarding the exact conditions in a storm event required to trigger a tornado, the factors affecting the dissipation of a tornado, and the effect of cloud seeding on tornado development.

Supercell thunderstorms are long lived (greater than 1 hour) and highly organized storms feeding off an updraft that is tilted and rotating. This rotation is referred to as a "mesocyclone" when detected by Doppler radar. The figure below is a diagram of the anatomy of a supercell that has spawned a supercell tornado. Tornadoes that form from a supercell thunderstorm are a very small extension of the larger rotation; they are the most common and the most dangerous type of tornado as most large and violent tornadoes are spawned from supercells.

Nonsupercell tornadoes are defined by NOAA as circulations that form without a rotating updraft. Damage from these types of tornadoes tends to be F2 or less (see Fujita Scale, below). The two types of nonsupercell tornadoes are gustnadoes and landspouts:

- A gustnado is a whirl of dust or debris at or near the ground with no condensation tunnel that forms along the gust front of a storm.

- A landspout is a narrow, ropelike condensation funnel that forms when the thunderstorm cloud is still growing and there is no rotating updraft. Thus, the spinning motion originates near the ground. Waterspouts are similar to landspouts but occur over water.

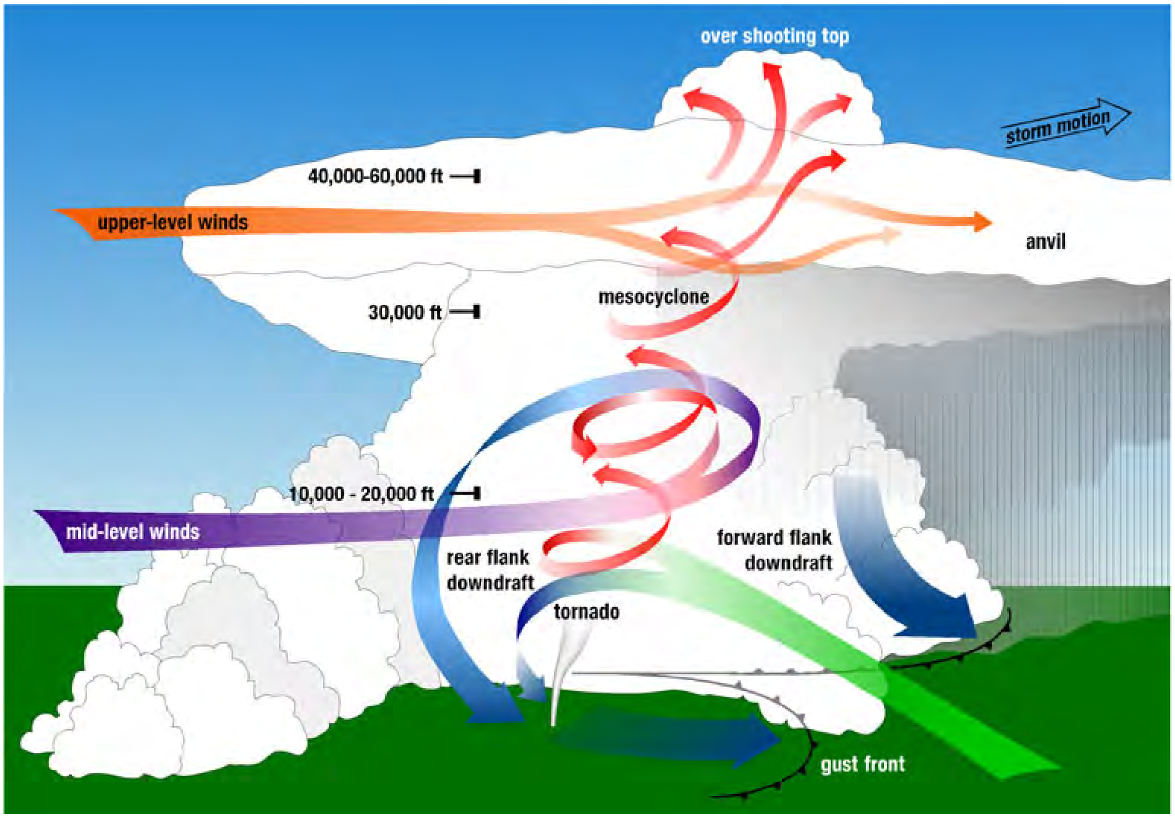


Figure 5-1: Anatomy of a Tornado. Image from NOAA National Severe Storms Laboratory.

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 F5, 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.

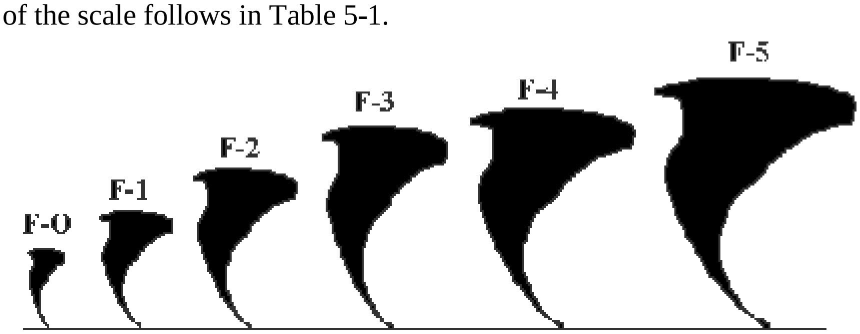


TABLE 5-1
Fujita Scale

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.
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 reinforced 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 percent of all tornadoes. These tornadoes last an average of 5 to 10 minutes and account for approximately 3 percent of tornado-related deaths. Strong tornadoes (F2 and F3) account for approximately 29 percent of all tornadoes and approximately 27 percent of all tornado deaths. These storms may last for 20 minutes or more. Violent tornadoes (F4 and above) are rare but extremely destructive and account for only 2 percent of all tornadoes. These storms sometimes last over an hour and result in approximately 70 percent of all tornado-related deaths.

The Enhanced Fujita Scale was released by NOAA for implementation on February 1, 2007. According to the NOAA website, 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.

Similar to the Fujita Scale, the Enhanced Fujita Scale is also a set of wind estimates based on damage. It uses 3-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	
F Number	*Fastest 1/4-mile (mph)*	*3-Second Gust (mph)*	*EF Number*	*3-Second Gust (mph)*	*EF Number*	*3-Second Gust (mph)*
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

Official records of tornado activity date back to 1950. According to NOAA, an average of 800 tornadoes is reported each year in the United States. The historic record of tornadoes near New Fairfield is discussed in Section 5.3. Tornadoes are most likely to occur in Connecticut in June, July, and August of each year.

According to the NOAA Storm Event Database, the highest relative risk for tornadoes in Connecticut is Litchfield (22 events between January 1, 1950 and July 31, 2015) and Hartford Counties (17 events), followed by New Haven (15 events), Fairfield (13 events), Tolland (11 events), Middlesex (7 events), Windham (3 events), and finally New London (2 events) Counties. The same source shows the adjacent Dutchess County (11 events) in New York as tied with four other New York counties as having the fifth-highest occurrence of tornado activity since 1950. By virtue of its location in Fairfield County (moderate risk) but adjacent to Litchfield County (high risk) and Dutchess County (moderate risk), the Town is therefore at a relatively moderate to high risk for tornadoes. The pattern of occurrence in Connecticut is expected to remain unchanged according to the *2014 Connecticut Natural Hazards Mitigation Plan* although that document points out that climate change is expected to increase the frequency and intensity of thunderstorms, in turn increasing the risk and occurrence of associated tornadoes.

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.

Image courtesy of NOAA.

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, there is an average of 100,000 thunderstorms per year in the United States. An average of 49 people per year died from lightning strikes in the United States from 1985 to 2014. Most lightning deaths and injuries occur outdoors, with 45 percent of lightning casualties occurring in open fields and ballparks, 23 percent under trees, and 14 percent involving water activities. Only 17 lightning-related fatalities occurred in Connecticut between 1959 and 2013.

Thunderstorms occur on 18 to 35 days each year in Connecticut. 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 New Fairfield area is very high during any given thunderstorm although no one 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. Depending on the size and location of downburst events, the destruction to property may be significant.

Downburst activity is, on occasion, mistaken for tornado activity. Both storms have very damaging winds (downburst wind speeds can exceed 165 mph) and are very loud. These "straight line" winds are distinguishable from tornadic activity by the pattern of destruction and debris such that the best way to determine the damage source is to fly over the area.

In 2014, a microburst struck the northern Fairfield County area, knocking over trees and a utility pool, taking out power, closing roads, and causing the electrocution death of a man in neighboring New Milford. The previous microburst in this area occurred in August 2010.

It is difficult to find statistical data regarding the frequency of downburst activity. NOAA reports that there are 10 downburst reports for every tornado report in the United States. Assuming that on average there are 8,000 downbursts reported per year, downbursts occur in approximately 8 percent of all thunderstorms in the United States each year. This value suggests that downbursts are a relatively uncommon yet persistent hazard. The risk to the Town is believed to be low for any given year.

Downbursts fall into two categories:

- ***Microbursts*** *affect an area less than 2.5 miles in diameter, last 5 to 15 minutes, and can cause damaging winds up to 168 mph.*
- ***Macrobursts*** *affect an area at least 2.5 miles in diameter, last 5 to 30 minutes, and can cause damaging winds up to 134 mph.*

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 1.5 pounds have been recorded. While crops are the major victims of hail, it is also a hazard to vehicles and property.

According to NOAA's National Weather Service, hail caused four deaths and an average of 47 injuries per year in the United States from 2000 to 2009. 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 New Fairfield is considered moderate in any given year.

5.3 Historic Record

An extensively researched list of tornado activity in Connecticut is available on Wikipedia. This list extends back to 1648 although it is noted that the historical data prior to 1950 is likely incomplete due to lack of official records and gaps in populated areas. Based on available information through July 2015, Litchfield County and Fairfield County have experienced a total of 29 and 20 tornado events, respectively, with reported damages totaling tens of millions of dollars. Table 5-3 summarizes the tornado events near New Fairfield from 1950 through August 2010 based on the Wikipedia list.

TABLE 5-3
Select Tornado Events near New Fairfield, 1648 – July 2013

Date	County	Fujita Scale	Property Damage	Injuries/Deaths
June 20, 1682	Fairfield	-	NR	NR
August 17, 1784	Litchfield	-	18 structures	5 inj.
October 8, 1797	Fairfield	-	NR	6 inj.
August 1, 1812	Fairfield	-	NR	NR
July 22, 1817	Litchfield	-	NR	NR
August 14, 1820	Fairfield	-	NR	NR
June 3, 1836	Dutchess and Litchfield	-	NR	"Many"
August 9, 1878	Litchfield	-	"Major"	NR
September 14, 1882	Litchfield	-	14 structures	2 dead, 18 inj.
September 27, 1899	Fairfield	-	Buildings	NR
September 15, 1901	Fairfield	-	Several barns	1 dead
August 28, 1911	Fairfield	-	Roofs	NR
July 14, 1950	Fairfield	F2	$250,000	3 inj.
August 21, 1951	Litchfield	F2	$250,000	9 inj.
August 15, 1958	Fairfield	F1	$2,500	NR
August 21, 1958	Litchfield	F1	$0	NR
May 12, 1959	Litchfield	F2	$2,500	NR
June 18, 1962	Litchfield	F2	$25,000	NR
August 11, 1966	Litchfield	F2	$25,000	NR
August 9, 1968	Fairfield	F1	$0	NR
August 20, 1968	Litchfield	F1	$2,500	NR
July 19, 1971	Fairfield	F2	$25,000	NR
August 7, 1972	Litchfield	F1	$250,000	NR
August 9, 1972	Litchfield	F1	$25,000	NR

TABLE 5-3 (Continued)
Select Tornado Events near New Fairfield, 1648 – July 2013

June 12, 1973	Litchfield	F2	$0	NR
June 29, 1973	Litchfield	F1	$2,500	NR
September 18, 1973	Fairfield	F1	$0	NR
July 3, 1974	Litchfield	F1	$2,500	NR
June 19, 1975	Litchfield	F1	$0	NR
July 20, 1975	Litchfield	F1	$2,500	NR
June 30, 1976	Litchfield	F2	$25,000	NR
August 7, 1978	Dutchess	F-	$25,000	NR
May 12, 1984	Dutchess	F0	$25,000	NR
July 25, 1987	Dutchess	F0	$250,000	NR
July 21, 1988	Dutchess	F1	$25,000	NR
July 10, 1989 2:45 p.m.	Litchfield	F2	$25,000,000	4 inj.
July 10, 1989 3:15 p.m.	Litchfield	F2	$25,000,000	70 inj.
June 29, 1990	Fairfield	F0	$2,500	7 inj.
July 5, 1992	Dutchess	F0	$250,000	NR
July 5, 1992	Fairfield	F0	$0	NR
July 31, 1992	Dutchess	F1	$2,500,000	NR
August 4, 1992	Fairfield	F1	$300	NR
May 29, 1995	Dutchess	F-	$10,000,000	5 inj.
July 9, 1996	Fairfield	F1	$0	NR
May 31, 1998	Litchfield	F1	$4,000	NR
May 18, 2000	Dutchess	F0	$70,000	NR
June 23, 2001 1:00 p.m.	Litchfield	F1	$150,000	1 inj.
June 23, 2001 1:50 p.m.	Litchfield	F2	$250,000	NR
June 23, 2001 2:18 p.m.	Litchfield	F0	"Minor"	NR
July 1, 2001	Litchfield	F0	$75,000	NR
May 31, 2002	Dutchess	F1	$35,000	NR
May 31, 2002	Fairfield	F1	$0	NR
June 5, 2002	Litchfield	F1	$40,000	NR
June 16, 2002	Dutchess	F1	$20,000	NR
June 16, 2002	Litchfield	F0	$10,000	NR
September 28, 2003	Dutchess	F1	$10,000	NR
June 25, 2006	Dutchess	F1	$0	NR
July 12, 2006	Fairfield	F1	$2,000,000	NR
May 16, 2007	Fairfield	EF1	$0	NR
July 31, 2009	Fairfield	F1	$10,000	NR
June 24, 2010	Fairfield	EF1	$7,000,000	23 inj.
July 21, 2010	Litchfield	EF1	$24,000,000	NR
June 9, 2011	Litchfield	EF1	$0	NR
July 1, 2013	Fairfield	EF0	$0	NR

NR = None Reported

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

- July 5, 1992 – An F0 tornado struck near New Fairfield.
- August 28, 1993 – Police reported several trees down in New Fairfield due to thunderstorm winds.
- April 4, 1995 – Thunderstorm winds caused $100,000 in damage throughout Dutchess County. Some of the damage was reported in neighboring Pawling.
- May 21, 1996 – Severe thunderstorms produced damage across parts of Litchfield County and caused approximately $5,000 in property damage. Numerous wires and trees were downed by the wind in neighboring New Milford.
- July 9, 1997 – Severe thunderstorms produced flooding and damaging winds that downed trees throughout Litchfield County, causing approximately $5,000 in damage. The wind downed trees and wires in New Fairfield.
- May 31, 1998 – A strong low-pressure system produced an F1 tornado near Washington in Litchfield County, and a severe thunderstorm downed trees and wires in New Milford.
- 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 mph in Litchfield County, causing widespread downing of trees and power lines. Up to 5,000 homes were left without power, and approximately $100,000 in wind damage was reported.
- May 18, 2000 – Severe thunderstorms caused widespread damage across Dutchess County. In Pawling, a large tree fell on power lines and then onto a car causing extensive damage. Pea-sized hail was reported that caused a million dollars in crop damage.
- July 1, 2001 – An F0 tornado tracked across southern Litchfield County, touching down seven times along its path from New Milford to Roxbury. The storm caused $75,000 in damages.
- July 10, 2001 – Locally severe thunderstorms produced dime-sized hail in neighboring Sherman.
- May 31, 2002 – Severe weather in Litchfield County produced hail up to 2 inches in diameter in Thomaston, blew down trees, and caused 37,000 power outages and $10,000 in damages across the county. In Dutchess County, 1-inch hail was reported in Dover, and an F1 tornado touched down near Wingdale in southern Dover.
- June 16, 2002 – A severe storm produced an F1 tornado in Pawling and an F0 tornado in the Lanesville section of New Milford. The F0 tornado produced tree damage near the intersection of Cross Road and Route 7. Nickel-sized hail was also reported in New Milford and Sherman.
- August 22, 2003 – A severe thunderstorm produced high winds that knocked down several trees in Sherman.
- October 27, 2003 – Thunderstorm winds downed trees and power lines in New Fairfield and nearby Danbury.
- August 20, 2004 – Hail measuring 0.75 inches was reported in neighboring New Milford and Sherman. Fallen trees blocked roads in Pawling. The following day, lightning struck a house on Hurds Corners Road in Pawling.
- July 27, 2005 – Severe thunderstorms with winds approaching 60 mph blew down numerous trees and some wires in New Milford, New Fairfield, and Pawling.
- June 21, 2006 – A man was struck by lightning in New Fairfield, causing minor injuries.
- July 19, 2007 – A severe thunderstorm produced damaging straight-line winds estimated at 85 to 95 mph that downed numerous trees on Straight Rock Drive and Long Mountain Road

in Gaylordsville and New Milford. Trees were reported down on power lines near Route 55 in Sherman.

- May 12, 2008 – High winds downed trees and power lines in Danbury and across Route 37 in New Fairfield.
- June 14, 2008 and June 16, 2008 – Strong thunderstorm winds (50 mph) blew down trees in New Milford on both dates. On June 16, quarter-sized hail was reported in Dover.
- July 16, 2009 – Ping-pong-ball-sized hail was reported in New Milford.
- July 26, 2009 – Strong thunderstorm winds (50 mph) blew down wires in neighboring Kent. Nickel to ping-pong-ball-sized hail was reported in New Milford, and ping-pong-ball-sized hail was reported in Pawling. Trees were reported down in South Dover and Pawling.
- June 25, 2010 – An EF-1 tornado struck Bridgeport in southern Fairfield County causing massive damage throughout parts of the city.
- August 16, 2010 – An isolated severe thunderstorm downed trees, poles, and wires onto a road in Sherman.
- June 9, 2011 – Southern Connecticut experienced widespread severe weather and high winds. Twenty to 30 trees were reported down throughout New Fairfield.
- August 21, 2011 – Numerous severe thunderstorms passed through Southwest Connecticut. Trees were reported down, including one in Sherman.
- September 8, 2012 – A few severe storms across southwest Connecticut caused $8.5 K in damage, including downed electric wires and tree limbs.
- May 23, 2013 – Isolated severe thunderstorms produced high winds and heavy rain, downing tree limbs, causing flash flooding, and wreaking $5.5 K of damage.
- July 1, 2013 – Multiple trees and power lines were knocked down by thunderstorms, resulting in widespread power outages. One system produced an EF0 tornado near the coast.
- May 27, 2014 – A collapsing thunderstorm produced 100-mph straight line winds that caused significant damage in neighboring New Milford. Many trees and branches were blown down, blocking roads and causing approximately 13,000 power outages. One person in New Milford died from electrocution when power lines were knocked onto his car. Storm damage reports were widespread.
- July 23, 2014 – A line of thunderstorms passed through the area, with isolated severe thunderstorms producing damaging winds and frequent lightning. Multiple trees were reported down, one landing on a home. $7,000 of damage was reported.
- June 23, 2015 – A passing cold front triggered multiple severe thunderstorms across the entirety of Southern Connecticut. $138,000 of damage, mostly from downed trees, was reported.
- August 4, 2015 – A cluster of severe thunderstorms produced multiple macrobursts around southern Connecticut. Many trees were felled by winds, with one crushing a car in Danbury and several others blocking a road near the Danbury Field Mall. $19,000 of damage was reported in Danbury.

5.4 Existing Capabilities

Warning is the primary method of existing mitigation for tornadoes and thunderstorm-related hazards. The NOAA National Weather Service issues watches and warnings when severe weather is likely to develop or has developed, respectively. Tables 5-4 and 5-5 list the NOAA Watches and Warnings, respectively, as pertaining to actions to

> ***A severe thunderstorm watch*** *is issued by the National Weather Service when the weather conditions are such that a severe thunderstorm (having winds greater than 58 mph, or having hail three-fourths of an inch or greater, or that can produce a tornado) is likely to develop.*
>
> ***A severe thunderstorm warning*** *is issued when a severe thunderstorm has been sighted or indicated by weather radar.*

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 New Fairfield. 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.

In the Town of New Fairfield, the local utilities are responsible for tree branch removal and maintenance above and near their lines. The Town also performs tree branch trimming along Town roads and on Town property. In addition, all new developments in New Fairfield must place utilities underground wherever possible. The tree warden also approaches residents on a case-by-case basis when trees and branches on their property look hazardous though ultimately tree removal on private property is up to the property owner. More information on tree maintenance was provided in Section 4.0.

Municipal responsibilities relative to tornado mitigation and preparedness include the following:

- Developing and disseminating emergency public information and instructions concerning tornado safety, especially 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

Summary

New Fairfield's capabilities to mitigate and respond to summer storm and tornado hazards all relate to wind-protection measures. Many of these are discussed in section 4.4. Programs and policies include: ensuring communication systems are operational prior to forecast storms; broadcasting storm warning information; disseminating tornado safety information and evacuation procedures; designating tornado-resistant public shelters; periodic testing of tornado response plans; putting emergency personnel on standby at tornado “watch” stage; a strong tree maintenance program; a post-storm debris removal program; requiring buildings meet the Connecticut State Building Code; an increase in the number and distribution of power generators; and improved coordination with Eversource.

5.5 Vulnerabilities and Risk Assessment

Description – According to the Connecticut *2014 Natural Hazard Mitigation Plan Update*, Fairfield County has a moderate to high risk of tornado activity based on historical occurrences. By virtue of its location in Fairfield County, New Fairfield has a medium to low potential to experience tornado damage. In addition, NOAA states that climate change has the potential to increase the frequency and intensity of tornadoes, so it is possible that the pattern of occurrence in Connecticut could change in the future.

Although tornadoes pose a threat to all areas of the state, their occurrence is not considered frequent enough to justify the construction of tornado shelters. Instead, the state has provided NOAA weather radios to all public schools as well as many local governments for use in public buildings. The general public continues to rely on mass media for knowledge of weather warnings. Warning time for tornadoes is very short due to the nature of these types of events, so predisaster response time can be limited. However, the NOAA weather radios provide immediate notification of all types of weather warnings in addition to tornadoes, making them very popular with communities.

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

In general, thunderstorms and hailstorms in Connecticut are more frequent in the western and northern parts of the state and less frequent in the southern and eastern parts. Fairfield County experiences an average of 7.5 severe, damaging thunderstorms per year according to the Connecticut *2014 Natural Hazard Mitigation Plan Update*. Although lightning is usually associated with thunderstorms, it can occur on almost any day. The likelihood of lightning strikes in the New Fairfield area is very high during any given thunderstorm although no one area of the Town is at higher risk of lightning strikes. The risk of at least one hailstorm occurring in New Fairfield is considered moderate in any given year.

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. New Fairfield 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 power lines in New Fairfield are detected quickly, and any associated fires are quickly extinguished. However, it is important to have adequate water supply for fire protection to ensure that this level of safety is maintained. Wildfire hazards are addressed in chapter 9.

There are no critical facilities believed to be more susceptible to summer storm damage than any other, with the exception of the War Memorial. Some critical facilities are more susceptible than others to flooding damage due to summer storms. Such facilities susceptible to flooding damage were discussed in Section 3.5.

Loss Estimates – The *2014 Connecticut Natural Hazards Mitigation Plan Update* provides annual estimated losses on a countywide basis for several hazards. Based on the population of New Fairfield relative to Fairfield County, the annual estimated loss is $2,973 for thunderstorms and $1,972 for tornadoes. The figure for tornadoes is low despite high costs due to the infrequency of their occurrence.

Summary – According to Town personnel, no single area of Town is more susceptible to wind damage than any other. Secondary damage from falling branches and trees is more common than direct wind damage to structures.

5.6 Potential Mitigation Strategies and Actions

Specific mitigation steps that can be taken to prevent damage from heavy rainfall and high winds associated with Summer Storms and Tornadoes are covered in =Sections 3.6 and 4.6, respectively.

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.

More information is available at:

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

Available information from FEMA includes the following:

- Design and construction guidance for creating and identifying community shelters
- Recommendations to better protect your business, community, and home from tornado damage, including construction and design guidelines for structures
- 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 in Connecticut. Residents should instead be encouraged to purchase a NOAA weather radio containing an alarm feature.

The implementation of an emergency notification system would be beneficial in warning residents of an impending tornado. 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. This fact was evidenced most recently by the severe storm that struck Lake County, Florida on February 2, 2007. This powerful storm that included several tornadoes stuck at about 3:15 a.m. According to National Public Radio, local broadcast stations had difficultly warning residents due to the lack of listeners and viewers and encouraged those awake to telephone warnings into the affected area.

5.7 Status of Mitigation Strategies and Actions

The prior mitigation strategies and actions for hazards related to winds, hail, tornadoes, and downbursts are listed below with commentary regarding the status of each.

TABLE 5-6
Status of Previous Strategies and Actions

Strategy or Action	Status
Prevention	
Increase tree limb maintenance and inspections, especially in the Town center.	*The Town feels its current inspection regime is sufficient, so it has been classified as a capability. The action of increasing inspections has been retired from the HMP. See Section 4.7.*
Perform outreach regarding dangerous trees on private property.	*This action has not been completed and is being carried forward into this HMP Update.*
Continue to require that utilities be placed underground in new developments and pursue funding to place them underground in existing developed areas.	*New developments are required to place utilities underground, and that aspect of this action has been reclassified as a capability.* *Town officials hope to secure funding for burial of utilities in developed areas. That aspect is being carried forward into this HMP Update. This action addresses all hazards and has been moved to Section 10.1.*
Property and Natural Resource Protection	
Require compliance with the amended Connecticut Building Code for wind speeds.	*This action is part of Town ordinances and regulations and has been redefined as a capability. See Section 4.7.*
Have the Building Department make literature available during the permitting process regarding appropriate design standards.	*Complete. The Town requires compliance with the Amended Connecticut Building Code for Wind Speeds. This action has been reclassified as a capability.*

New actions relevant to summer storms and tornadoes were identified during the update process. These all related to damage from high winds and as such are described in Section 4.7. Additional 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. However, unlike summer storms, winter events and the hazards that result (wind, snow, and ice) have more widespread geographic extent. The entire Town is susceptible to winter storms and due to its high elevation can have higher amounts of snow than surrounding communities. 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.

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 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.

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

- **Blizzards** include winter storm conditions of sustained winds or frequent gusts of 35 mph or greater that cause major blowing and drifting of snow, reducing visibility to less than one-quarter mile for 3 or more hours. Extremely cold temperatures and/or wind chills are often associated with dangerous blizzard conditions.

- **Freezing Rain** consists of rain that freezes on objects such as trees, cars, or roads and forms a coating or glaze of ice. Temperatures in the mid to upper atmosphere are warm enough for rain to form, but surface temperatures are below the freezing point, causing the rain to freeze on impact.

- **Ice Storms** are forecasted when freezing rain is expected to create ice buildups of one-quarter inch or more that can cause severe damage.

- **Nor'easters** are the classic winter storm in New England 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 rain or snow. They usually occur between November 1 and April 1 of any given year, with such storms occurring outside of this period typically bringing rain instead of snow.

- **Sleet** occurs when rain drops freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects. It can accumulate like snow and cause a hazard to motorists.

- **Snow** is frozen precipitation composed of ice particles that forms in cold clouds by the direct transfer of water vapor to ice.

- **Winter Storms** are defined as heavy snow events that have a snow accumulation of more than 6 inches in 12 hours or more than 12 inches in a 24-hour period.

Impacts from severe winter weather can become dangerous and a threat to people and property. Most winter weather events occur between December and March although in 2011 Connecticut experienced a significant October snowstorm that left much of the state without power for a week. Winter weather may include snow, sleet, freezing rain, and cold temperatures. According to NOAA, winter storms were responsible for the death of 33 people per year from 2000 to 2009. Most deaths from winter storms are indirectly related to the storm 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, and flooding as a result of snowmelt.

Until recently, the Northeast Snowfall Impact Scale (NESIS) was used by NOAA to characterize and rank high-impact northeast snowstorms. This ranking system has evolved into the currently used Regional Snowfall Index (RSI). The RSI ranks snowstorms that impact the eastern two-thirds of the United States, placing them in one of five categories: Extreme, Crippling, Major, Significant, and Notable. The RSI is based on the spatial extent of the storm, the amount of snowfall, and the juxtaposition of these elements with population. RSI differs from NESIS in that it uses a more refined geographic area to define the population impact. NESIS had used the population of the entire two-thirds of the United States in evaluating impacts for all storms whereas RSI has refined population data into six regions. The result is a more region-specific analysis of a storm's impact. The use of population in evaluating impacts provides a measure of societal impact from the event. Table 6-1 presents the RSI categories, their corresponding RSI values, and a descriptive adjective.

Connecticut experiences at least one severe winter storm every 5 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.

TABLE 6-1
RSI Categories

Category	RSI Value	Description
1	1-3	Notable
2	3-6	Significant
3	6-10	Major
4	10-18	Crippling
5	18.0+	Extreme

RSI values are calculated within a GIS. The aerial distribution of snowfall and population information is combined in an equation that calculates the RSI score, which varies from around one for smaller storms to over 18 for extreme storms. The raw score is then converted into one of the five RSI categories. The largest RSI values result from storms producing heavy snowfall over large areas that include major metropolitan centers. Approximately 196 of the most notable historic winter storms to impact the Northeast have been analyzed and categorized by RSI through March 2013.

6.3 Historic Record

Eleven major winter nor'easters have occurred in Connecticut during the past 30 years (in 1988, 1992, 1996, 2003, 2006, 2009, 2010, two in 2011, 2013, and 2015). According to the NCDC, there have been over 85 major snow and ice events in the state of Connecticut between January 2000 and March 2015, causing over $22.6 million in damages. Notably, the historic Nor'easter of October 2011 (Winter Storm Alfred) caused power outages, cell-phone tower damage, air travel disruptions, loss of livestock, and an estimated $11 million in damages.

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. However, winter storm Alfred from October 29-30, 2011 had an ice precipitation component to it. Although wet snow was the major problem, ice mixed in along and just to the north of the shoreline, which slickened roadways and led to additional weight buildup on trees and utility lines and other infrastructure. 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 2002 that hit Litchfield and western Hartford Counties resulted in $2.5 million in public sector damages.

Additional examples of the most significant recent winter storms to affect Dutchess County, Fairfield County, and Litchfield County taken from the NCDC database include the following:

- February 6 -7, 1993 – Record cold caused five million dollars in damage in Dutchess County.
- March 13-14, 1993 – A powerful storm caused blizzard conditions and up to 21 inches of snow in Litchfield County, with 40,000 power outages and $550,000 in property damage reported throughout Connecticut.
- January 15-16, 1994 – A Siberian air mass brought record to near-record low temperatures across Connecticut. Strong northwest winds accompanied the cold and drove wind chill values to 30 to 50 degrees below zero. Neighboring Danbury recorded a low of minus eight degrees Fahrenheit.
- February 11, 1994 – A major nor'easter produced 8 to 13 inches of snow across Connecticut. Four to 12 inches were reported in Dutchess County.
- December 23, 1994 – An unusual snowless 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 mph were reported.
- December 19, 1995 – A winter storm produced 6 to 8 inches of snow in Litchfield County and 9 to 14 inches of snow in Fairfield County.
- January 7-8, 1996 – An intense winter storm caused heavy snow throughout Litchfield County, causing many power outages, several roofs to collapse, and approximately $80,000

in damages. Reported snowfall totals included 24 inches in New Hartford and 22 inches in Harwinton, both northeast of New Fairfield. The storm was classified as a blizzard in Fairfield County. Nearby Standfordville in Dutchess County experienced 36 inches of snow, and the storm caused $640,000 in damages across several New York counties.

- December 8, 1996 – A coastal storm produced over 9 inches of snow in New Fairfield. Twelve thousand customers lost power in Dutchess County.
- February 22, 1997 – High winds downed trees and wires across Litchfield County, resulting in approximately $6,000 in property damage. The winds caused $219,000 in property damage in Dutchess County.
- March 31 – April 1, 1997 – A late season storm produced rain and wet snow across Litchfield County, with 12 inches of snow reported in nearby Litchfield and 13.2 inches reported in Danbury. This storm caused over one million dollars in property damage, and over 30,000 homes lost power across the county. A state of emergency was declared in Dutchess County.
- January 15, 1998 – An ice storm caused widespread icing across northern Fairfield County, northern New Haven County, and northern Middlesex County. At least one-half inch of ice accumulated on power lines and trees. Power outages were reported in New Fairfield and Danbury.
- March 15, 1999 – A heavy snowstorm produced 9 inches of snow in Danbury and 6 to 11 inches of snow across most of the rest of Connecticut.
- January 25, 2000 – A winter storm produced snow, sleet, and freezing rain in Litchfield County with accumulations of 6 to 10 inches. $25,000 in property damage was reported. The storm caused whiteout conditions in Fairfield County, and 7 inches of snow was reported in Danbury.
- December 12, 2000 – High winds downed trees and power lines in numerous locations across Connecticut, including in Brookfield, New Fairfield, and Sherman.
- January 21, 2001 – Heavy snowfall occurred across interior Connecticut, producing 6.3 inches at Danbury and 8 inches in Sherman.
- February 5, 2001 – Heavy snowfall produced 19 inches of snow in Danbury.
- December 25, 2002 – Six to 12 inches of snow fell throughout Litchfield and Fairfield Counties.
- February 17, 2003 – A heavy snowstorm caused near-blizzard conditions and produced 24 inches of snow in New Fairfield.
- December 5, 2003 – Heavy snowfall produced 13 inches of snow in Danbury.
- January 22-23, 2005 – Sherman received FEMA assistance related to snow plowing efforts after a major winter storm. Ten inches of snow was reported across Dutchess County.
- December 9, 2005 – Heavy snowfall produced 12.5 inches in New Fairfield.
- February 12-13, 2006 – The Category III storm produced 28 inches of snow in Danbury. Sherman received money from FEMA related to snow plowing operations.
- March 16, 2007 – A winter storm beginning during the Friday afternoon rush hour produced 6 to 12 inches of snow across Litchfield and Fairfield Counties. The storm caused treacherous travel conditions that resulted in many accidents.
- December 19, 2008 – Heavy snowfall produced 8.5 inches of snow in Danbury.
- January 6, 2009 – An ice storm produced up to 0.4 inches of ice across Fairfield County. The storm caused one death and injured three.
- March 13, 2010 – Sustained 60-mph wind gusts and heavy precipitation led to much tree damage throughout Fairfield County, Connecticut.
- December 26-27, 2010 – An intense low pressure system moved across the region with bands of heavy snow with embedded thunderstorms and significant winds. The powerful blizzard brought the area 10 to 18 inches of snow with sustained winds of 25 to 40 mph with gusts in

excess of 60 mph. The storm made all forms of travel extremely difficult to nearly impossible, and service on Metro North and Amtrak lines was suspended due to high snow drift.

- January 11-12, 2011 – Very heavy snow developed across the region, producing snowfall rates of 3 to 4 inches per hour and snow totals ranging from 15 to 30 inches in southern Connecticut. The highest snowfall totals were seen across northern portions of Fairfield and New Haven counties.
- January 26-27, 2011 – A period of moderate to heavy snow moved through the region, producing 2 to 5 inches before a second round of precipitation consisting of very heavy snow moved across the area. This system boasted snowfall rates of 3 to 4 inches per hour over a 4- to 6-hour period, which raised snow totals to 12-20" of snow throughout much of the region.
- October 29-30, 2011 - Winter Storm Alfred dropped up to 32" of snow and caused over 600,000 electrical customers in Connecticut to lose power for a significant amount of time. New Fairfield lost 100 percent of its power, and electricity was not completely restored until 8 days after the event. The storm was unique in that much of the foliage had yet to fall from trees, which provided more surface area for snow to land and stick, therefore making the trees significantly heavier than if the storm was to occur when trees had lost their foliage. The storm resulted in the death of eight people in Connecticut, four from carbon monoxide poisoning. In all, approximately 90 shelters and 110 warming centers were opened statewide. In New Fairfield, the primary shelter was open to provide residents with food, water, showers, and supplies while the Senior Center was used to house about 15 residents. The overall storm impacts and damages resulted in a Presidential Disaster Declaration for Connecticut. FEMA Public Assistance funds to the Town were $310,468.15.
- February 8, 2013 – A fierce nor'easter (dubbed "Nemo" by the Weather Channel) brought blizzard conditions to most of the Northeast, producing snowfall rates of 5 to 6 inches per hour in parts of Connecticut. Three consecutive hours of blizzard conditions dropped 19 inches in Stamford to as much as 33 inches in Stratford. Winds also gusted as high as 82 mph near Westport, and the storm caused more than 700,000 power outages. All roads in Connecticut were closed for 2 days. This storm was ranked as a "Crippling" storm by RSI. The overall storm impacts and damages resulted in a Presidential Disaster Declaration for Connecticut. FEMA public assistance funds provided to the Town were $33,331.13.
- January 26, 2015 – A strong Nor'easter (named Winter Storm Juno) brought heavy snow and strong winds to Southern Connecticut, with blizzard conditions in New London County. Snowfall of 6 to 7 inches was reported. North winds gusted up to 35 mph at Danbury Airport.
- February 7, 2015 - A 3-day period of snowfall impacted all of northwestern Connecticut. Snowfall amounts ranged between 6 and 13 inches across the area, with the heaviest amounts in the higher terrain of northern Litchfield County.

6.4 Existing Capabilities

Existing programs applicable to inland 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 and sand and salt trucks; tree trimming to protect power lines; and other associated snow removal and response preparations.

As it is almost guaranteed that winter storms will occur annually in Connecticut, it is important for municipalities to budget fiscal resources toward 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 that could be impacted by the upcoming storm (especially the elderly and special needs persons).

The amount of snowfall in New Fairfield is elevation dependent during storms. The Town primarily uses Town staff for plowing operations. The Town utilizes plow trucks to clear and treat all Town-owned roadways, properties, and sidewalks. The Connecticut Department of Transportation plows Routes 37 and 39 and Shortwoods Drive leading to Pootatuck State Park. Private communities are responsible for plowing their own roads. Town roads are not prioritized for plowing. During emergencies, a plow vehicle can be dispatched ahead of an emergency vehicle.

<u>Summary</u>

In summary, policies relevant to winter storm mitigation include: primarily using Town staff for plowing operations; clearing of state, Town, and private roads are the responsibility of the state, Town, and private communities respectively. Relevant programs include: ensuring communication systems, equipment and supplies, evacuation routes and shelters are all prepared prior to forecast storm events; dispatching plows ahead of emergency vehicles. Improvements to New Fairfield winter storm mitigation capabilities address hazards such as falling tree limbs, flooding, and transportation. These have already been addressed in sections 3.4 and 4.4.

6.5 Vulnerabilities and Risk Assessment

<u>Description</u> – Based on the historic record in Section 6.3, Connecticut experiences at least one major nor'easter approximately every 4 years although a variety of minor and moderate snow and ice storms occur nearly every winter. According to the *2014 Connecticut Natural Hazards Mitigation Plan Update*, Connecticut residents can expect at least two or more severe winter weather events per season, including heavy snowstorms, potential blizzards, nor'easters, and potential ice storms. Fortunately, catastrophic ice storms are relatively 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.

According to the *2014 Connecticut Natural Hazards Mitigation Plan Update*, recent climate change studies predict a shorter winter season for Connecticut (as much as 2 weeks) and less snow-covered days with a decreased overall snowpack. These models also predict that fewer, more intense precipitation events will occur with more precipitation falling as rain rather than snow. This trend suggests that future snowfalls will consist of heavier (denser) snow, and the potential for ice storms will increase. Such changes will have a large impact on how the state and its communities manage future winter storms and the impact such storms have on the residents, roads, and utilities in the state.

As mentioned for summer storms, the heavily treed landscape in close proximity to populated residential areas in the Town 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 freezing water pipes in basements.

Heavy winter precipitation can also lead to roof collapse. As an example, using media reports, a list of roof/building collapses and damage due to buildup of frozen precipitation was compiled for just the time period between January 12, 2011 and February 17, 2011. The list (Table 6-2) includes 76 locations.

TABLE 6-2
Reported Roof Collapse Damage, 2011

Address	Municipality	Date	Description
205 Wakelee Avenue	Ansonia	2/2/2011	Catholic Charities
Route 44	Barkhamsted	2/4/2011	Barkhamsted Highway Department Salt Shed
8 Railroad Avenue	Beacon Falls	2/2/2011	Manufacturing Corporation
20 Sargent Drive	Bethany	2/2/2011	Fairfield County Millworks
50 Hunters Trail	Bethany	2/2/2011	Sun Gold Stables
74 Griffin Road South	Bloomfield	2/14/2011	Home Depot Distribution Center
25 Blue Hill Road	Bozrah	1/27/2011	Kofkoff Egg Farm
135 Albany Turnpike	Canton	2/3/2011	Ethan Allen Design Center
520 South Main Street	Cheshire	1/12/2011	Cheshire Community Pool (prior to recent ice storm)
1701 Highland Avenue	Cheshire	1/23/2011	Cox Communications
174 East Johnson Ave	Cheshire	2/2/2011	First Calvary Life Family Worship Center
166 South Main Street	Cheshire	2/3/2011	George Keeler Stove Shop (Historic Building)
1755 Highland Avenue	Cheshire	2/7/2011	Nutmeg Utility Products
45 Shunpike Road	Cromwell	2/2/2011	K Mart (cracks inside and outside - no official collapse)
Cromwell Hills Drive	Cromwell	2/4/2011	Cromwell Gardens
98 West Street	Danbury	1/28/2011	Garage
142 N. Road	East Windsor	2/3/2011	Dawn Marie's Restaurant
3 Craftsman Road	East Windsor	2/4/2011	Info Shred
140 Mountain Road	Ellington	1/27/2011	Garage Collapse
100 Phoenix Avenue	Enfield	2/1/2011	Brooks Brothers
South Road	Enfield	2/2/2011	Bosco's Auto Garage
175 Warde Terrace	Fairfield	2/3/2011	Parish Court Senior Housing
19 Elm Tree Road	Glastonbury	2/6/2011	Residence
Unknown	Hampton	1/28/2011	Wood Hill Farm barn collapse - animals died
Gillette Street	Hartford	1/19/2011	Garage
West Street	Hebron	2/2/2011	Residential
Connecticut Route 101	Killingly	2/8/2011	Historic church converted to an office building
759 Boston Post Road	Madison	2/3/2011	Silver Moon, Brandon Gallery, Coffee Shop, Cinemas
478 Center Street	Manchester	1/28/2011	Lou's Auto Sales and Upholstery
1388 East Main Street	Meriden	1/28/2011	Jacoby's
260 Sherman Avenue	Meriden	2/6/2011	Engine 4 Fire Station
275 Research Parkway	Meriden	2/17/2011	Four Points by Sheraton Carport
1310 South Main Street	Middletown	1/30/2011	Passport Inn Building & Suites
505 Main Street	Middletown	2/2/2011	Accounting firm, converted, mixed use (3 story)
70 Robin Court	Middletown	2/3/2011	Madison at Northwoods Apartment
80 North Main Street	Middletown	2/7/2011	Abandoned warehouse
Pepe's Farm Road	Milford	1/30/2011	Vacant manufacturing building
282 Woodmont Road	Milford	2/2/2011	Kip's Tractor Barn
150 Main St #1	Monroe	2/2/2011	Monroe Paint & Hardware
Route 63	Naugatuck	1/21/2011	Former Plumbing Supply House
410 Rubber Avenue	Naugatuck	2/2/2011	Thurston Oil Company
1210 New Haven Road	Naugatuck	2/4/2011	Rainbowland Nursery School (structural damage)

Address	Municipality	Date	Description
1100 New Haven Road	Naugatuck	2/17/2011	Walmart (structural damage)
5 Shore Drive	New Fairfield	2/8/2011	Marina Roof
290 Goffe Street	New Haven	2/7/2011	New Haven Armory
201 South Main Street	Newtown	2/9/2011	Bluelinx Corp.
80 Comstock Hill Ave	Norwalk	1/27/2011	Silvermine Stable
5 Town Line Road	Plainville	1/27/2011	Classic Auto Body
130 West Main Street	Plainville	2/2/2011	Congregational Church of Plainville
Terryville Section	Plymouth	1/12/2011	Public Works Garage (Terryville section)
286 Airline Avenue	Portland	1/27/2011	Midstate Recovery Systems, LLC (transfer station)
680 Portland-Cobalt Rd.	Portland	1/27/2011	Vacant commercial property
Tryon Street	Portland	1/27/2011	Residential home (sunroof)
Main Street	Portland	1/28/2011	Middlesex Marina
93 Elm Street	Rocky Hill	2/6/2011	Residential garage
99 Bridgeport Avenue	Shelton	2/3/2011	Shell Gas Station
100 Maple Street	Somers	1/27/2011	Lindy Farms (barn)
68 Green Tree Lane	Somers	2/2/2011	Residential
95 John Fitch Blvd	South Windsor	2/3/2011	South Windsor 10-Pin Bowling Alley
595 Nutmeg Road N	South Windsor	2/8/2011	Waldo Brothers Company
45 Newell Street	Southington	2/2/2011	Yarde Metals
Furnace Avenue	Stafford Springs	2/2/2011	Abandoned mill building
370 South Main Street	Terryville	2/8/2011	Former American Modular
46 Hartford Turnpike	Tolland	2/3/2011	Colonial Gardens
364 High Street	Tolland	2/9/2011	Horse barn
61 Monroe Turnpike	Trumbull	2/1/2011	Trumbull Tennis Center
5065 Main St # L1207	Trumbull	Unknown	Taco Bell
Route 83	Vernon	1/31/2011	Former Clyde Chevrolet
136 Dudley Avenue	Wallingford	1/27/2011	Tri State Tires
1074 South Colony Rd	Wallingford	1/29/2011	Zandri's Stillwood Inn
121 North Main Street	Waterbury	2/2/2011	Former bowling alley (Sena's Lanes)
456 New Park Avenue	West Hartford	2/8/2011	Shell gas station
Island Lane	West Haven	1/27/2011	Commercial building
Unknown	Wethersfield	2/2/2011	Automotive center roof collapse; 10 cars damaged
50 Sage Park Road	Windsor	2/2/2011	Windsor High School (auditorium roof collapse)
1001 Day Hill Road	Windsor	2/7/2011	Mototown USA
27 Lawn Acre Road	Windsor Locks	2/7/2011	Long View RV

Note that the Marina on Candlewood Lake in New Fairfield is listed above as one of the structures damaged that winter.

In addition, winter storms present 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 and traffic jams during heavy snow and even light icing events. Roads may become impassable, inhibiting the ability of emergency equipment to reach trouble spots and accessibility to medical and shelter facilities. Stranded motorists, especially senior and/or handicapped citizens, are at particularly high risk of injury or death from exposure 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. When coupled with slippery road conditions, poor sight lines and heavy glare create dangerous driving conditions.

Icing causes difficult driving conditions throughout the hillier sections of New Fairfield. Town officials noted that there is an icing problem on Shortwoods Road near Pootatuck State Park. The largest problems occur on narrow, steeply sloped private roads. Drifting snow is not as large a problem in New Fairfield as in other communities, but it still occurs. This problem is mitigated through municipal plowing efforts. Ice jams are not a problem along the rivers in New Fairfield.

Recall from Figures 2-7 and 2-8 that the elderly and persons with disabilities reside in the Town. It is possible that several hundred of the population impacted by a severe winter storm could consist of the elderly and disabled. Thus, it is important for New Fairfield's emergency personnel to be prepared to assist these special populations during emergencies such as winter storms.

<u>Loss Estimates</u> – The *2014 Connecticut Natural Hazards Mitigation Plan Update* provides annual estimated losses on a countywide basis for several hazards. In this plan, the annual estimated loss in Fairfield County for severe winter storms in $0. This figure is influenced by the difficulty in separating typical winter storm costs from those associated with extreme events. Neighboring Litchfield County has an annualized damages estimate of $97,151. By comparing New Fairfield's 2010 population of 13,881 to Litchfield County's 2010 population of 189,927, we can estimate annualized damages for New Fairfield as $7,100.

<u>Summary</u> – The entire community is at relatively equal risk for experiencing damage from winter storms although some areas may be more susceptible. Many damages are relatively site specific and occur to private property (and therefore are paid for by private insurance) while repairs for power outages are often widespread and difficult to quantify to any one municipality. For municipal property, the budget for plowing and minor repairs is generally adequate to handle winter storm damage although the plowing budget is often depleted in severe winters. In particular, the heavy snowfalls associated with the winter of 2010-2011 stressed the local plowing budget and raised a high level of awareness of the danger that heavy snow poses to roofs as did the snow associated with Winter Storm Alfred in October 2011 and storm Nemo in February 2013.

6.6 Potential Mitigation Strategies and Actions

Potential mitigation measures for flooding caused by nor'easters include those appropriate for flooding. These were presented in Section 3.6. Specific steps that can be taken to prevent damage from downed tree limbs or utility lines associated with both high winds and loading from snow and ice as well as other hazards created by wind are covered in Section 4.6.

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 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 New

Fairfield 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 directly damaged by heavy snow, ice, and winter winds.

6.6.2 Property Protection

Property can be protected during winter storms through the use of structural measures such as shutters, storm doors, and storm windows. Heating coils may be used to remove snow from angled roofs. 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.

> ***FEMA has produced a Snow Load Safety Guidance Document available at https://www.fema.gov/media-library/assets/documents/83501. A copy is in Appendix F of this plan.***

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. This can occur in both older buildings as well as newer buildings constructed in compliance with the most recent building codes. The Town should develop plans to prioritize the removal of snow from critical facilities and other municipal buildings and have funding available for this purpose. Heating coils may also be used to melt or evaporate snow from publicly and privately owned flat roofs.

Since the previous HMP, Meeting House School on Gillotti Road has been renovated, and its capacity for withstanding snow loading has been upgraded.

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.

Traffic congestion and safe travel of people to and from work can be mitigated by the use of staggered timed releases from work, prestorm closing of schools, and later start times for companies. Many employers and school districts employ such practices. Communities should consider the use of such staggered openings and closings to mitigate congestion during and after severe weather events if traffic conditions warrant.

6.6.4 Emergency Services

Emergency services personnel should identify areas that 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 access for emergency personnel into neighborhoods.

The Town by default has plowing routes that prioritize access to and from most critical facilities as these facilities are almost all located along state roads. However, the Town should consider standardizing plowing routes that prioritize the remaining critical facilities and secondary access routes to shelters. Residents should be made aware of the plow routes in order to plan how to best access critical facilities, perhaps via posting of the general routes on the Town website. Such routes should also be posted in other municipal buildings such as the library and the post office. It is recognized that plowing critical facilities may not be a priority to all residents as people typically expect their own roads to be cleared as soon as possible.

New Fairfield officials have indicated interest in performing a Global Positioning System (GPS) study of their Town roads in order to maximize efficiency when determining plowing routes. They would also like to solicit state assistance with plowing State Routes 37 and 39, the primary state roads in the Town, in a timelier manner. Typically, the Town finds that it needs to have those roads plowed on its own.

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

6.6.5 Structural Projects

Structural projects for many aspects of winter storms are not possible. Projects can be designed to mitigate icing due to poor drainage and other factors as well as performing retrofits for flat-roofed buildings such as heating coils or insulating pipes. Other potential structural projects related to flooding and wind damage associated with winter storms were discussed in Sections 3.6 and 4.6, respectively.

One structural project that the Town has attempted to implement in the past is the construction and maintenance of a "snow fence" along Gillotti Road in order to reduce snow drifting at that site. The Public Works Department found it was not feasible to maintain this fence over the long term and ended the project.

6.7 Status of Mitigation Strategies and Actions

Previous strategies and actions for snow and ice are listed below with commentary regarding the status of each.

TABLE 6-3
Status of Previous Strategies and Actions

Project	Status
Prevention	
Increase tree limb maintenance and inspections, especially in the downtown areas.	*The action has been retired from the HMP. See Section 4.7.*
Continue to require that utilities be placed underground in new developments and pursue funding to place them underground in existing developed areas.	*New developments are required to place utilities underground, and that aspect of this action has been reclassified as a capability.* *Town officials hope to secure funding for burial of utilities in developed areas. That aspect is being carried forward into this HMP update. This action addresses all hazards and has been moved to Section 10.1.*
Continue to provide information on the dangers of cold-related hazards.	*Complete – This information is available through the Town website. This has been reclassified as a capability.*
Review and post evacuation plans to ensure timely migration of people seeking shelter in all areas of New Fairfield.	*This is an ongoing effort. Officials feel it is important to have flexible evacuation routes to adapt to road blockages from downed trees, flooding, etc. during an event. Currently, the First Selectman drives the evacuation routes after an event to determine the best passable route. A new strategy that addresses this action is listed below this table.*
Post a list of Town sheltering facilities 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.	*This has been reclassified as a capability.*
Prioritize plowing routes and post the snow plowing prioritization in Town buildings each winter to increase public awareness.	*A new strategy that addresses this action is listed below this table.*

A new strategy has been identified through the process of updating this Plan:

- ❑ Evaluate the cost effectiveness of performing a GPS study of roads in order to prioritize plowing routes, increase efficiency and efficacy of plowing efforts, and help plan evacuation routes.

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

7.0 EARTHQUAKES

7.1 Setting

The entire Town 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 may possibly occur but that may cause significant effects to a large area of the Town.

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 telephone 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 are 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 that have a common calibration. The magnitude of an earthquake is thus represented by a single, instrumentally determined value recorded by a seismograph, which records the varying amplitude of ground oscillations.

The following is a 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. Rails bent.
XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII. Damage total. Lines of sight and level are destroyed. Objects thrown in the air.

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 microearthquakes 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.

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 intraplate 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, nonreinforced masonry that is not seismically designed. Those who live or work in nonreinforced 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 1668 and 2007. 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 are 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 Timiskarning, 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 1953, causing shaking but no damage.
- On November 3, 1968, another Intensity V earthquake in southern Connecticut caused minor damage in Madison and Chester.
- Earthquake activity was 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.
- On March 11, 2008, a 2.0 magnitude earthquake with its epicenter 3 miles northwest of the center of Chester occurred.
- A magnitude 5.0 earthquake struck at the Ontario-Quebec border region of Canada on June 23, 2010. This earthquake did not cause damage in Connecticut but was felt by residents in Hartford and New Haven counties.
- A magnitude 3.9 earthquake occurred 117 miles southeast of Bridgeport, Connecticut on the morning of November 30, 2010. The quake did not cause damage in Connecticut but was felt by residents along Long Island Sound.
- An earthquake with a magnitude 2.1 was recorded near southeastern Connecticut on November 29, 2013. The earthquake did not cause damage but was felt by residents from Montville to Mystic.
- A magnitude 2.7 quake occurred beneath the town of Deep River on August 14, 2014.
- A series of quakes hit Plainfield, Connecticut on January 8, 9, and 12, 2015. These events registered magnitudes of 2.0, 0.4, and 3.1, respectively. Residents in the Moosup section of Plainfield reported minor damage such as the tipping of shelves and fallen light fixtures.

A magnitude 5.8 earthquake occurred 38 miles from Richmond, Virginia on August 23, 2011. The quake was felt from Georgia to Maine and reportedly as far west as Chicago. Many residents of Connecticut experienced the swaying and shaking of buildings and furniture during the earthquake although widespread damage was constrained to an area from central Virginia to southern Maryland. According to Cornell University, the August 23 quake was the largest event to occur in the east central United States since instrumental recordings have been available to seismologists.

7.4 Existing Capabilities

The Connecticut Building Codes include design criteria for buildings specific to each municipality as adopted by the Building Officials and Code Administrators (BOCA). These include the seismic coefficients for building design in the Town. The Town has adopted these codes for new construction, and they are enforced by the Town Building Official.

Due to the infrequent nature of damaging earthquakes, land use policies in New Fairfield do not directly address earthquake hazards. However, the Subdivision Regulations of the Town (Section

3.02) prohibit development on slopes greater than 25 percent. The Town reserves the right to impose more stringent regulations on a site to maintain the stability of the bank under the proposed conditions.

Summary

In summary, New Fairfield's capabilities to mitigate for hazards have remained strong since adoption of the initial HMP. Town policy continues to require adherence to Connecticut Building Codes and to prohibit development on especially steep slopes.

7.5 Vulnerabilities and Risk Assessment

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 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.

***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 and especially in finer textured soils.**

As explained in Section 2.3, several areas in the Town are underlain by sand and gravel, including the commercial Town center. Figure 2-4 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 new construction. However, many of these areas occur in floodplains associated with the various streams and rivers in New Fairfield, so they are already regulated. The areas that are not at increased risk during an earthquake due to unstable soils are the areas in Figure 2-4 underlain 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 and 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 9.0.

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 percent chance that at some point in a 50-year period an earthquake would cause peak acceleration (ground shaking) values of 4 percent to 8 percent 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 percent 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 percent of gravity. Reports of "some chimneys broken" correspond to an intensity of about VII, or about 10 percent to 20 percent of gravity. According to the USGS National Seismic Hazard Mapping Project (2009), an earthquake impacting the Town has a 2 percent chance of exceeding a peak acceleration of 10 to 12 percent of the force of gravity in a 50-year period.

The <u>AEL</u> 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 nonexistent for a particular year.

According to the FEMA *HAZUS-MH* 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.

According to the *2014 Connecticut Natural Hazard Mitigation Plan Update*, Connecticut is at a low to moderate risk for experiencing an earthquake of a magnitude greater than 3.5 and at a moderate risk of experiencing an earthquake of a magnitude less than 3.0 in the future. No earthquake with a magnitude greater than 3.5 has occurred in Connecticut within the last 30 years, and the USGS currently ranks Connecticut 43rd out of the 50 states for overall earthquake activity.

A series of earthquake probability maps were generated using the 2009 interactive web-based mapping tools hosted by the USGS. These maps were used to determine the probability of an earthquake of greater than magnitude 5.0 or greater than magnitude 6.0 damaging the Town. Results are presented in Table 7-1 below.

TABLE 7-1
Probability of a Damaging Earthquake in the Vicinity of New Fairfield

Time Frame (Years)	Probability of the Occurrence of an Earthquake Event > Magnitude 5.0	Probability of the Occurrence of an Earthquake Event > Magnitude 6.0
50	2% to 3%	< 1%
100	4% to 6%	< 1%
250	10% to 12%	2% to 3%
350	12% to 15%	3% to 4%

Based on the historic record and the probability maps generated from the USGS database, the state of Connecticut has areas of seismic activity. It is likely that Connecticut will continue to experience minor earthquakes (magnitude less than 3.0) in the future. While the risk of an earthquake affecting New Fairfield is relatively low over the short term, long-term probabilities suggest that a damaging earthquake (magnitude greater than 5.0) could occur within the vicinity of New Fairfield.

Because a damaging earthquake would likely affect a large area beyond New Fairfield, it is likely that the community may not be able to receive regional aid for a few days. It is important for municipal facilities and departments to have adequate backup plans and backup supplies to ensure that restoration activities may begin and continue until outside assistance can be provided.

HAZUS-MH Simulations and Loss Estimates

The *2014 Connecticut Natural Hazard Mitigation Plan Update* created four "maximum plausible" earthquake scenarios (three historical, one potential) within *HAZUS-MH* to generate potential earthquake risk to the state of Connecticut. The same four scenarios were simulated within *HAZUS-MH* to generate potential damages in the Town from those events using the default year 2000 building inventories and census data. The four events are as follows:

- ❑ Magnitude 5.7, epicenter in Portland, Connecticut, based on historic event
- ❑ Magnitude 5.7, epicenter in Haddam, Connecticut, based on historic event
- ❑ Magnitude 6.4, epicenter in East Haddam, Connecticut, based on historic event
- ❑ Magnitude 5.7, epicenter in Stamford, Connecticut, magnitude based on USGS probability mapping

The results for each *HAZUS-MH* earthquake simulation are presented in Appendix D. These results are conservatively high and considered appropriate for planning purposes for the Town. The range of potential impacts from any earthquake scenario is very large, ranging from minor impacts to the maximum possible impacts generated by *HAZUS-MH*. Note that potentially greater impacts could also occur.

Table 7-2 presents the number of residential buildings damaged by the various earthquake scenarios while Table 7-3 presents the total number of buildings damaged by each earthquake scenario. A significant percentage of building damage is to single-family residential buildings while other building types include agriculture, commercial, education, government, industrial, other residential, and religious buildings. The exact definition of each damage state varies based on building construction. See Chapter 5 of the *HAZUS-MH Earthquake Model Technical Manual* for the definitions of building damage states based on building construction.

TABLE 7-2
***HAZUS-MH* Earthquake Scenarios – Number of Residential Buildings Damaged**

Epicenter Location - Magnitude	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage	Total
Haddam – 5.7	1	0	0	0	1
Portland – 5.7	53	8	1	0	62
Stamford – 5.7	293	51	5	1	350
East Haddam – 6.4	244	40	4	1	289

TABLE 7-3
***HAZUS-MH* Earthquake Scenarios – Total Number of Buildings Damaged**

Epicenter Location - Magnitude	Slight Damage	Moderate Damage	Extensive Damage	Complete Damage	Total
Haddam – 5.7	2	0	0	0	2
Portland – 5.7	67	12	1	0	80
Stamford – 5.7	339	70	9	1	419
East Haddam – 6.4	290	60	7	1	358

The *HAZUS* simulations consider a subset of critical facilities termed "essential facilities," which are important during emergency situations. As shown in Table 7-4, minimal damage to essential facilities is expected for each earthquake scenario.

TABLE 7-4
***HAZUS-MH* Earthquake Scenarios – Essential Facility Damage**

Epicenter Location - Magnitude	Fire Stations (1)	Police Stations (1)	Schools (5)
Haddam – 5.7	None or Minor	None or Minor	None or Minor
Portland – 5.7	None or Minor	None or Minor	None or Minor
Stamford – 5.7	None or Minor	None or Minor	None or Minor
East Haddam – 6.4	None or Minor	None or Minor	None or Minor

Table 7-5 presents potential damage to utilities and infrastructure based on the various earthquake scenarios. The transportation network includes four major bridges and one important highway segment in the Town. Utilities include potable water, wastewater, natural gas, and electrical lines. Very little damage is expected to utilities and infrastructure as a result of the four earthquake scenarios, and no resultant fires or fire damage is expected.

TABLE 7-5
***HAZUS-MH* Earthquake Scenarios – Utility, Infrastructure, and Fire Damage**

Epicenter Location - Magnitude	Transportation Network	Utilities	Fire Damage
Haddam – 5.7	None or Minor	None or Minor	Zero ignitions, no damage
Portland – 5.7	None or Minor	None or Minor	Zero ignitions, no damage
Stamford – 5.7	None or Minor	One leak in potable water system, remaining systems have none or minor damage. Total damage: Approximately $5,000	Zero ignitions, no damage
East Haddam – 6.4	None or Minor	One leak in potable water system, one leak in wastewater system, remaining systems have none or minor damage. Total damage: Approximately $15,000	Zero ignitions, no damage

Table 7-6 presents the estimated tonnage of debris that would be generated by earthquake damage during each *HAZUS-MH* scenario. As shown in Table 7-6, up to 1,000 tons of debris are expected for the strongest and closest scenarios to the Town, with the majority of the debris from brick and wood. None of the generated debris is tree related.

TABLE 7-6
***HAZUS-MH* Earthquake Scenarios – Debris Generation (Tons)**

Epicenter Location - Magnitude	Brick/Wood	Reinforced Concrete/Steel	Tree Debris	Total	Estimated Cleanup Truckloads (25 Tons/Truck)
Haddam – 5.7	Minimal	Minimal	None	Minimal	0
Portland – 5.7	Minimal	Minimal	None	Minimal	0
Stamford – 5.7	730	270	None	1,000	40
East Haddam – 6.4	710	290	None	1,000	40

Table 7-7 presents the potential sheltering requirements based on the various earthquake events simulated by *HAZUS-MH*. The predicted sheltering requirements for earthquake damage are relatively minimal even for the stronger events and can be addressed through the use of the existing shelter facilities. However, it is possible that an earthquake could also produce a wildfire or a dam failure that could increase the overall sheltering need in the Town.

TABLE 7-7
***HAZUS-MH* Earthquake Scenarios – Shelter Requirements**

Epicenter Location - Magnitude	Number of Displaced Households	Short-Term Sheltering Need (Number of People)
Haddam – 5.7	0	0
Portland – 5.7	0	0
Stamford – 5.7	0 to 2	0
East Haddam – 6.4	0 to 2	0

Table 7-8 presents the casualty estimates generated by *HAZUS-MH* for the various earthquake scenarios. Casualties are broken down into four severity levels describing the extent of injuries:

- ❑ Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- ❑ Severity Level 2: Injuries will require hospitalization but are not considered life threatening.
- ❑ Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- ❑ Severity Level 4: Victims are killed by the earthquake.

TABLE 7-8
***HAZUS-MH* Earthquake Scenarios – Casualty Estimates**

Epicenter Location - Magnitude	2 AM Earthquake	2 PM Earthquake	5 PM Earthquake
Haddam – 5.7	None	None	None
Portland – 5.7	None	None	None
Stamford – 5.7	1 Level 1	1 Level 1	1 Level 1
East Haddam – 6.4	1 Level 1	1 Level 1	1 Level 1

Minimal casualties are expected due to earthquake damage in the Town for the four earthquake scenarios, and each is due to an injury in a single-family home. The casualty categories include commuters, educational, hotels, industrial, other-residential, and single-family residential and are accounted for during the night, in the early afternoon, and during the afternoon rush-hour.

Table 7-9 presents the total estimated losses and direct economic impact that may result from the four earthquake scenarios created for the Town as estimated by the *HAZUS-MH* software. Capital damage loss estimates include the subcategories of building, contents, and inventory damages. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building or its contents. Business interruption loss estimates include the subcategories of lost income, relocation expenses, and lost wages. The business interruption losses are associated with the inability to operate a business due to the damage sustained.

TABLE 7-9
***HAZUS-MH* Estimated Direct Losses from Earthquake Scenarios (x 1,000 dollars)**

Epicenter Location - Magnitude	Estimated Total Capital Losses	Estimated Total Income Losses	Estimated Total Losses
Haddam – 5.7	20	0	20
Portland – 5.7	950	190	1,140
Stamford – 5.7	8,830	990	9,820
East Haddam – 6.4	5,300	910	6,210

Despite the low probability of occurrence, earthquake damage presents a very real hazard to the Town. However, it is very unlikely that the Town would be at the epicenter of such a damaging earthquake.

7.6 Potential Mitigation Strategies and Actions

As earthquakes are difficult to predict and can affect the entire Town, potential mitigation can only include adherence to building codes, education of residents, and adequate planning.

Requiring adherence to current state building codes for new development and redevelopment is necessary to minimize the potential risk of earthquake damage. Communities may consider preventing new residential development in areas that are most at risk to collapse or liquefaction. Many Connecticut communities already have regulations restricting development on steep slopes. Additional regulations could be enacted to buffer development a certain distance from the bottom of steep slopes or to prohibit development on fill materials and areas of fine sand and clay. The State Geologist indicates that such deposits have the highest risk for seismic wave amplification. Other regulations could specify a minimum level of compaction for filled areas before it is approvable for development.

Departments providing emergency services should have backup plans and adequate backup facilities such as portable generators in place in case earthquake damage occurs to critical facilities, particularly public water and the wastewater treatment facilities. The Public Works Department should also have adequate backup plans and facilities to ensure that roads can be opened as soon as possible after a major earthquake.

The fact that damaging earthquakes are rare occurrences in Connecticut heightens the need to educate the public about this potential hazard. An annual pamphlet outlining steps each family can take to be prepared for disaster is recommended. Also, because earthquakes generally provide little or no warning time, municipal personnel and students should be instructed on what to do during an earthquake in a manner similar to fire drills.

Critical facilities may be retrofitted to reduce potential damage from seismic events. Potential mitigation activities may include bracing of critical equipment such as generators, identifying and hardening critical lifeline systems (such as water and sewer lines), utilizing flexible piping where possible, and installing shutoff valves and emergency connector hoses where water mains cross fault lines. Potential seismic mitigation measures for all buildings include strengthening and retrofitting nonreinforced masonry buildings and nonductile concrete facilities that are particularly vulnerable to ground shaking, retrofitting building veneers to prevent failure, installing window films to prevent injuries from shattered glass, anchoring rooftop-mounted equipment, and reinforcing masonry chimneys with steel bracing.

7.7 Status of Mitigation Strategies and Actions

The prior mitigation strategies associated with earthquakes are listed below with commentary regarding the status of each.

TABLE 7-10
Status of Previous Strategies and Actions

Strategy or Action	Status
Prevent new residential development in areas prone to collapse or liquefaction.	*Subdivision Regulations of the Town (Section 3.02) prohibit development on slopes greater than 25 percent. All new construction must submit an engineering plan to the Town Building Official, who feels that is sufficient to prevent construction in dangerous areas. This action has been reclassified as a capability.*
Require adherence to the state building codes.	*This has been reclassified as a capability.*
Ensure that municipal departments have adequate backup facilities such as portable generators in case earthquake damage occurs to critical facilities.	*The Volunteer Fire Department, Senior Center, and Police Station all have anchored generators. There are two portable generators stationed at the High School.* *The Town is interested in acquiring three more portable generators to be stored at the Town Hall, the Drop-Off Center, and the library. This action addresses all hazards and has been moved to Section 10.1.*

One new strategy has been identified through the update process:

- Regulate development on and near slopes to prohibit development of slopes greater than 25 percent.

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 and often 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 18 registered dams and potentially several other minor dams in the Town, dam failure can occur almost anywhere in New Fairfield. While flooding from a dam failure generally has a medium geographic extent, the effects are potentially catastrophic. Fortunately, a major dam failure is not considered a definite natural hazard event in any given year (Appended Table 2).

8.2 Hazard Assessment

The Connecticut DEEP 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 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 18 DEEP-registered dams within the Town, of which nine were Class A, two were Class BB, one was Class B, and six were undefined. The list of statewide Class B and C dams was updated by the DEEP in 2007 and again in 2013. Dams in New Fairfield are listed in Table 8-1, and dam locations are illustrated in Figure 8.1.

TABLE 8-1
Dams Registered with the DEEP in the Town of New Fairfield

Number	Name	Class
9101	Forest Lake Dam	BB[1]
9102	Oneill/Merten's Mill-Pond Dam	BB
9103	Rodgers Pond Dam	BB
9104	Feldman Pond Dam	A
9105	Weiner Pond Dam	---
9106	Squantz Pond Dam	---
9107	Ball Pond Dam	A
9108	Gillotti Pond Dam	A
9109	Manlapaz Pond Dam	A
9110	Disbrow Pond Dam	A
9111	Fox Pond Dam	---
9112	Saw Mill Road Pond Dam	A
9113	Narrow Pond Dam	A
9114	Hermansen Dam	A
9115	Gerow Brook Pond Dam	A
9116	Green Mill Pond Dam	---
9117	Quaker Pond Dam	---
9119	Margerie Lake North Dam	C[2]

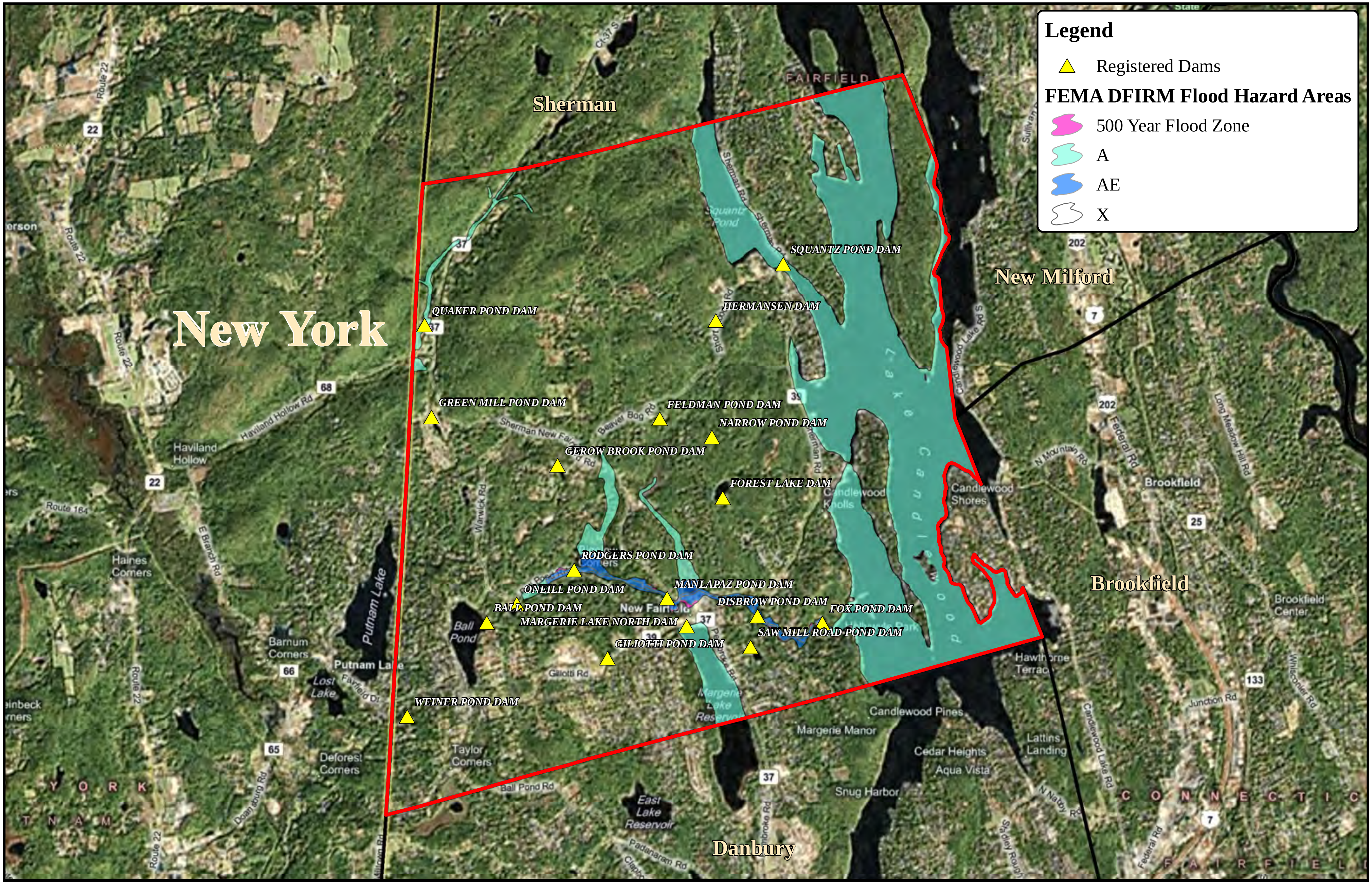
[1]Listed as a Class B dam in 1996, not included in the 2007 DEEP updated list, assigned Class BB in the 2013 update.
[2]Undefined in 1996, Class C in 2013 updated list.

There is one Class C (high hazard) dam, the Margerie North Pond Dam, in the Town. This dam is one of two containing Margerie Reservoir and is located immediately upstream of the New Fairfield Town center. Margerie Reservoir is a public water supply owned by the City of Danbury. Failure of a Class C dam is expected to result in major property, roadway, and economic damage as well as loss of life.

Importantly, this dam was not discussed in detail in the previous HMP because it was not assigned a hazard class until 2013. The dam was last inspected in 2012 and was overdue for another as of January 7, 2014. It is not known whether a dam failure analysis has been performed for the Margerie North Pond Dam.

Failure of a Class B (significant hazard) dam has a minor potential for loss of life but could cause significant property damage while failure of a Class BB (moderate hazard) dam is expected to cause minor property damage but no loss of life. Forest Lake Dam was registered as a Class B dam in 1996, was not included in the 2007 DEEP list of Class B and C dams, and was registered as a Class BB dam in the 2013 DEEP list of Class B and C dams. It is currently not considered to be a significant hazard.

Most of the eastern border of New Fairfield is formed by Candlewood Lake, which is impounded by a series of Class C dams and dikes in New Milford and Danbury. A failure of one or all of these dams would cause severe flooding in New Milford and Danbury, but property and infrastructure damage related to such a failure would be minimal in New Fairfield.



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Natural Hazard Pre-Disaster Mitigation Plan
Town of New Fairfield, Connecticut

Location: **New Fairfield, CT**

MMI#: 2534-09
MXD: H:\Fig8-1_Dams.mxd
Source: CT DEP, FEMA, Microsoft Virtual Earth

N

Dams Registered with the DEP

Map By: JBH
Date: October, 2010
Scale: 1" = 6,000'

Sheet: **Figure 8-1**

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 is a listing of some of the more catastrophic dam failures in Connecticut's recent history:

- 1938 and 1955: Exact numbers of dam failures caused by these floods are unavailable, but the Connecticut DEEP believes that more dams were damaged in these events than in the 1982 or 2005 flooding events.
- 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.
- 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, and the Connecticut DEEP 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	DEEP
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	City of Meriden
-----	ABB Pond Dam	Bloomfield	--	Minor Damage	Private
4905	Springborn Dam	Enfield	BB	Minor Damage	DEEP
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	DEEP

A significant dam failure occurred in neighboring Sherman due to the April 2007 storm. Floodwaters at Rogers Pond Dam (Class BB) overtopped the spillway and caused a full failure that drained the pond. Part of the earthen embankment failed, and the floodwaters cut a breach 30 feet wide and 15 feet deep. The dam was originally constructed in 1945. According to the Association of State Dam Safety Officials, dams in the Connecticut towns of Bethany and Waterford also experienced failures due to the April 2007 flood.

The Association of State Dam Safety Officials states that dam failures have been documented in every state. From January 1, 2005 through January 1, 2009, state dam safety programs reported 132 dam failures and 434 incidents requiring intervention to prevent failure.

8.4 Existing Capabilities

The dam safety statutes are codified in Sections 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 DEEP according to Connecticut Public Act 83-38.

> ***Dams regulated by the DEEP must be designed to pass the 100-year rainfall event with 1 foot of freeboard, a factor of safety against overtopping.***
>
> ***Significant and high hazard dams are required to meet a design standard greater than the 100-year rainfall event.***

Dam Inspection Regulations require that nearly 700 dams in Connecticut be inspected annually. The DEEP currently prioritizes inspections of those dams that 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 DEEP 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 DEEP Commissioner is empowered by statute to remove or correct, at the expense of the owner, any unsafe structures that present a clear and present danger to public safety.

Owners of Class C dams have traditionally been required to maintain Emergency Operation Plans (EOPs). Guidelines for dam EOPs were published by DEEP in 2012, creating a uniform approach for development of EOPs. As dam owners develop EOPs using the new guidance, DEEP anticipates that the quality of EOPs will improve, which will ultimately help reduce vulnerabilities to dam failures.

Important dam safety program changes have recently occurred in Connecticut. Public Act No. 13-197, *An Act Concerning the Dam Safety Program and Mosquito Control*, passed in June 2013 and describes new requirements for dams related to registration, maintenance, and EOPs, which will be called emergency action plans (EAPs) moving forward. This Act requires owners of certain unregistered dams or similar structures to register them by October 1, 2015. The Act generally shifts regularly scheduled inspection and reporting requirements from the DEEP to the owners of dams. The Act also makes owners generally responsible for supervising and inspecting construction work and establishes new reporting requirements for owners when the work is completed.

Effective October 1, 2013, the owner of any high or significant hazard dam (Class B and C) must develop and implement an EAP after the Commissioner of DEEP adopts regulations. The EAP shall be updated every 2 years, and copies shall be filed with DEEP and the chief executive officer of any municipality that would potentially be affected in the event of an emergency. New regulations shall establish the requirements for such EAPs, including but not limited to (1) criteria and standards for inundation studies and inundation zone mapping; (2) procedures for monitoring the dam or structure during periods of heavy rainfall and runoff, including personnel assignments and features of the dam to be inspected at given intervals during such periods; and (3) a formal notification system to alert appropriate local officials who are responsible for the warning and evacuation of residents in the inundation zone in the event of an emergency.

At the time this HMP Update is being written, the City of Danbury, the owner of the Class C Margerie North Pond Dam (the only significant hazard dam in New Fairfield), has prepared a draft EAP. Danbury anticipates that the EAP will be final within the time frame of the approval of the New Fairfield HMP.

The Connecticut DEEP also administers the Flood and Erosion Control Board program, which can provide noncompetitive state funding for repair of municipality-owned dams. Funding is limited by the State Bond Commission. State statute Section 25-84 allows municipalities to form Flood and Erosion Control Boards, but municipalities must take action to create the board within the context of the local government such as by revising the municipal charter. More information regarding the Flood and Erosion Control Board program can be found at http://www.ct.gov/dep/lib/dep/water_inland/flood_mgmt/fecb_program.pdf.

The Town has recently established a Flood and Erosion Control Board that is focused specifically on flood and erosion hazards associated with the Margerie Reservoir.

Summary

Programs enacted in New Fairfield to mitigation dam failure include participation in the Statewide Dam Safety Program, staying up to date on the evolution of any EAPs and Dam Failure Analyses for high hazard dams in Town, making copies of those documents available at the Town Hall for public viewing, and including dam failure areas into the AlertNOW emergency notification system.

The Town's capabilities to mitigate for dam failure and prevent loss of life and property have increased since the initial HMP was adopted, mainly as a result of recent statewide legislative actions described above. In the next few years, dam safety programs will continue to strengthen. However, the reclassification of the Margerie North Pond Dam reflects a significant hazard that must be addressed moving forward.

Other improvements to dam-failure mitigation capabilities arise from improvement in flood mitigation, described in section 3. The establishment of a Flood and Erosion Control Board and participation in that DEEP program is an important aspect of this capability.

8.5 Vulnerabilities and Risk Assessment

By definition, failure of Class B and C dams may cause catastrophic loss of life and property and therefore would have the highest impact on the residents and infrastructure of the Town. However, the failure of any of the 17 other dams in Town could also have impacts within the Town. The impacts related to the larger and higher-hazard dams in Town, namely the Margerie Reservoir North Dam, are described below. This description is based on information available at the Connecticut DEEP.

- Forest Lake Dam – This wetland pond dam is owned by Bruce Oberfest of Chappaqua, New York and located east of Short Woods Road in eastern New Fairfield. It was listed as a Hazard Class B dam in 1996 and in DEEP correspondence in 2004 but was listed as Class BB in the 2013 high hazard dam list compiled by the DEEP. DEEP correspondence from 2004 expresses concern about seepage between the original dam and a modified cap placed over the dam after construction. The dam controls flow from Pierce Lake.

- Margerie Reservoir is the main storage reservoir within the City of Danbury's Padanaram Brook Watershed public water supply. The watershed occupies much of western and northwestern Danbury and extends into the Town of New Fairfield. Margerie Reservoir was developed in 1935 and became operational in 1937. The reservoir has a dam at its southern end and a dike at its northern end. According to the National Program for Inspection of Non-Federal Dams, the dike is an earthfill embankment about 1,104 feet long with a maximum height of about 16 feet. The dike appeared to be in good condition at the time of the National Program inspection in 1978, and a toe drain at the dike appeared to be functioning as intended. The reservoir spillway is located at the main dam. A spillway is not present at the dike.

  When the dam and dike for Margerie Reservoir were reconstructed several years ago, provisions were made to allow for the eventual raising of Margerie Reservoir by 3 feet to provide additional storage for diversions from adjacent watersheds. Specifically, the Margerie Reservoir dam and dike were constructed sufficiently wide to allow raising but were not constructed to the full height. A failure of the Margerie Reservoir dike would cause flooding of the New Fairfield Town center, potentially damaging the Town Hall (one of the Town's critical facilities) and rendering the busy intersection of Routes 37 and 39 completely impassable. The flood wave would follow Ball Pond Brook to Candlewood Lake.

  The Town has recently established a Flood and Erosion Control Board that is specifically focused on hazards from Margerie Reservoir. This Board may be able to assist with mitigation of potential dam failure.

While the failure of any of the Candlewood Lake dams and dikes (including the Squantz Pond Dam) would not have a direct impact on the Town, residents bordering the lake and those who have boats moored at the lake would be indirectly affected. Any failure would cause the lake level to lower, and a complete failure could cause the entire lake to drain. A rapid drawdown could cause damage to boats as they come to rest on the bed of the lake, and if the dams were not restored, the failure would negatively impact individual property values. Failure of the Squantz Pond causeway would isolate the Bogus Hill neighborhood, restricting access to these residences to Route 33 from Sherman to the north.

Loss Estimates

As described above, the only dam failure that would cause significant damage to New Fairfield is that of the Margerie Reservoir dike south of the Town Center. For the purposes of estimating losses with failure of that dam, it is assumed that the extent of flooding downstream of the dam would be similar to that caused by a 0.2-percent annual-chance flood event.

Approximately $25.1 million in residential, commercial, industrial, and municipal structures are located within the estimated dam-failure inundation zone, which includes the area directly below the Margerie Reservoir dam and the 0.2-percent-annual-chance floodplain of Ball Pond Brook downstream of the Margerie Reservoir Dam. Given the expectation that water would be flowing with significant velocity following a dam failure, the inundation of roads and infrastructure not accounted for in the assessed property values, and the additional economic costs of flooding in the downtown area, this figure is a reasonable estimate of economic loss due to a dam failure. Note that *HAZUS-MH* calculations for the predicted economic losses due to the 100-year flood event produce an estimate of $5.58 million.

Given the lack of historic dam failures in New Fairfield, we can assume that a storm capable of breaching the Margerie Reservoir Dike has a very low annual chance of occurring, perhaps a 0.1 percent annual chance. Using a conservative estimate, we can calculate annualized damages due to dam failure at $25,100.

The 2014 Connecticut Natural Hazard Mitigation Plan reports $64,144,116 in damage from 38 dam failures statewide since 1877. This gives a statewide annualized damage due to dam failure of $461,468. By comparing the population of New Fairfield to the population of Connecticut, we can estimate from this data an annualized damage figure of $1,792.24 in New Fairfield. Given the infrequency of dam failures in New Fairfield, this may be more reasonable than the above estimate. Nevertheless, for planning purposes, and because of the high concentration of valuable assets downstream of the Margerie Reservoir Dam, it is advisable to use the more conservative estimate.

8.6 Potential Mitigation Strategies and Actions

The Town should work with private property owners, the City of Danbury, and the Connecticut DEEP to stay up to date on the evolution of any EAPs and Dam Failure Analyses for the significant hazard dams in New Fairfield should any be produced. The Town's Office of Emergency Management should possess copies of all existing EAPs and Dam Failure Analyses for dams in New Fairfield. If possible, copies of these documents should be made available at the Town Hall for reference and public viewing.

FEMA and the Association of Dam Safety Officials have a variety of resources available for dam owners. More information can be found at http://www.fema.gov and http://www.damsafety.org/resources/downloads/

The Town should maximize its emergency preparedness for a potential dam failure. The Town should also consider coordinating occasional inspections of Class A, AA, BB, and unranked dams with the assistance of private property owners and informing dam owners of resources available to them through various governmental agencies.

The Town should consider including future dam failure areas into the AlertNow emergency notification system. This system combines database and GIS mapping technologies to deliver outbound emergency notifications to geographic areas or specific groups of people such as emergency responder teams at a rate of up to 60,000 calls per hour. This technology should be used to warn downstream residents of an impending dam failure and facilitate evacuation. In addition, residences within and/or near mapped 100-year floodplains (located downstream of Class BB or Class B dams) could be used to delineate potential dam failure areas.

Finally, the Town should actively coordinate with the City of Danbury to receive a copy of its Dam Failure Analysis and EAP for the Margerie North Pond Dam and should make those reports available for reference and public viewing at the Town Hall.

8.7 Status of Mitigation Strategies and Actions

The prior mitigation strategies associated with dam failure are listed below with commentary regarding the status of each.

TABLE 8-3
Status of Previous Strategies and Actions

Project	Status
Prevention	
Stay up to date on the evolution of any EOP/EAPs and Dam Failure Analyses for significant hazard dams should any be produced.	*This is part of the Town's standard operating procedure and has been reclassified as a capability.*
Make copies of EOP/EAP documents available at the Town Hall for reference and public viewing.	*This cannot be considered complete until the Margerie North Pond Dam EAP is completed by the City of Danbury and a copy is placed at Town Hall.* *This action is carried forward.*
Coordinate inspections of Class A, AA, BB, and unranked dams with the assistance of property owners.	*Connecticut State Historic Preservation Office contractors inspected the lower class dams in Town and provided preliminary information that can be used to ascertain the integrity of the dams; however, the Town does not have the capability to inspect them all.* *This action is dropped.*
Include future dam failure areas into the AlertNow emergency notification system.	*This action has been completed and is reclassified as a capability.* *AlertNow has been replaced by Blackboard.*
Establish a Flood and Erosion Control Board to oversee private dam maintenance and problems with flooding and erosion.	*A Flood and Erosion Control Board was established in 2015. This board is specific to the Margerie Reservoir.*

Additional strategies were identified while updating this Plan:

- ❑ Include potential dam failure areas into the AlertNow emergency notification system.
- ❑ Actively coordinate with the City of Danbury to ensure that New Fairfield receives a copy of the Dam Failure Analysis and EAP for the Margerie North Pond Dam.

There are several suggested potential mitigation strategies that are applicable to all hazards in this Plan. These are outlined in the Section 10.1.

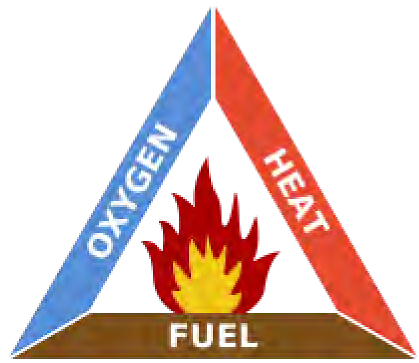
9.0 WILDFIRES

9.1 Setting

The ensuing discussion about wildfires is focused on the undeveloped wooded and shrub/grassland areas of New Fairfield, along with the wildland interface, which is a low-density suburban type development found at the margins of these wooded areas. Structural fires in higher density areas of the Town are not considered.

9.2 Hazard Assessment

Wildfires are any nonstructure fire, other than a prescribed burn, that occurs in undeveloped areas. They are considered to be 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." According to the U.S. Bureau of Land Management, each of three elements (known as the fire triangle) must be present in order to have any type of fire:



The Fire Triangle. Public Domain Image Hosted by Wikimedia Commons.

- ❑ Fuel – Without fuel, a fire will stop. Fuel can be removed naturally (when the fire has consumed all burnable fuel) or manually by mechanically or chemically removing fuel from the fire. Fuel separation is important in wildfire suppression and is the basis for controlling prescribed burns and suppressing other wildfires. The type of fuel present in an area can help determine overall susceptibility to wildfires. According to the Forest Encyclopedia Network, four types of fuel are present in wildfires:
  - Ground Fuels, consisting of organic soils, forest floor duff, stumps, dead roots, and buried fuels
  - Surface Fuels, consisting of the litter layer, downed woody materials, and dead and live plants to 2 meters in height
  - Ladder Fuels, consisting of vine and draped foliage fuels
  - Canopy Fuels, consisting of tree crowns
- ❑ Heat – Without sufficient heat, a fire cannot begin or continue. Heat can be removed through the application of a substance, such as water, powder, or certain gases, that reduces the amount of heat available to the fire. Scraping embers from a burning structure also removes the heat source.
- ❑ Oxygen – Without oxygen, a fire cannot begin or continue. In most wildland fires, this is commonly the most abundant element of the fire triangle and is therefore not a major factor in suppressing wildfires.

Nationwide, humans have caused approximately 90 percent of all wildfires in the last decade. Accidental and negligent acts include unattended campfires, sparks, burning debris, and irresponsibly discarded cigarettes. The remaining 10 percent of fires are caused primarily by lightning. According to the USGS, wildfires can increase the potential for flooding, debris flows, or landslides; increase pollutants in the air; temporarily destroy timber, foliage, habitats, scenic vistas, and watershed areas; and have long-term impacts such as reduced access to recreational areas, destruction of community infrastructure, and reduction of cultural and economic resources.

Nevertheless, wildfires are also a natural process, and widespread suppression of wildfires is now recognized as having increased fire hazards as both live and dead vegetation (fuel) 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 firefighting 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 firefighting 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 DEEP Forestry Division, much of Connecticut was deforested by settlers and turned into farmland during the colonial period. A variety of factors in the 19th century caused the decline of farming in the state, and forests reclaimed abandoned farm fields. In the early 20th century, deforestation again occurred in Connecticut, this time for raw materials needed to ship goods throughout the world. Following this deforestation, shipping industries in Connecticut began to look to other states for raw materials, and the deciduous forests of today began to grow in the state.

During the early 20th century, wildfires regularly burned throughout Connecticut. Many of these fires began accidentally by sparks from railroads and industry while others were deliberately set to clear underbrush in the forest and provide pasture for livestock. A total of 15,000 to 100,000 acres of land were burned annually during this period. This destruction of resources led to the creation of the position of the State Forest Fire Warden and led to a variety of improved coordination measures.

According to the Connecticut Natural Hazards Mitigation Plan (2007), Connecticut enacted its first statewide 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 1940s 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 DEEP, 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 firefighting command capabilities.

According to the USDA Forest Service Annual Wildfire Summary Report for 1994 through 2003, an average of 600 acres per year in Connecticut were burned by wildfires. The National Interagency Fire Center (NIFC) reports that a total of 3,448 acres of land burned in Connecticut from 2002 through 2012 due to 2,334 nonprescribed wildfires, an average of 1.5 acres per fire and 313 acres per year (Table 10-1). The Connecticut DEEP Forestry Division estimates that wildland fires burn approximately 1,300 acres per year.

The *2014 Connecticut Natural Hazards Mitigation Plan Update* states that in seven of the eight counties in Connecticut the primary cause of wildland fires is unknown. The secondary cause is identified as incendiary (arson) and debris burning.

TABLE 9-1
Wildland Fire Statistics for Connecticut

Year	Number of Wildland Fires	Acres Burned	Number of Prescribed Burns	Acres Burned	Total Acres Burned
2015	76	159	4	25	184
2014	28	69	4	34	103
2013	76	238	4	37	275
2012	180	417	4	42	459
2011	196	244	7	42	286
2010	93	262	6	52	314
2009	264	246	6	76	322
2008	330	893	6	68	961
2007	361	288	7	60	348
2006	322	419	6	56	475
2005	316	263	10	130	393
2004	74	94	12	185	279
2003	97	138	8	96	234
2002	101	184	13	106	290
Total	**2,334**	**3,448**	**85**	**913**	**4,361**

Source: National Interagency Fire Center

Traditionally, the highest forest fire danger in Connecticut occurs in the spring from mid March to mid May. The worst wildfire year for Connecticut in the past decade 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 5 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 town of Watertown, Connecticut, burned 300 acres.

Much of the northern half of New Fairfield is privately and publicly owned forest, and fires have occurred throughout the Town, especially at the New Fairfield Transfer Station.

Smoldering Forest after the 2015 Wildland Fire

New Fairfield experienced a significant wildfire in September 2015. Thirty-five fire departments responded to help fight the fire. Twenty-eight acres of state forestland were burned. The plume was 3,000 feet high. The blaze was first discovered on a Saturday covering 10 acres, was fought, and was thought to be controlled. On Sunday, it had spread more. No losses to structures or vehicles were experienced, with a minor amount of lost gear and supplies.

9.4 Existing Capabilities

Connecticut enacted its first statewide 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 1940s prompted the state legislature to join the Northeastern Interstate Forest Fire Protection Compact with its neighbors in 1949.

The technology used to combat wildfires has significantly improved since the early 20^{th} 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 firefighting command capabilities. Existing mitigation for wildland fire control is typically focused on Fire Department training and maintaining an adequate supply of equipment. The Town of New Fairfield Subdivision Regulation and the New Fairfield Water Supply Ordinance require provision of supplemental water supply systems for fire protection and stipulate that the Fire Department review and approve the location, size, design, construction specifications, and installation of these water supply systems. In addition, new roads, subdivisions, and fire ponds are required to allow for fire truck access. New Fairfield promotes intermunicipal cooperation in firefighting efforts as seen during the 2015 blaze.

Unlike wildfires on the west coast of the United States where the fires are allowed to burn toward development and then stopped, the New Fairfield Volunteer Fire Department goes to the fires whenever possible. This proactive approach is believed to be effective for controlling wildfires. The Fire Department has some water storage capability but primarily relies on the use of the 68 fire ponds, dry hydrants, and water tanks to fight fires located along major roads throughout Town. Exact locations of each water source are available on the New Fairfield Volunteer Fire Department website at http://www.nfvfd.org/6586/.

The Connecticut DEEP Division of Forestry monitors the weather each day during nonwinter months as it relates to fire danger. The Division utilizes precipitation and soil moisture data to compile and broadcast daily forest fire probability forecasts. Forest fire danger levels are classified as low, moderate, high, very high, or extreme. In addition, the National Weather Service (NWS) issues a Red Flag warning when winds will be sustained or there will be frequent gusts above a certain threshold (usually 25 mph), the relative humidity is below 30 percent, and precipitation for the previous 5 days has been less than one-quarter inch. Such conditions can cause wildfires to quickly spread from their source area.

The Connecticut DEEP has recently changed its Open Burning Program. It now requires individuals to be nominated and designated by the Chief Executive Officer in each municipality that allows open burning and to take an online training course and exam to become certified as an "Open Burning Official." Permit template forms were also revised that provide permit requirements so that the applicant/permittee is made aware of the requirements prior to, during, and after burn activity. The regulated activity is then overseen by the Town.

Summary

In summary, New Fairfield programs that mitigate wildfire hazards include adding firefighting water supplies to areas currently underserved, intermunicipal firefighting coordination, public outreach and education about fire safety and outdoor burning, patrolling public spaces to monitor campfires, and participation in the Connecticut Open Burning program. Policies include requiring fire ponds with dry hydrants and water tanks to be installed at new subdivisions, requiring that roads are constructed to allow firefighting vehicles access to new subdivisions, and proactively going to fires when possible rather than letting them burn.

New Fairfield's capabilities to mitigate for wildfires and prevent loss of life and property have increased since the initial HMP adoption due to moderate changes in state policy that have created more robust wildfire control mechanisms. The Town will continue to evaluate whether capabilities need to be strengthened in the future.

9.5 Vulnerabilities and Risk Assessment

Description – The most common causes of wildfires are arson, lightning strikes, and fires started 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 creates 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 NCDC, the last drought in Fairfield County occurred in 2002.

According to the Connecticut DEEP, the actual forest fire risk in Connecticut is low due to several factors. First, the overall incidence of forest fires is very low (212 fires occurred in Connecticut per year from 2002 to 2012, which is a rate of one and a quarter per municipality per year). 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 firefighters at the local and state level are readily available to fight fires in the state, and intermunicipal 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 5 acres in comparison to the two most extreme wildfires recorded since 1986 that burned 300 acres each. Given the availability of firefighting water in New Fairfield, including the use of nearby water bodies, and the long-standing mutual aid assurances the Town Fire Department has with neighboring communities, it is believed that these figures are applicable to this Town. Indeed, Town personnel report that in a typical year the largest fires only burn a couple of acres before being contained despite the rural nature of the Town.

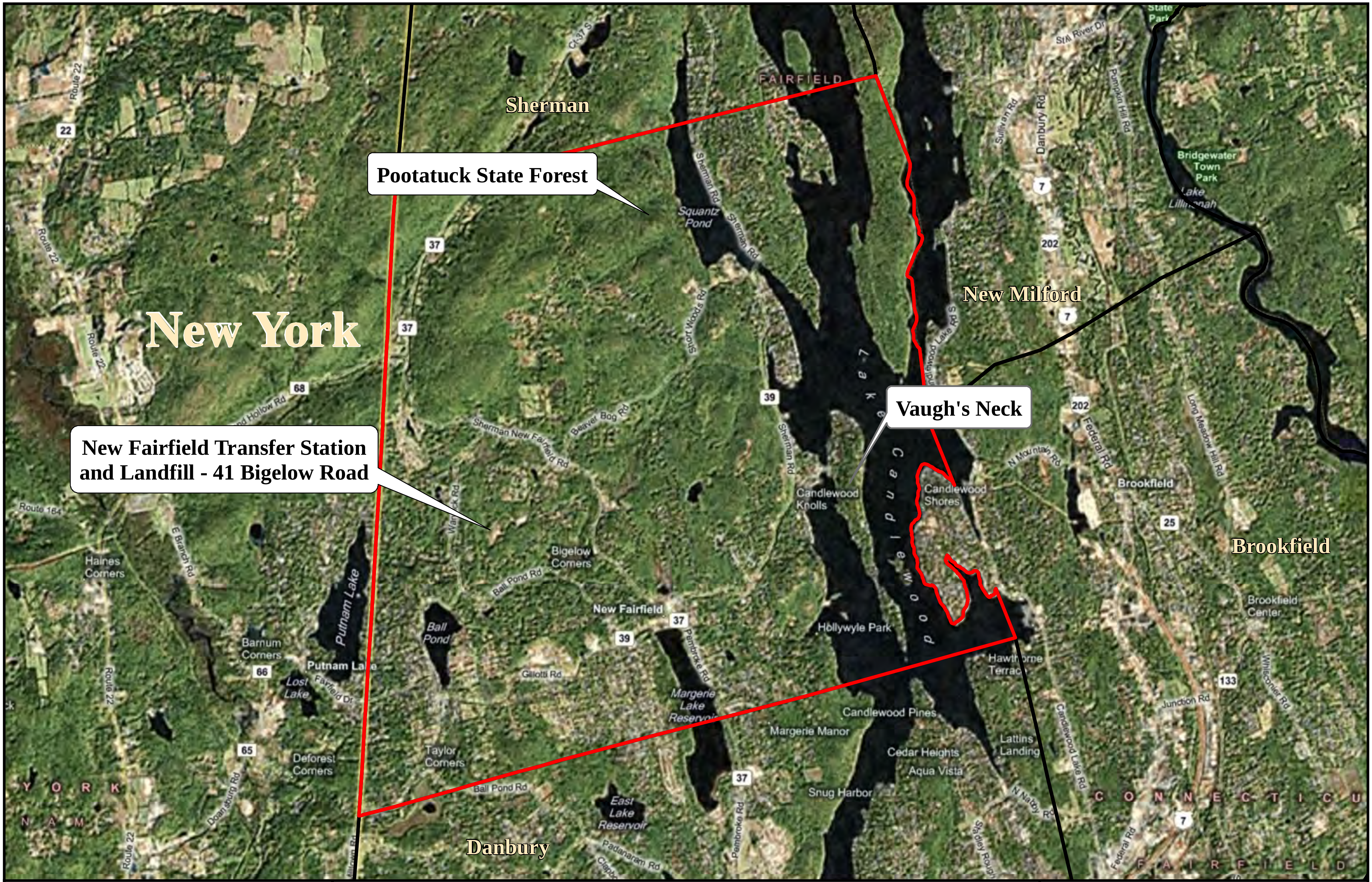
Wildfires are of particular concern in the many wooded areas and other areas with poor access for firefighting equipment throughout New Fairfield. However, the geographic extent of these areas is small, and the preparedness and responsiveness of the New Fairfield Volunteer Fire Department is very strong. As a result, the overall vulnerability of New Fairfield to wildfire hazards is low. Figure 9-1 presents the wildfire risk areas for the Town. Hazards associated with wildfires include property damage and loss of forest. Wildfires are considered a likely event each year, but when one occurs, it is generally contained to a small range with limited damage to nonforested areas.

In addition, there are many areas of Town where roads are narrow and one way. This hinders emergency access to fight fires. This is a particular problem within many of the private community associations. Fire trucks often need to drive into such areas in line with the last one in being the first one to back out as there is no place to turn around. In other places, fire trucks simply can't get to the houses that are up narrow dirt roads and driveways. The Fire Department should continue public education in these areas and encourage homeowners and private communities to widen the access for emergency vehicles wherever possible.

There are limited public camping areas in Town, so there are few fires caused by out-of-control campfires. The only forested state park in town is the Pootatuck State Forest, which borders Squantz Pond in northern New Fairfield.

The wildfire risk areas in New Fairfield presented in Figure 9-1 were defined as being contiguous wooded areas with limited access. These areas are generally associated with large tracts of privately and publicly owned forests and other Town-owned open space (including the Town landfill, also delineated in Figure 9-1). The limited access conservation properties are considered to be at the highest risk for fires. As each area borders residential sections of the Town, residents on the outskirts of these risk areas are the most vulnerable to fire, heat, and smoke effects of wildfires. Despite having a large amount of forest/suburban interface, the overall risk from wildfires occurring in the Town is considered to be low. Such fires fail to spread far due to the speed of detection and strong fire response.

In summary, areas adjacent to open space are considered most at risk from wildfires. In addition, there is concern about fires in the wooded northern sections of Town where there is limited firefighting water available. While fires are infrequent in these areas, they can often be difficult to access and fight.



Natural Hazard Pre-Disaster Mitigation Plan
Town of New Fairfield, Connecticut

Engineering, Landscape Architecture and Environmental Science
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MMI#: 2534-09
MXD: H:\Fig9-1_Wildfire.mxd
Source: CT DEP, Microsoft Virtual Earth

N

Wildfire Risk Area

Location: New Fairfield, CT

Map By: JBH
Date: October, 2010
Scale: 1" = 6,000'

Sheet: Figure 9-1

Should a wildfire occur, it seems reasonable to estimate that the average area to burn would be 5 acres during a drought period and 1 to 2 acres during wetter periods, consistent with the state averages. 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 fire response in the Town.

Recall from Figures 2-7 and 2-8 that the elderly and persons with disabilities reside in the Town. In comparing these figures with the wildfire risk areas presented in Figure 9-1, it is possible that several hundred of the population impacted by a wildfire could consist of the elderly, a small number could consist of linguistically isolated households, and several persons with disabilities could reside near wildfire impact areas. Thus, it is important for the New Fairfield Fire Department to be prepared to assist these special populations during emergencies, including wildfire.

<u>Loss Estimates</u> – The *2014 Connecticut Natural Hazards Mitigation Plan Update* provides annual estimated losses on a countywide basis for several hazards. Based on the population of New Fairfield relative to Fairfield County, the annual estimated loss is $850 for wildfires. This figure is considered reasonable for New Fairfield despite the occurrence of the large wildfire in 2015.

9.6 Potential Mitigation Strategies and Actions

Potential mitigation measures for wildfires include a mixture of prevention, education, and emergency planning. Although educational materials are available through the Fire Department, they should be made available at other municipal offices as well. Education of homeowners on methods of protecting their homes is far more effective than trying to steer growth away from potential wildfire areas, especially given that the available land that is environmentally appropriate for development may be forested.

Water system improvements are an important class of potential mitigation for wildfires. Additionally, ensuring access to wildland areas by emergency vehicles is essential for fire mitigation. Potential mitigation strategies could include:

- ❑ Install additional supplies of firefighting water where needed.
- ❑ Widen access roads such that emergency vehicles can access remote locations.
- ❑ Expand the access road network to ensure emergency vehicles can arrive at wildfire sites.
- ❑ Provide outreach programs on how to properly manage burning and fires on private property.
- ❑ Patrol Town-owned open space and parks to prevent unauthorized campfires.
- ❑ Enforce regulations and permits for open burning.

The most significant recent wildfire in New Fairfield, in summer 2015, occurred on state-owned forest land. Because the property is managed by the state, mitigation options for the Town are limited. At the same time, wildfires in remote, forested areas can be beneficial to both the ecological systems of those areas and to the lessening of future fire hazards in those areas (*Managing Grasslands, Shrublands, and Young Forest Habitats for Wildlife: A Guide for the Northeast 2006)*. Based on this event, New Fairfield should coordinate with the State of Connecticut to ensure adequate monitoring of and access to fires on state land. Additionally, the

Town should encourage private landowners and State Forest managers to perform prescribed burns and should itself perform burns on municipal land where and when appropriate.

9.7 Status of Mitigation Strategies and Actions

TABLE 9-2
Status of Previous Strategies and Actions

Strategy or Action	Status
Require the installation of fire ponds with dry hydrants and water tanks in new subdivisions and commercial developments.	*This action is part of Town ordinances and regulations and has been redefined as a capability.*
Add additional supplies of firefighting water where adequate water supplies do not currently exist.	*This is an ongoing effort, but Town officials feel it has been completed as much as possible under current land-use conditions. Action has been reclassified as a capability.*
Encourage property owners to widen access roads such that fire trucks and other emergency vehicles can access remote locations.	*This action is being carried forward.*
Promote intermunicipal cooperation in firefighting efforts.	*Action has been reclassified as a capability.*
Provide public outreach programs to increase awareness of forest fire danger and how to use common firefighting equipment.	*Complete. For example, school field trips go to the firehouse and learn about fire safety. This action has been reclassified as a capability.*
Review subdivision applications to ensure new neighborhoods and driveways are properly sized to allow access of emergency vehicles.	*This action is part of Town ordinances and regulations and has been redefined as a capability.*
Provide outreach programs on how to properly manage burning and campfires on private property.	*This action is being carried forward.*
Patrol Town-owned open space and parks to prevent unauthorized campfires.	*This is part of the Town's standard operating procedure and has been reclassified as a capability.*
Enforce regulations and permits for open burning.	*This is part of Town ordinances and regulations and has been redefined as a capability.*

During the course of the Plan update, particularly in response to the recent wildfire on state property, the following new strategies were identified:

- ❑ Coordinate with the State of Connecticut to ensure there is adequate monitoring of fires on State Forest land.
- ❑ Coordinate with the State of Connecticut to ensure there is adequate accessibility for emergency vehicles to respond to fires on State Forest land.
- ❑ Perform prescribed burning on municipal land when and where appropriate.

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

10.0 RECOMMENDATIONS

10.1 Additional Strategies and Actions

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, developing a microgrid is a recommendation for hurricane, summer storm, and winter storm 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 new all-hazard strategies are proposed here:

- ❑ Acquire up to three additional portable generators to be stored at the Town Hall, the Drop-Off Center, and the library.
- ❑ Upgrade emergency notification system to a company that has more capabilities for assisting residents with special needs.
- ❑ Review and update potential evacuation routes while allowing flexibility in case of downed trees or power lines blocking the road.
- ❑ Create a public road-closure reporting system so residents can inform the Town of the locations of downed tree limbs and power lines or flooded roads. This will assist officials in updating evacuation routes during and after storm events.
- ❑ Pursue funding to place utilities underground in existing developed areas.

10.2 Prioritization of Proposed Strategies and Actions

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, is outlined in FEMA planning documents such as *Developing the Mitigation Plan* (FEMA 386-3) and *Using Benefit-Cost Review in Mitigation Planning* (FEMA 386-5). STAPLEE stands for the "Social, Technical, Administrative, Political, Legal, Economic, and Environmental" criteria for making planning decisions. The STAPLEE method was used in the previous HMP.

10.2.1 The STAPLEE Method

Criteria were divided into potential benefits (pros) and potential costs (cons) for each mitigation strategy. The following questions were asked about the proposed mitigation strategies:

- ❑ **Social**:
  - Benefits: Is the proposed strategy socially acceptable to the Town?
  - Costs: Are there any equity issues involved that would mean that one segment of New Fairfield could be treated unfairly? Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower-income people? Is the action compatible with present and future community values?

- **Technical**:
  - Benefits: Will the proposed strategy work? Will it reduce losses in the long term with minimal secondary impacts?
  - Costs: Is the action technically feasible? Will it create more problems than it will solve? Does it solve the problem or only a symptom?

- **Administrative**:
  - Benefits: Does the project make it easier for the community to administrate future mitigation or emergency response actions?
  - Costs: Does New Fairfield have the capability (staff, technical experts, and/or funding) to implement the action, or can it be readily obtained? Can New Fairfield perform the necessary maintenance? Can the project be accomplished in a timely manner?

- **Political**:
  - Benefits: Is the strategy politically beneficial? Is there public support both to implement and maintain the project? Is there a local champion willing to see the project to completion? Can the mitigation objectives be accomplished at the lowest cost to the community (grants, etc.)?
  - Costs: Have political leaders participated in the planning process? Do project stakeholders support the project enough to ensure success? Have the stakeholders been offered the opportunity to participate in the planning process?

- **Legal**:
  - Benefits: Is there a technical, scientific, or legal basis for the mitigation action? Are the proper laws, ordinances, and resolutions in place to implement the action?
  - Costs: Does New Fairfield have the authority to implement the proposed action? Are there any potential legal consequences? Will the community be liable for the actions or support of actions, or for lack of action? Is the action likely to be challenged by stakeholders who may be negatively affected?

- **Economic**:
  - Benefits: Are there currently sources of funds that can be used to implement the action? What benefits will the action provide? Does the action contribute to community goals, such as capital improvements or economic development?
  - Costs: Does the cost seem reasonable for the size of the problem and the likely benefits? What burden will be placed on the tax base or local economy to implement this action? What proposed actions should be considered but tabled for implementation until outside sources of funding are available?

- **Environmental**:
  - Benefits: Will this action beneficially affect the environment (land, water, endangered species)?
  - Costs: Will this action comply with local, state, and federal environmental laws and regulations? Is the action consistent with community environmental goals?

Each proposed mitigation strategy presented in this plan was evaluated and assigned a "benefit" score and a "cost" score for each of the seven STAPLEE criteria, as outlined below:

- A score of "1" was assigned if the project will have a beneficial effect for that particular criterion, or a "0" if the project would have a negligible effect or if the questions were not applicable to the strategy.
- A score of "-1" was assigned if the project would have an unfavorable impact for that particular criterion, or a "0" if the project would have a negligible impact or if the questions were not applicable to the strategy.
- Technical and Economic criteria were double-weighted (x2) in the final sum of scores.
- The total benefit score and cost score for each mitigation strategy was summed to determine each strategy's final STAPLEE score.

An evaluation matrix with the total scores from each strategy can be found in Appendix A. The highest scoring is determined to be of more importance economically, socially, environmentally, and politically and, hence, is prioritized over those with lower scoring.

Although a community may implement recommendations as prioritized by the STAPLEE method, an additional consideration is important for those recommendations that may be funded under the FEMA mitigation grant programs. To receive federal funding, the mitigation action must have a benefit-cost ratio (BCR) that exceeds one. Calculation of the BCR is conducted using FEMA's Benefit Cost Analysis (BCA) toolkit. The calculation may be complex, varying with the mitigation action of interest, and dependent on detailed information such as property value appraisals, design and construction costs for structural projects, and tabulations of previous damages or NFIP claims.

Although it is beyond the scope of this plan to develop precise BCRs for each recommendation, the STAPLEE table in Appendix A provides an estimate of the cost, while the final columns of that table evaluate the various benefits. When pursuing grants for selected projects, this information can be used to help select the projects that have the greatest chance of successfully navigating through the application review process.

10.2.2 Priority Strategies and Actions

The top new projects and procedures are summarized below:

- Upgrade emergency notification system to a company that has more capabilities for assisting residents with special needs. Include potential dam failure areas into the system.
- Perform a GPS study to prioritize plowing routes and post the snow plowing prioritization in Town buildings each winter to increase public awareness.
- Actively coordinate with the City of Danbury to secure a copy of the Dam Failure Analysis and EAP for the Margerie North Pond Dam.
- Coordinate with the State of Connecticut to ensure there is adequate monitoring of fires on State Forest land.
- Require developers to perform an analysis of downstream impacts of development and determine whether stormwater retention or detention is the best option at a given site, rather than having the responsibility of analysis be on the Town. Determinations would be subject to approval by the Town Engineer.

- ❑ In conjunction with the land trusts in Town, pursue the acquisition of additional municipal open space inside SFHAs and set it aside as greenways, parks, or other nonresidential, noncommercial, or nonindustrial use.

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 are given in Section 11.4.

FEMA (Federal Emergency Management Agency) Grants and Assistance Programs

American Recovery & Reinvestment Act (ARRA)
http://www.fema.gov/government/grant/arra/index.shtm

The ARRA is an economic stimulus package that was designed to jumpstart the U.S. economy, create or save millions of jobs, and put a down payment on addressing long-neglected challenges nationally. The Fire Station Construction Grant (SCG) Program is one aspect of the ARRA. A total of $210,000,000 is available to nonfederal fire departments and state and local governments that fund/operate fire departments to achieve goals of firefighter safety and improved response capability/capacity based on need through the construction, renovation, or modification of fire stations.

Buffer Zone Protection Program (BZPP)
http://www.fema.gov/government/grant/bzpp/index.shtm

This grant provides security and risk management capabilities at the 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 reestablish a communication network in the event that the current information system 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.

Commercial Equipment Direct Assistance Program (CEDAP)
http://www.fema.gov/government/grant/cedap/index.shtm

This direct assistance program provides equipment and technical assistance to enhance regional response capabilities, mutual aid, and interoperable communications. Eligible applicants include law enforcement agencies and emergency responder agencies who demonstrate that the equipment would improve their capability and capacity to respond to a major critical incident or to work with other first responders.

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.

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 Institute
http://training.fema.gov/

Provides training and education to the fire service, emergency management officials, its allied professions, and the general public.

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 if 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 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 Program 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 DEEP.

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 DEEP.

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 (IECGP)
http://www.fema.gov/government/grant/iecgp/index.shtm

The FY 2009 IECGP provides governance, planning, training and exercise, and equipment funding to states, territories, and local and tribal governments to carry out initiatives to improve interoperable emergency communications, including communications in collective response to natural disasters, acts of terrorism, and other man-made disasters. All proposed activities must be integral to interoperable emergency communications and must be aligned with the goals, objectives, and initiatives identified in the grantee's approved Statewide Communication Interoperability Plans (SCIP).

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 on 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 subgrants to local governments. PDM grants are awarded on a competitive basis. This grant program is administered through the DEEP.

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 nonprofit 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 subgrantees in need of assistance.

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 subgrants to local governments.

Severe Repetitive Loss (SRL) Program
http://www.fema.gov/government/grant/srl/index.shtm

The SRL Program 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 floodproofing (historic properties only).

Transit Security Grant Program (TSGP)
http://www.fema.gov/government/grant/tsgp/index.shtm

The purpose of the 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 antiterrorism 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 antiterrorism and security awareness program.

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 FEMA administers the grants in cooperation with the U.S. Fire Administration.

Fire Prevention & Safety Grants (FP&S)
http://www.firegrantsupport.com/fps/

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 FEMA. 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.

National Fire Academy Education and Training
http://www.usfa.dhs.gov/nfa/

Provides training to increase the professional level of the fire service and others responsible for fire prevention and control.

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 directly 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 floodproofing and flood preparedness projects*
- U.S. Department of Agriculture – *financial assistance to reduce flood damage in small watersheds and to improve water quality*
- Connecticut Department of Energy & 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*
- Connecticut Department of Energy & 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 Town is authorized to update this HMP as needed. Appendix E contains a record of the adoption of this Plan in the Town.

The individual recommendations of the HMP must be implemented by the municipal departments that oversee these activities. **A "local coordinator" will be selected as the individual in charge; this is the Office of the First Selectman**. 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 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 5 years from the date of adoption or when other plans are updated, whichever is sooner.

The 2014 Plan of Conservation and Development (POCD) already includes several aspects of hazard mitigation. Actions listed in the POCD include protection of environmentally sensitive areas, construction of flood management projects, review of zoning in steep or unstable areas, and expansion of water services.

Relevant actions include (not direct quotes):
(a) Strengthen stormwater management regulations.
(b) Maintain flood hazard controls that will assure continued participation in the NFIP and CRS.
(c) Support actions that will lead to the protection of slopes of 25 percent or greater.
(d) Focus on public safety services for future capital investment.
(e) Determine a sensible means of improving cellular communication through the Town to assist community services in coordinating with one another.

Due to the nature of the planning process, many of these actions overlap with those suggested in the initial HMP as well as this update. Moving forward, some specific POCD actions can be phased out as projects are completed, and new actions can be incorporated based on the HMP recommendations.

The Office of the First Selectman will be responsible for assigning appropriate Town officials to update the Plan of Conservation and Development (POCD), Subdivision Regulations, Wetlands Regulations, and EOP 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 POCD and the EOP are the two documents most likely to benefit from the inclusion of the Plan in the Town's library of planning documents.

The POCD was most recently updated in 2014 subsequent to adoption of the initial HMP and already includes elements of hazard mitigation. It is scheduled to be updated in 2024, far beyond the end of this HMP Update's planning horizon. Incorporation of new HMP actions and goals into future updates of, and amendments to, the POCD is an important part of hazard mitigation but is not listed as a specific action of this HMP.

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 project lists maintained and updated by the DPW.

11.2 Progress Monitoring and Public Participation

The local coordinator will be responsible for monitoring the successful implementation of this HMP Update and will provide the linkage between the multiple departments involved in hazard mitigation at the local level relative to communication and participation. As the plans will be adopted by the local government, coordination is expected to be able to occur without significant barriers.

Site Reconnaissance for Specific Suggested Actions – The local coordinator, with the assistance of appropriate department personnel, will annually perform reconnaissance-level inspections of sites that are associated with specific actions. Examples include structural projects. This will ensure that the suggested actions remain viable and appropriate. The worksheet in Appendix C will be filled out for specific project-related actions as appropriate. This worksheet is taken from the *Local Mitigation Planning Handbook.*

Site Reconnaissance is to be completed between April 1 and November 1 each year.

The local coordinator will be responsible for obtaining a current list of RLPs in the community each year, understanding that the Town does not include any at this time and may not include any in the future. Any RLPs shall be subject to a windshield survey at least once every 2 years to ensure that the list is reasonably accurate relative to addresses and other basic information. Some of the reconnaissance-level inspections could occur incidentally during events such as flooding when response is underway.

Annual Reporting and Meeting – The local coordinator will be responsible for holding an annual meeting to review the Plan. Matters to be reviewed on an annual basis include the goals and objectives of the HMP, hazards or disasters that occurred during the preceding year, mitigation activities that have been accomplished to date, a discussion of reasons that implementation may be behind schedule, and suggested actions for new projects and revised activities. Results of site reconnaissance efforts will be reviewed also. A meeting should be conducted in March or April of each year, at least 2 months before the annual application cycle for grants under the HMA program[1]. This will enable a list of possible projects to be circulated to applicable local departments to review and provide sufficient time to develop a grant application. The local coordinator shall prepare and maintain documentation and minutes of this annual review meeting.

An annual meeting should be conducted by March or April each year. Appendix G contains worksheets that may be helpful for this annual meeting.

Postdisaster meeting to be conducted within 2 months of each federal disaster declaration in Connecticut.

[1] PDM and FMA applications are typically due to the state in June of any given year.

<u>Postdisaster Reporting and Meeting</u> – Subsequent to federally declared disasters in the State of Connecticut for Litchfield County, a meeting shall be conducted by the local coordinator with representatives of appropriate departments to develop a list of possible projects for developing an HMGP application. The local coordinator shall prepare a report of the recent events and ongoing or recent mitigation activities for discussion and review at the HMGP meeting. Public outreach may be solicited for HMGP applications at a *separate* public meeting.

<u>Continued Public Involvement</u> – Continued public involvement will be sought regarding the monitoring, evaluating, and updating of the HMP. Public input can be solicited through community meetings, presentations on local cable access channels, and input to web-based information gathering tools. Public comment on changes to the HMP may be sought through posting of public notices and notifications posted on the Town's website and the WestCOG website.

11.3 Updating the Plan

The Town will update this HMP at such time that a consensus to do so is reached by the Board of Selectmen of New Fairfield or at least once every 5 years.

Updates to this HMP will be coordinated by the local coordinator. The Town understands that this HMP will be considered current for a period of 5 years from the date of approval with the expiration date reported by FEMA via the approval letter. The local coordinator will be responsible for compiling the funding required to update the HMP in a timely manner such that the current Plan will not expire while the Plan update is being developed; the assistance of the regional planning organization may be solicited from time to time for this purpose.

Table 11-1 presents a schedule to guide the preparation for the Plan update and then the actual update of the Plan. The schedule understands that the current version of this Plan was adopted in November 2016 but bumps the annual meeting back 1 month to October of each year.

TABLE 11-1
Schedule for Hazard Mitigation Plan Update

Month and Year	Tasks
October 2017	Annual meeting to review Plan content and progress
October 2018	Annual meeting to review Plan content and progress
October 2019	Annual meeting to review Plan content and progress
April 2020	Ensure that funding for the Plan update is included in the fiscal year 2019-2020 budget.
October 2020	Annual meeting to review Plan content and progress
October 2020	Secure consultant to begin updating the Plan, or begin updating in-house.
June 2021	Forward draft updated Plan to DEMHS for review.
July-September 2021	Process edits from state and FEMA and obtain the approval pending adoption.
October 2021	Adopt updated Plan.

To update the Plan, the local coordinator will coordinate the appropriate group of local officials consisting of representatives of many of the same departments solicited for input to this HMP. In addition, local business leaders, community and neighborhood group leaders, relevant private and nonprofit interest groups, and the six neighboring municipalities will be solicited for representation. This committee may include representatives from the public works and planning departments in the municipalities of Sherman, New Milford, Brookfield, and Danbury (in Connecticut) and in the two New York municipalities. The Candlewood Lake Watershed Association may also be involved with Plan update efforts.

The project action worksheets prepared by the local coordinator and annual reports described above will be reviewed. In addition, the following questions will be asked:

- ❑ Do the mitigation goals and objectives still reflect the concerns of local residents, business owners, and officials?
- ❑ Have local conditions changed so that findings of the risk and vulnerability assessments should be updated?
- ❑ Are new sources of information available that will improve the risk assessment?
- ❑ If risks and vulnerabilities have changed, do the mitigation goals and objectives still reflect the risk assessment?
- ❑ What hazards have caused damage locally since the last edition of the HMP was developed? Were these anticipated and evaluated in the HMP, or should these hazards be added to the plan?
- ❑ Are current personnel and financial resources at the local level sufficient for implementing mitigation actions?
- ❑ For each mitigation action that has not been completed, what are the obstacles to implementation? What are potential solutions for overcoming these obstacles?
- ❑ For each mitigation action that has been completed, was the action effective in reducing risk?
- ❑ What mitigation actions should be added to the Plan and proposed for implementation?
- ❑ If any proposed mitigation actions should be deleted from the Plan, what is the rationale?

Updates may include deleting recommendations as projects are completed, adding recommendations as new hazard effects arise, or modifying hazard vulnerabilities as land use and available data changes. For example, a more detailed *HAZUS-MH* analysis could be run for flooding, hurricanes, and earthquakes using site-specific information. This information could include additional utilities not included in the current *HAZUS-MH* analysis such as pumping stations and water treatment plants, as well as spatially locating critical and essential facilities and utilities. In addition, the list of shelters and critical facilities should be updated as necessary or at least every 5 years.

11.4 Technical and Financial Resources

This section is comprised of a list of resources to be considered for technical assistance and potential 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 predisaster and postdisaster 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 the following:

- *Flood Hazard Mapping Program*, which maintains and updates NFIP 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
- *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 NFIP

- *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
- *Community Rating System (CRS)*, a voluntary incentive program under the NFIP that recognizes and encourages community floodplain management activities
- *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 *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 *Technical Assistance Contracts (TAC)* in place 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 postdisaster 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.

<u>Response & Recovery Division</u>

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) provides 75 percent grants for mitigation projects to protect eligible damaged public and private nonprofit facilities from future damage. "Minimization" grants at 100 percent 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 percent 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 the following:

- *Capitalization Grants for Clean Water State Revolving Funds*: Low interest loans to governments to repair, replace, or relocate wastewater treatment plants 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 nonpoint pollution are eligible. Grants are administered through the CT DEEP.

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 floodprone homes or protecting them from flood damage. Funding is a 100 percent grant and 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 postflood 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 U.S. Army Corps of Engineers (USACE) provides 100 percent funding for floodplain management planning and technical assistance to states and local governments under several flood control acts and the Floodplain Management Services Program (FPMS). Specific programs used by the USACE for mitigation are listed below.

- *Section 205 – Small Flood Damage Reduction Projects*: This section of the 1948 Flood Control Act authorizes the USACE to study, design, and construct small flood control projects in partnership with nonfederal government agencies. Feasibility studies are 100 percent federally funded up to $100,000, with additional costs shared equally. Costs for preparation of plans and construction are funded 65 percent with a 35 percent nonfederal match. In certain cases, the nonfederal share for construction could be as high as 50 percent. The maximum federal expenditure for any project is $7 million.

- *Section 14 – Emergency Streambank and Shoreline Protection:* This section of the 1946 Flood Control Act authorizes the USACE to construct emergency shoreline and stream bank protection works to protect public facilities such as bridges, roads, public buildings, sewage treatment plants, water wells, and nonprofit public facilities such as churches, hospitals, and schools. Cost sharing is similar to Section 205 projects above. The maximum federal expenditure for any project is $1.5 million.

- *Section 103 – Hurricane and Storm Damage Reduction Projects:* This section of the 1962 River and Harbor Act authorizes the USACE to study, design, and construct small coastal storm damage reduction projects in partnership with nonfederal government agencies. Beach nourishment (structural) and floodproofing (nonstructural) are examples of storm damage reduction projects constructed under this authority. Cost sharing is similar to Section 205 projects above. The maximum federal expenditure for any project is $5 million.

- *Section 208 – Clearing and Snagging Projects:* This section of the 1954 Flood Control Act authorizes the USACE to perform channel clearing and excavation with limited embankment construction to reduce nuisance flood damages caused by debris and minor shoaling of rivers. Cost sharing is similar to Section 205 projects above. The maximum federal expenditure for any project is $500,000.

- *Section 206 – Floodplain Management Services:* This section of the 1960 Flood Control Act, as amended, authorizes the USACE to provide a full range of technical services and planning guidance necessary to support effective floodplain management. General technical assistance efforts include determining the following: site-specific data on obstructions to flood flows, flood formation, and timing; flood depths, stages, or floodwater velocities; the extent, duration, and frequency of flooding; information on natural and cultural floodplain resources; and flood loss potentials before and after the use of floodplain management measures. Types of studies conducted under Floodplain Management Services include floodplain delineation, dam failure, hurricane evacuation, flood warning, floodway, flood damage reduction, stormwater management, floodproofing, and inventories of floodprone structures. When funding is available, this work is 100 percent federally funded.

In addition, the USACE also provides emergency flood assistance (under Public Law 84-99) after local and state funding has been used. This assistance can be used for both flood response and postflood response. USACE assistance is limited to the preservation of life and improved property; direct assistance to individual homeowners or businesses is not permitted. In addition, the USACE can loan or issue supplies and equipment once local sources are exhausted during emergencies.

U.S. Department of Commerce
National Weather Service
Northeast River Forecast Center
445 Myles Standish Boulevard
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 nonstructural 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 provides 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
Connecticut Office
344 Merrow Road, Suite A
Tolland, CT 06084-3917
(860) 871-4011

The Natural Resources Conservation Service provides technical assistance to individual landowners, 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, nonprofit organizations, and the private sector.

State Resources

Connecticut Department of Administrative Services, Division of Construction Services
165 Capitol Avenue
Hartford, CT 06106
(860) 713-5850
http://www.ct.gov/dcs/site/default.asp

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 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 Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127
(860) 424-3000
http://www.dep.state.ct.us/

The Department includes several divisions with various functions related to hazard mitigation as follows:

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

- *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.

- *Flood & Erosion Control Board Program*: Provides assistance to municipalities to solve flooding, beach erosion, and dam repair problems. Has the power to construct and repair flood and erosion management systems. Certain nonstructural 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 noncompetitive basis.

- *Inland Wetlands and Watercourses Management Program*: Provides training, technical, and planning assistance to local Inland Wetlands agencies and 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.

Planning and Standards Division **-** Administers the Clean Water Fund and many other programs directly and indirectly related to hazard mitigation including the Section 319 nonpoint 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.

<u>Connecticut Department of Emergency Services and Public Protection</u>
1111 Country Club Road
Middletown, CT 06457
(860) 685-8190
http://www.ct.gov/dps/

<u>Connecticut Division of Emergency Management and Homeland Security</u>
25 Sigourney Street, 6th Floor
Hartford, CT 06106-5042
(860) 256-0800
http://www.ct.gov/demhs/

DEMHS is the lead division responsible for emergency management. Specifically, responsibilities include emergency preparedness, response and recovery, mitigation, and an extensive training program. DEMHS is the state point of contact for most FEMA grant and assistance programs and oversees hazard mitigation planning and policy and administration of the Hazard Mitigation Grant Program, Flood Mitigation Assistance Program, and Pre-Disaster Mitigation Program. It also has responsibility for making certain that the State Natural Hazard Mitigation Plan is updated every 5 years. 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. Additionally, the agency is available to provide technical assistance to subapplicants during the planning process.

DEMHS operates and maintains the CT "Alert" emergency notification system powered by Everbridge. This system uses the state's Enhanced 911 database for location-based notifications to the public for life-threatening emergencies. The database includes traditional wire-line telephone numbers, and residents have the option to register other numbers on-line in addition to the land line.

DEMHS employs the *State Hazard Mitigation Officer*, who is in charge of hazard mitigation planning and policy and has oversight of administration of the Hazard Mitigation Grant Program, Flood Mitigation Assistance Program, and Pre-Disaster Mitigation Program. He also has the responsibility of making certain that the State Natural Hazard Mitigation Plan is updated every 5 years.

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 that 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 that could be mitigation related.

Connecticut Office of Policy and Management
450 Capitol Avenue
Hartford, CT 06106
(860) 418-6200
http://www.ct.gov.opm

Small Town Economic Assistance Program

The Small Town Economic Assistance Program (STEAP) funds economic development, community conservation, and quality of life projects for localities that are ineligible to receive Urban Action bonds. This program is administered by the Connecticut Office of Policy and Management (OPM). Connecticut municipalities may receive up to $500,000 per year if (1) they are not designated as a distressed municipality or a public investment community, and (2) the State POCD does not show them as having a regional center. Public Act 05-194 allows an Urban Act Town that is not designated as a regional center under the State POCD to opt out of the Urban Action program and become a STEAP town for a period of 4 years. Projects eligible for STEAP funds include the following:

1) Economic development projects such as (a) constructing or rehabilitating commercial, industrial, or mixed-use structures and (b) constructing, reconstructing, or repairing roads, access ways, and other site improvements
2) Recreation and solid waste disposal projects
3) Social service-related projects, including day care centers, elderly centers, domestic violence and emergency homeless shelters, multipurpose human resource centers, and food distribution facilities
4) Housing projects
5) Pilot historic preservation and redevelopment programs that leverage private funds
6) Other kinds of development projects involving economic and community development, transportation, environmental protection, public safety, children and families, and social service programs.

In recent years, STEAP grants have been used to help fund many types of projects that are consistent with the goals of hazard mitigation. Projects funded in 2013 and 2014 include stream bank stabilization, dam removal, construction of several EOCs in the state, conversion of a building to a shelter, public works garage construction and renovations, design and construction of a public safety communication system, culvert replacements, drainage improvements, bridge replacements, generators, and open space acquisition.

Private and Other Resources

Association of State Dam Safety Officials (ASDSO)
450 Old Vine Street
Lexington, KY 40507
(859) 257-5140
http://www.damsafety.org

ASDSO is a nonprofit organization of state and federal dam safety regulators, dam owners/operators, dam designers, manufacturers/suppliers, academia, contractors, and others interested in dam safety. The mission is to advance and improve the safety of dams by supporting the dam safety community and state dam safety programs, raising awareness, facilitating cooperation, providing a forum for the exchange of information, representing dam safety interests before governments, providing outreach programs, and creating an unified community of dam safety advocates.

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 assists communities with the NFIP with a membership of over 1,000. ASFMP 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.

Connecticut Association of Flood Managers (CAFM)
P.O. Box 960
Cheshire, CT 06410
ContactCAFM@gmail.com
http://www.ctfloods.org/

CAFM is a professional association of private consultants and local floodplain managers that provides training and outreach regarding flood management techniques. CAFM is the local state chapter of ASFPM.

Institute for Business & Home Safety
4775 East Fowler Avenue
Tampa, FL 33617
(813) 286-3400
http://www.ibhs.org/

A nonprofit 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, NY 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 key words to identify useful publications from the more than 900 documents in the library.

***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 floodproofing 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 that cannot be funded elsewhere.

***AmeriCorps* -** AmeriCorps is the 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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APPENDIX A
STAPLEE MATRIX

Actions and Strategies 2016 - 2021	Associated Report Sections: Flooding	Hurricanes and Tropical Storms	Summer Storms and Tornadoes	Winter Storms	Earthquakes	Dam Failure	Wildfires	Category 1. Prevention 2. Property Protection 3. Natural Resource Prot. 4. Structural Projects 5. Public Information	Responsible Department[1]	Timeframe	Cost Low < $10,000 Med < $100,000 High > $100,000	Potential Funding Sources	Weighted STAPLEE Criteria[2] — *Benefits*: Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	*Costs*: Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	**Total STAPLEE Score**
ALL HAZARDS																													
Acquire up to three additional portable generators to be stored at the Town Hall, the Drop-Off Center, and the Library.	x	x	x	x	x	x		1,4	DPW	7/2018-6/2021	High	ARRA, CEDAP	1	1	1	1	1	0	0	**6**	0	1	0	0	0	0	1	**3**	***3***
Upgrade emergency notification system to a company that has more capabilities for assisting residents with special needs.	x	x	x	x	x	x	x	1,5	OEM	7/2017-6/2018	Med	NET Guard, CEDAP, IECGP	1	1	1	1	1	1	0	**8**	0	0	0	0	0	0	0	**0**	***8***
Review and update potential evacuation routes while allowing flexibility in case of downed trees or power lines blocking the road.	x	x	x	x	x	x	x	1,5	OEM	1/2017-12/2017	Low	Municipal/OB	1	1	1	1	0	0	0	**5**	0	0	1	0	0	0	0	**1**	***4***
Create a public road-closure reporting system so residents can inform the town of the locations of downed tree limbs and power lines, or flooded roads.	x	x	x	x				5	DPW	7/2071-6/2018	Med	Municipal/OB	1	1	1	1	0	1	0	**7**	0	0	1	0	0	1	0	**3**	***4***
Pursue funding to place utilities underground in existing developed areas.	x	x	x	x	x	x	x	1,2,4	DPW	7/2020-6/2021	High	HMA	1	1	1	0	0	0	0	**4**	1	0	1	0	0	1	0	**4**	***0***
FLOODING																													
Require developers to determine whether detention or retention of stormwater is the best option for reducing peak flows downstream of a project, rather than having the responsibility be on Town officials.	x	x	x					1	ZC	7/2018-6/2019	Low	Municipal/OB	0	1	0	0	1	1	1	**6**	0	0	1	1	0	0	0	**2**	***4***
In conjunction with the land trusts in town, pursue the acquisition of additional municipal open space inside SFHAs and set it aside as greenways, parks, or other nonresidential, noncommercial, or nonindustrial use.	x	x	x					2,3	PC, ZC	7/2018-6/2019	High	HMA	1	1	1	1	1	0	1	**7**	0	0	1	0	0	0	0	**1**	***6***
Coordinate with the CTDOT and pursue/allocate funding to upgrade the Ball Pond Brook road crossing at Bigelow Corners	x	x	x					4	DPW	7/2017-6/2018	High	Municipal/CI/DOT	1	1	0	1	1	0	1	**6**	0	0	1	0	0	1	0	**3**	***3***
WIND DAMAGE RELATED TO HURRICANES, SUMMER STORMS, AND WINTER STORMS																													
Collaborate with the Stormwise project, participate in education, management, and research efforts, and implement the Stormwise framework.		x	x	x	x			1,2,3,5	DPW	7/2017-6/2018	Low	Municipal/OB	0	1	1	0	0	0	1	**4**	0	0	1	0	0	1	0	**3**	***1***
Develop a microgrid within the Town using both private and Town-owned generators.	x	x	x	x	x			1,4	DPW	7/2020-6/2021	Med	CT DEEP	1	1	1	1	0	0	0	**5**	0	0	0	0	1	1	0	**3**	***2***
Evaluate the cost-effectiveness of installing solar panels on Town buildings to provide an additional source of local electricity in the event of a regional power outage.	x	x	x	x				4	Selectman's Office	7/2020-6/2021	Low	Municipal/OB/EPA Smartgrowth	1	1	1	1	1	0	1	**7**	0	0	0	0	0	1	0	**2**	***5***
WINTER STORMS																													
Evaluate the cost-effectiveness of performing a GPS study of roads in order to prioritize plowing routes, increase efficiency and efficacy of plowing efforts, and help plan evacuation routes.				x				1,5	DPW	7/2017-6/2018	Low	Municipal/OB	1	1	1	1	1	1	0	**8**	0	0	1	0	0	0	0	**1**	***7***
EARTHQUAKES																													
Regulate development on and near slopes to prohibit construction on slopes greater than 25%	x				x			2	ZC	7/2017-6/2018	Low	Municipal/OB	0	1	1	0	1	1	1	**7**	1	0	1	1	0	0	0	**3**	***4***
DAM FAILURE																													
Make copies of EOP/EAP documents available at the Town Hall for reference and public viewing.	x					x		5	OEM	1/2017-12/2017	Low	Municipal/OB	1	1	1	1	1	1	0	**8**	0	0	0	0	0	0	0	**0**	***8***
Include potential dam failure areas into the AlertNow emergency notification system.	x					x		5	OEM	7/2017-6/2018	Low	Municipal/OB	1	1	1	1	1	1	0	**8**	0	0	0	0	0	0	0	**0**	***8***
Actively coordinate with the Town of Danbury to ensure that New Fairfield receives a copy of the Dam Failure Analysis and EAP for the Margerie North Pond Dam.	x					x		5	Selectman's Office	1/2017-12/2017	Low	Municipal/OB	1	1	0	1	1	1	0	**7**	0	0	1	0	0	0	0	**1**	***6***
WILDFIRES																													
Encourage property owners to widen access roads such that fire trucks and other emergency vehicles can access remote locations.							x	1,2,5	Fire Department	1/2017-12/2017	Low	Municipal/OB	0	1	1	0	0	1	0	**5**	1	0	1	0	1	0	0	**3**	***2***
Provide outreach programs on how to properly manage burning and campfires on private property							x	5	Fire Department	7/2017-6/2018	Med	Municipal/OB/USFS	1	1	1	1	1	1	1	**9**	0	0	1	0	0	0	0	**1**	***8***
Coordinate with the State of Connecticut to ensure there is adequate monitoring of fires on State Forest land.							x	1	Selectman's Office	7/2018-6/2019	Low	Municipal/OB/CT DEEP	1	1	1	0	0	1	0	**6**	0	0	1	0	1	0	0	**2**	***4***
Coordinate with the State of Connecticut to ensure there is adequate accessibility for emergency vehicles to respond to fires on State Forest land.							x	1	Selectman's Office	7/2018-6/2019	Low	Municipal/OB/CT DEEP	0	1	1	0	0	1	0	**5**	0	0	1	0	1	0	0	**2**	***3***
Perform prescribed burning on municipal land when and where appropriate.							x	1,3	Fire Department	7/2017-6/2018	Med	Municipal/OB	0	1	1	0	0	1	1	**6**	1	0	1	1	0	0	0	**3**	***3***

[1]**Notes**
PC = Planning Commission
ZC = Zoning Commission
DPW = Department of Public Works
OEM = Office of Emergency Management
OB = Operating Budget
CI = Capital Improvement

[2]**Notes**
Beneficial or favorable ranking = 1
Neutral or Not Applicable ranking = 0
Unfavorable ranking = -1

Technical and Economic Factors have twice the weight of the remaining categories
(i.e. their values are counted twice in each subtotal).

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 New Fairfield 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.

Meeting Agenda
HAZARD MITIGATION PLAN UPDATE FOR TOWN OF NEW FAIRFIELD
October 29, 2015

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1. Purpose and Need for Hazard Mitigation Plan
    a. Disaster Mitigation Act of 2000
    b. Status of the Town's hazard mitigation plan (approved 8/23/11; expires 8/23/16)

2. Update on Hazard Mitigation Grant Programs (PDM, HMGP)

3. What's New with Local Plan Updates and Approvals
    a. Include loss estimates for the hazards not evaluated by HAZUS
    b. Improved public involvement and outreach to neighboring towns
    c. Make plan maintenance more specific
    d. Incorporation of hazard mitigation plan into other town plans
    e. Assign specific timeframes to hazard mitigation actions

4. Project Scope
    a. Data collection, outreach
    b. Update vulnerability analysis and run HAZUS
    c. Revisit strategies and update plan
    d. DESPP/DEMHS and FEMA review and approval

5. Project Schedule

6. Review of Hazards and Events from 2011-2015

7. Data Collection Needs for Loss Estimates

8. Review of Table of Actions from Current Plan

9. Outreach and Public Involvement

10. Next Steps

Update of Hazard Mitigation Plan for the Town of New Fairfield

Presented by:
David Murphy, P.E., CFM
Noah Slovin
Milone & MacBroom, Inc.

October 29, 2015

Purpose and Need for a Hazard Mitigation Plan

- 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
- Status of Plans in Connecticut
  - Most initial plans developed 2005-2011
  - New Fairfield plan was adopted in 2011
  - Local plans are updated every five years

What is a Natural Hazard?

- **An extreme natural event that poses a risk to people, infrastructure, and resources**

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What is Hazard Mitigation?

- **Actions that reduce or eliminate long-term risk to people, property, and resources from natural hazards and their effects**

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Long-Term Goals of Hazard Mitigation

- Reduce loss of life and damage to property and infrastructure
- Reduce the costs to residents and businesses (taxes, insurance, repair costs, etc.)
- Projects can provide long-term reductions in municipal service costs (e.g. emergency response, infrastructure maintenance)
- 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

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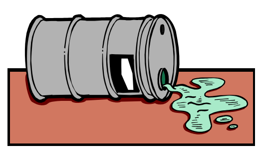
What a Hazard Mitigation Plan Does Not Address

- Terrorism and Sabotage

- Disaster Response and Recovery
- Human Induced Emergencies (some fires, hazardous spills and contamination, disease, etc



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Update on Hazard Mitigation Grant Programs

- **Local communities must have a FEMA-approved Hazard Mitigation Plan in place to receive Federal Grant Funds for Hazard Mitigation Projects**
  - o **PDM (Pre-Disaster Mitigation)**
  - o **HMGP (Hazard Mitigation Grant Program)**
  - o **FMA (Flood Mitigation Assistance)**
- **Connecticut has limited HMGP funds to distribute from Hurricane Sandy, Winter Storm Nemo in 2013, and the winter storm of early 2015**
- **However, DEMHS does not plan to solicit grant applications ☹**

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How Can the Plan be Used?

- **Grants can be used for:**
  - o **Building acquisitions or elevations**
  - o **Culvert replacements**
  - o **Drainage projects**
  - o **Riverbank stabilization**
  - o **Landslide stabilization**
  - o **Wind retrofits**
  - o **Seismic retrofits**
  - o **Snow load retrofits**
  - o **Standby power supplies for critical facilities**

This home in Trumbull was acquired and demolished using a FEMA grant

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How Can the Plan be Used?

Culvert Replacement to be funded by HMGP

Floyd 1999

Irene 2011

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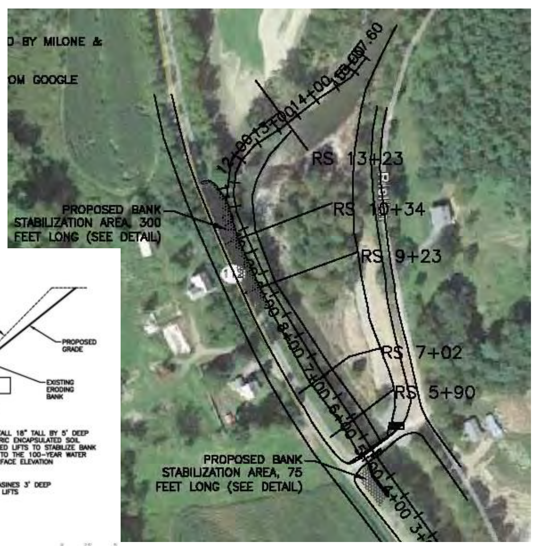
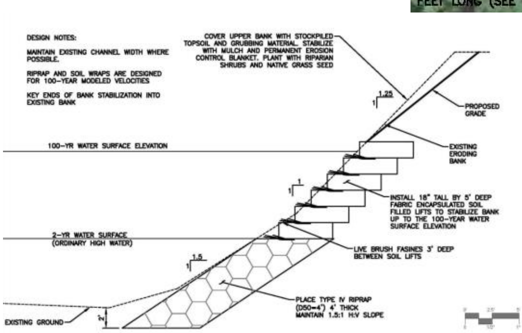
How Can the Plan be Used?



Riverbank Stabilization to be funded by HMGP



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Hazards Proposed to Include in the Plan

- Floods
- Hurricanes and tropical storms
- Summer storms and tornadoes

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Hazards Proposed to Include in the Plan

- Winter storms and nor'easters
- Earthquakes
- Wildfires
- Dam failure
- Landslides (optional)

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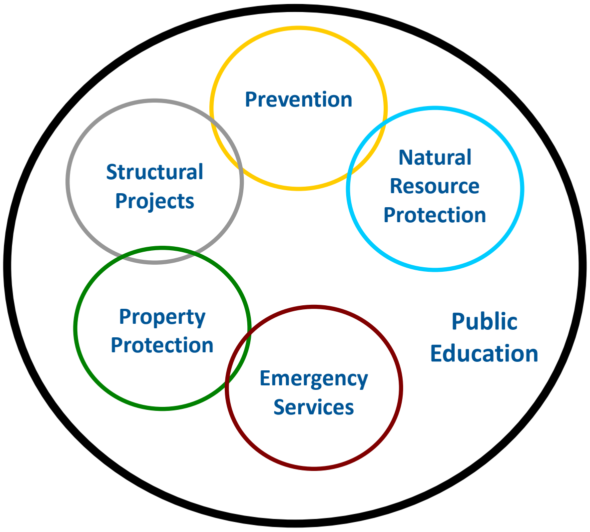
Hazard Mitigation Strategies and Actions



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Flood Mitigation Strategies

Flood Mitigation

Structural Projects

- Replace Bridges and Culverts
- Remove In-Stream Dams
- Remove Obstructions
- Upstream Detention
- Install Stormwater Systems
- Create Floodways
- Enlarge Channels
- Reduce Flow Resistance
- Install Levees
- Install Flood Walls

Property Protection

- Wet Floodproofing
- Dry Floodproofing
- Elevate Buildings
- Relocate Buildings
- Secure Utilities
- Anchor Floatables
- Remove Hazardous Materials
- Re-Grade Properties
- Purchase Flood Insurance
- Join the Community Rating System (CRS)

Prevention

- Modify Zoning
- Modify Comp Plan
- Stormwater Management Regulations
- Increase Flood Damage Prevention Standards
- Freeboard
- Low Impact Development
- Minimize Impervious Cover

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Flood Mitigation Strategies

Flood Mitigation

Natural Resources

- Acquire or Preserve Floodplain Land
- Acquire and Remove Structures from Floodplains and Convert to Open Space
- Acquire or Preserve Other Lands
- Increase Wetland Storage
- Re-Connect Streams to Floodplains

Emergency Services

- Build Local Capacities to Respond
- Move Critical Facilities from Flood Risk Areas
- Establish Emergency Shelters
- Elevate Roads or Bridges to Ensure Egress
- Develop Community Evacuation Plans
- Develop Site-Specific Evacuation Plans
- Establish Satellite Facilities in Areas Subject to Isolation

Public Education

- Newsletters
- Community Meetings
- Information Kiosks
- Web Site with Flood Risk Maps
- Education of Municipal Staff
- Leverage State and FEMA Education Programs
- Establish a Standing Committee or Board to Oversee Outreach

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Other Hazard Mitigation Strategies

- Strengthen or reinforce shelters and critical facilities
- Create backup critical facilities
- Bury utilities
- Harden utilities
- Expand and fund tree maintenance programs
- Snow load removal plans and programs
- Shutters, load path, and roof projects
- Enhance fire suppression capabilities with dry hydrants, cisterns, etc.
- Bracing for potential earthquake damage
- Public education programs and resources

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Components of Hazard Mitigation Plan Process

- Review natural hazards that could occur
- Update the vulnerability assessment for structures and populations; and identify critical facilities and areas of concern
- Incorporate effects of federally declared disasters that have occurred in the last few years:
  - Winter snow loads/collapsing roofs in January 2011
  - Tropical Storm Irene in August 2011 (and T.S. Lee afterward)
  - Winter Storm Alfred in October 2011
  - Hurricane Sandy in October 2012
  - Winter Storm Nemo in February 2013
  - Winter Storm of January 2015

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Components of Hazard Mitigation Plan Process

- Assess adequacy of mitigation measures currently in place such as regulations and drainage projects
- Update mitigation goals, strategies, and actions
- HAZUS vulnerability/risk analysis and loss estimates
- Outreach to neighboring towns
- Public participation
- Develop plan document
- State (DEMHS) and FEMA reviews
- Local adoption
- Annual plan maintenance and reporting

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Data Collection and Discussion

- What are the town's critical facilities?
- Shelters and evacuation routes
- Standby power supplies
- Discussion of recent storms (Irene, Alfred, Sandy)
- Development and redevelopment trends
- Update on areas of flooding
- How are drainage and flooding complaints received and tracked?
- Have any bridges, culverts, or stormwater systems been replaced or upgraded?
- Dams and effects of dam failure

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Data Collection and Discussion

- Update on areas prone to wind damage or increased wind damage risk
- Tree maintenance and tree warden budget
- Update on snow and ice removal routes and capabilities
- Update on areas prone to icing or drifts in winter
- Areas without fire protection and use of dry hydrants and cisterns
- Areas prone to wildfires, fire department capabilities, coordination with nearby municipalities

MILONE & MACBROOM

Loss Estimates

- **Public Assistance reimbursements needed (2011-2015)**
- **Typical costs to recover from a severe thunderstorm**
- **Typical costs to recover from a severe winter storm**
- **Typical costs to address a wildfire or brush fire**
- ***The September 2015 wildfire provides a unique opportunity to gather financial losses for the plan***

Milone & MacBroom

Hazard Mitigation Strategies and Actions

- **Review prior actions**
- **New mitigation actions?**
- **What one or two things can be done in New Fairfield with current budgets?**
- **What one or two things would be done in New Fairfield if money was not a concern?**

Milone & MacBroom

Next Steps

- Provide loss estimates and financial figures
- Outreach and public involvement
  - Coordination with other HVCEO/WestCOG municipalities
  - Public information meeting in Autumn 2015
  - Choice of survey vs. a meeting

MILONE & MACBROOM

DATE: October 29, 2015
MMI #: 3101-14-5
PROJECT: New Fairfield HMP Update

SUBJECT: Town of New Fairfield Municipal Staff HMP Update Meeting
LOCATION: New Fairfield Town Hall
4 Brush Hill Road
New Fairfield, CT 06812

ATTENDEES:
Jim Vigar, Director of the Office of Emergency Management
Bob Rzasa, Director of the Public Works Department
Susan Chapman, First Selectman
Christopher Baldwin, Building Official
Rob Sachnin, AICP, Senior Planner, WestCOG
Dave Hannon, Deputy Director, WestCOG
Noah Slovin, Milone & MacBroom, Inc.
David Murphy, P.E., CFM, Milone & MacBroom, Inc.

A. Welcome and Introductions

Mr. Murphy welcomed the attendees and conducted introductions.

B. Description and Need for Hazard Mitigation Planning

Mr. Murphy presented details on the purpose and need for mitigation planning, availability of grant programs, the hazard mitigation planning process, the current status of the plan update, and the project schedule. The Initial New Fairfield plan is still in effect through August 2016.

C. Data Collection

Mr. Murphy led the meeting participants through the different sections of the Hazard Mitigation Plan update in order to determine changes in the status of previous projects, information on new projects, or other new information.

- Capabilities Update: The town reported on any new equipment, etc., they had acquired
  - A new power generator was acquired and placed at the Company A fire station
  - A new tractor trailer was purchased to assist with future transport of emergency supplies.

- Standby power: New Fairfield has a few outstanding standby power needs
  - A new standby generator was purchased for the New Fairfield Volunteer Fire Department Company A Station at 302 Ball Pond Road ("Public Safety Complex" with Police Department, Fire Station, and Emergency Operation Center) in 2014. This is an anchored generator, so not portable.
  - Two portable generators are stored at the New Fairfield High School (54 Gillotti Road), and can be transported to facilities in need during emergencies. (There is an additional anchored generator at the senior center and one at the police department).
  - After the October Winter storm (Winter Storm Alfred) in 2011, and the subsequent power outage, many local businesses and homeowners bought small-scale private generators.
  - The Town would like to acquire two more portable generators, one to be stored at the Town Hall and a second at the Drop-Off Center. Ideally, a third would go to the library.

- Recent Development: New Fairfield has seen minor development, as well as some renovation
    - A new subdivision named Barn Brook is being developed on Route 37. Current plans are for the number of units to be in the 20s, but the developer may go as high as 40. The houses are set back from the stream that flows through the site. This stream flows through a box culvert under the access road to the development.
    - There have been about 4 teardowns/rebuilds in the last 5 years. These have been relatively small homes on the shores of Candlewood Lake that have been torn down and replaced with larger houses.

- Recent Significant Events:
    - Tropical Storm Irene: 90% of the Town lost power during this event, and power wasn't completely restored for 6 to 7 days afterwards. The Town opened its primary shelter (New Fairfield High School) during and after this event, providing residents with food, water, showers, and supplies. The Senior Center was used to house about 15 residents.
        - During Irene, the State DEMHS distributed emergency supplies out of Rentschler Field in Hartford – they were not able to ship them to New Fairfield. After this event the Town purchased their own tractor trailer to help in future events.
        - It was also noted that the distribution center loaded the truck that the town rented for transport with a forklift, and when the truck arrived at the Town it was a challenge to unload the supplies.
    - Winter Storm Alfred: Snow caused trees and limbs to fall, taking out power for 100% of the Town. Power wasn't completely restored until 8 days after the storm. The primary Shelter (New Fairfield High School) was open for food, water, showers, and supplies. The Senior Center housed about 15 residents.
    - Hurricane Sandy: Sandy had a minor impact on New Fairfield. Only a small number of power outages were reported. The High School shelter was open for 4-5 days.
    - June 2011 Microburst and Waterspout: This strong wind event took town a significant number of trees and power lines, impacting infrastructure. At Candlewood Hills there were 2 weeks of cleanup. Schools in that area were closed for two days. A tree fell on a house, cutting it in half. Another tree fell on a photovoltaic system. The Town shelter was opened.
    - Damage figures can be extracted from public assistance numbers. We'll talk to Ed (203-312-5656)

- Utilities: Loss of power from downed trees and limbs is a primary concern in New Fairfield
    - Eversource has taken over power distribution in New Fairfield. They have a good liaison for the town now, which the meeting attendees agreed has been beneficial. It is still a challenge to restore power after events because the Town is at the end of the line.
        - Despite the positive response to the liaison, meeting attendees stated that response time has actually diminished since Eversource took over from Connecticut Light and Power. They complained that Eversource has not been forthcoming with its information, which would help pinpoint power outage risk locations.

- o The Town has an effective plan for tree maintenance. 10 years ago they were spending $40-50 K a year. Now they are down to about $15 K a year. The Town does have a tree warden (who was not present).

- Flooding: This is a moderate concern in New Fairfield.
  - o Drainage complaints are common and occasionally result in projects. The Town has to look into the problem first, and check the legalities and liabilities.

- Dam Failure: This is a moderate concern in New Fairfield.
  - o The Town received an Emergency Action Plan for the Margerie Reservoir this past year (2014-2015)

- Wind: This is a major concern in New Fairfield.
  - o There have been no changes in wind vulnerabilities.

- Winter Storms: This is a moderate concern in New Fairfield.
  - o The Town would like to do a GPS study of their roads to improve plowing routes.
  - o The Town often has to plow routes 37 and 39 (the primary State roads in the area), despite that being the State's responsibility.
  - o Gillotti Road experiences problems due to snow drift. They used to put up snow fencing but it was not effective given the effort involved. The ballfields adjacent to the road are the source of the problem.
  - o In 2011 the roof of the Chatterton Marina at Candlewood Lake collapsed.

- Earthquakes: This is a minor concern in New Fairfield.
-

- Wildfires: This is a moderate concern in New Fairfield.
  - o New Fairfield experienced a significant wildfire in September 2015. 35 departments were involved in fighting the fire. 28 acres of State forest-land was burned. The plume was 3,000 feet high. The blaze was first discovered on a Saturday covering 10 acres, and was controlled. On Sunday it had spread more. No losses to structures or vehicles were experienced, with a minor amount of lost gear and supplies.
  - o There have been a few other small brush fires over the years.
  - o New developments are required to have underground cisterns to support firefighting efforts.
  - o The High School recently installed a new sprinkler system.

D. Goals, Objectives, and Strategies

- A worksheet containing the strategies from the 2011 plan was reviewed. Results are included in a table below.
- East Lake Brook Project: all four culverts in this watershed have been upgraded and have increased capacity.
- Candlewood Corners: a culvert replacement project is underway – construction is expected to take place in 2016. This project will increase the capacity of the culvert to pass water during high flows, thereby reducing flooding.
- Sawmill Roach Bridge: Bridge upgrade to increase capacity is in design and should take place in 2017. This project is federally funded. (?)
- Muskett Ridge Bridge: Bridge upgrade to increase capacity was completed in 2013.
- Get more generators
- Look into creating a town microgrid: this is an idea about which the previous First Selectman, John Hodge, was interested. Dave Hannon described the concept.
    - It can be challenging to know which transmission line is out and causing an outage. The microgrid helps mitigate this problem.
    - Not sure if PURA program is still on to help support this.
- Installing Solar Panels on town buildings (and elsewhere?) may be desired to mitigate regional power outages.
- Somebody has begun running Emergency Preparedness seminars for seniors. In these forums they encourage people to, among other things, purchase emergency radios.
- The town firetrucks have been retrofitted with iPads that have GPS and GIS software, assisting with arriving at emergency locations.

E. <u>Public Outreach</u>

- The idea of a future public meeting was discussed. It was agreed that public meetings are often not a successful forum for reaching a large audience. Instead, efforts will focus on online outreach, and if high interest is shown a public meeting will be considered.

- An online survey (Designed by Milone and MacBroom, Inc using SurveyMonkey) will be issued for New Fairfield as the primary method to solicit feedback from the public.

SUMMARY OF ALL RECOMMENDATIONS

Project	Status
All Hazards	
Disseminate informational pamphlets regarding natural hazards to public locations.	Complete, reclassified as a capability, removed from list of actions
Add pages to the Town website (http://www.newfairfield.org/) dedicated to citizen education and preparation for natural hazard events.	Complete, reclassified as a capability, removed from list of actions
Post a list of Town sheltering facilities in the Town Hall and on the Town's website so residents can best plan how to access critical facilities during a natural hazard event.	Will post on website – has not happened yet. Jim will do this.
Encourage residents to purchase and use NOAA weather radios with alarm features.	Complete. They have townwide. Need to get antennas. Promote during emergency preparedness seminars held for seniors.
Continue to review and update the Town EOP at least once annually.	Capability
Review potential evacuation routes to ensure timely migration of people seeking shelter in all areas of New Fairfield and post evacuation information on the Town website and in municipal buildings.	Complete. Routes need to be flexible. Manually drive streets after an event to find best routes. Reclassified as a capability.
Consider modifying the Plan of Conservation and Development and the Subdivision Regulations to encourage two modes of egress from new neighborhoods by the creation of through streets.	Some new developments do this. Unclear whether any official encouragement takes place. Dunham Pond has 2. This is a capability
Continue reviewing subdivision applications to ensure new neighborhoods and driveways are properly sized to allow access of emergency vehicles.	Capability
Continue to encourage property owners to widen access roads such that fire trucks and other emergency vehicles can access remote locations.	Has been done already where possible. Remaining roads are private and the Town does not have jurisdiction. The Town has reached saturation in encouraging this. The action is to be removed from the list.
Continue to require that utilities be placed underground in new developments and pursue funding to place them underground in existing developed areas.	Done in new developments, and is therefore a capability. Officials want this to happen in already developed areas, but are not hopeful.
Flooding	
Continue to regulate activities within SFHAs.	Complete, reclassified as a capability.
Consider requiring buildings constructed in floodprone areas to be protected to the highest recorded flood level even if not located within a defined SFHA.	Needs to be reviewed anyways. Need to stick to building code.
Ensure new buildings be designed and graded to shunt drainage away from the building.	Capability.
Require developers to support whether detention or retention of stormwater is the best option for reducing peak flows downstream of a project.	Most developments have detention and retention systems. Privately maintained. New Fairfield Subdivision Regulations: From New Fairfield, Connecticut – Code of Ordinances: Supplement 13. Accessed at municode.com on 11/6/15 Online content updated March 31, 2014 Codified through Ordinance of August 6, 2013 Originally published in 1990 by Board of Selectmen Appendix B: Section 1.5 (e) 3: *Downstream drainage.* The board of selectmen and/or town engineer shall also determine the effect of each proposed subdivision on existing downstream drainage facilities outside the area of the subdivision. Where it is anticipated that the **additional runoff** incident to the development of the subdivision will **overload** an existing **downstream** drainage facility during a fifty-year

	storm, the commission shall not approve the subdivision until the subdivider has made such provision for the improvement of such potential condition as the commission deems reasonable to require of the subdivider. The commission shall notify the first selectman of such potential condition where facilities may be involved, at the time of the approval of the preliminary layout.
In conjunction with the land trusts in town, pursue the acquisition of additional municipal open space inside SFHAs and set it aside as greenways, parks, or other nonresidential, noncommercial, or nonindustrial use.	Incomplete. Progress impeded by lack of funding.
Compile a checklist that cross-references the bylaws, regulations, and codes related to flood damage prevention that may be applicable to a proposed project and make this list available to potential applicants.	There is a checklist of individual departments to be contacted by applicants.
Selectively pursue conservation recommendations listed in the Plan of Conservation and Development and other studies and documents.	New developments must assign a portion of their land to be open space. This most recently occurred with the development of Barn Brook.
Continue to regulate development in protected and sensitive areas, including steep slopes, wetlands, and floodplains.	This has been reclassified as a capability
Provide outreach regarding home elevation, flood barriers, dry floodproofing, and wet floodproofing techniques to private homeowners with flooding problems.	Not Needed
<u>Structural Projects</u>	
Pursue/allocate funding to upgrade and/or repair each of the East Lake Brook road crossings discussed in the East Lake Brook Flood Study completed in 2009.	Done
Pursue/allocate funding to construct the improved box culvert conveyance design for the Candlewood Corners road drainage site.	Complete as of 2016.
Pursue/allocate funding to upgrade the Ball Pond Brook road crossing at Bigelow Corners.	Will be carried forward.
Reevaluate the drainage computations for public dead-end roads in town that span a watercourse, evaluating the dead-end roads with the most structures at risk first. If any of these roads are considered sufficiently undersized, resize the culvert or crossing to an acceptable level.	Musket Ridge Bridge is being fixed for that reason. This action will be carried forward for additional similar bridges and culverts.
Encourage the private communities in town to reevaluate the drainage computations for their floodprone streets as well.	Nope
<u>Wind Damage Related to Hurricanes, Summer Storms, and Winter Storms</u>	
Continue tree limb maintenance and inspections, especially along state roads and other evacuation routes. Continue inspections and outreach regarding trees on private property near power lines and Town rights-of-way.	Complete, reclassified as a capability.
Provide for the Building Department to have literature available regarding appropriate design standards for wind.	Complete, reclassified as a capability.
Continue to require compliance with the amended Connecticut Building Code for wind speeds.	This has been reclassified as a capability. The CBC was updated in March 2013 *(Sec. 29-252-1d. State Building Code – [2009 Amendment to the] 2013 Amendment to the 2005 Connecticut*

	Supplement.). New Fairfield's Wind Speed standard was raised to 100 mph.
Encourage the use of structural techniques related to mitigation of wind damage in new structures to protect new buildings to a standard greater than the minimum building code requirements.	No new critical facilities are planned in the Town, so this actions is not needed within the lifetime of this updated HMP. It will be removed from the list of actions.
Winter Storms	
Continue to provide information on the dangers of cold-related hazards.	This has been reclassified as a capability. Information is provided through the website.
Consider prioritizing plowing routes and post the snow plowing prioritization in Town buildings each winter to increase public awareness.	Complete. An additional action with the goal of prioritizing plowing routes (performing a GPS analysis of Town roads) has been developed during the update process.
A new thing!	Meeting House School was renovated and snow loading was upgraded
Earthquakes	
Consider preventing new residential development in areas prone to collapse.	Must submit an engineered plan for construction on a slope. Check Steep Slope Regulations
Continue to require adherence to the state building codes.	This has been reclassified as a capability.
Ensure that municipal departments have adequate backup facilities such as portable generators in case earthquake damage occurs.	Complete – the town has two portable generators. Additionally, files are backed up off-site through Iron Mountain through a UConn grant. The Town desires to acquire additional generators.
Dam Failure	
Stay current on the evolution of EOPs and Dam Failure Analyses for Class B dams whose failure could impact areas of New Fairfield. Place copies of any dam EOPs and Dam Failure Analyses on file in the Town Hall for public viewing.	This has been reclassified as a capability. Received an EAP for Margerie Reservoir this past year.
Consider implementing Town inspections of Class AA, A, BB, and unranked dams.	Not desired. CT DEEP is implementing new dam safety regulations that will require owners of even these low-hazard dams to perform inspections. This action will be removed.
Include dam failure areas in the contact database for the AlertNow emergency notification system.	AlertNow replaced by Blackboard. Might be upgrading to a new company that has more capabilities for special needs.
Consider establishing a Flood and Erosion Control Board in New Fairfield to oversee private dam maintenance and problems with flooding and erosion.	No longer needed (see above).
Wildfires	
The Town should continue to require the installation of fire ponds with dry hydrants and water tanks in new subdivisions and commercial developments and should look to install additional supplies of fire fighting water where adequate water supplies do not currently exist.	Reclassified as a capability.
Continue to promote intermunicipal cooperation in fire fighting efforts.	Reclassified as a capability.
Continue to support public outreach programs to increase awareness of forest fire danger and how to use common fire fighting equipment.	Reclassified as a capability.

Provide outreach programs on how to properly manage burning and campfires on private property.	Complete. For example, school field trips go to the fire house and learn about fire safety. Reclassified as a capability.
Patrol Town-owned open space and parks (especially the landfill) to prevent unauthorized campfires.	Reclassified as a capability.
Enforce regulations and permits for open burning.	Reclassified as a capability. Mike Crawford, the Fire Marshall, is the Open Burning Official.

Town of New Fairfield
Board of Selectmen
4 Brush Hill Road
New Fairfield, CT 06812

MINUTES
Board of Selectmen Special Meeting
Monday, August 30, 2010
7:30 PM
Community Room

Members present:
John Hodge, First Selectman
Susan Chapman, Selectman
Monika Thiel, Selectman

Other Town Officials Present:
Ed Sbordone, Accounting Manager
Wes Marsh, BOF Chairman
Robert Klick, BOF Member
Jane Landers, BOF Member
Al Mardis, BOF Member
Tom Wahlig, BOF Member
Mike Gill, HRRA

Call To Order First Selectman John Hodge called the meeting to order at 7:30pm

Pledge of Allegiance

Correspondence and Announcements
First Selectman Hodge read a letter that he received from MCCA thanking the town for the $5,000 donation that was sent from the sober house zoning violations fine.

First Selectman Hodge noted that New Fairfield is now officially a “Heart Safe” Community.

First Selectman Hodge noted that school will be opening this week and reminded everyone to drive safely.

First Selectman Hodge reminded residents to lock the doors of their homes and cars.

Selectman Thiel read a letter from some of the parents of the swim team regarding the swim docks at the Town Park. First Selectman Hodge noted that he would like to have a discussion regarding this issue and will put it on the agenda for the Tuesday, September 7th BOS meeting. The letter will be attached to the minutes of this meeting.

Selectman Susan Chapman noted that there will be a Natural Disaster Mitigation meeting on Tuesday, September 7th at 7:00pm.

Public Comment
Resident Jim Mellett asked about a business plan for the Historic Houses.

Mike Gill from HRRA (Housatonic Resources Recovery Authority) noted that there will be a “WE Recycle” day on Saturday, September 18th at the parking lot of the Senior Center from 9am to 1pm. Up to

7 electronic items per car can be recycled. Electronics accepted will be computers, laptops, TVs, scanners, monitors, printers, fax machines, etc. Mr. Gill asked that no home appliances be brought.

Mr. Gill further noted that Saturday, September 25th will be Household Hazardous Waste Day at the Danbury Public Works facility at 53A Newtown Road from 9am to 2pm. Items collected at this event include paint, varnishes, paint strippers, etc.

First Selectman John Hodge noted that the Historic Houses have been rented to Preserve New Fairfield, Inc. and it is up to them to devise a business plan. Mr. Hodge also noted that there is a fire line already in place at the Historic Houses.

Approval of Minutes
Susan Chapman made a motion to approve the minutes of the August 12, 2010 regular meeting as presented. John Hodge seconded the motion.

Vote: 3-0-0 (Motion approved)

Agenda Items
John Hodge made a motion to switch agenda item #6 (Budget Transfers) with agenda item #7 (Discuss and possibly vote on $200,000 surplus to Williams Road Bridge). Susan Chapman seconded the motion.

Vote: 3-0-0 (Motion approved)

Discussion and vote to apply 2009/2010 surplus to Williams Road Bridge project
First Selectman Hodge noted that the town has approximately $750,000 in budget surplus from the 2009/2010 fiscal year. Mr. Hodge spoke of using $250,000 towards the Williams Road bridge project. Bridges on Smoke Hill and Old Farm Roads are already scheduled to be done and the contractor has agreed to extend the contract to October 1, 2010 and give the same price for the Williams Road Bridge. The price for the Williams Road project would be approximately $266,000. There was a discussion of whether $200,000 or $250,000 of the surplus should be used for this project. The use of the surplus must be approved by the BOF and also approved at a Town Meeting.

Susan Chapman made a motion to recommend to a Town Meeting an Additional Appropriation of $250,000 from the 2009/2010 budget surplus for the Williams Road Bridge project pending BOF approval. John Hodge seconded the motion.

Vote: 2-0-1 (Motion approved-Monika Thiel abstained)

Budget Transfers
John Hodge made a motion to make the following Inter-Departmental transfer in the amount of $22,744.33. Monika Thiel seconded the motion. (Such document to be attached to the minutes of this meeting)

Vote: 3-0-0 (Motion approved)

$'s	To Account #		$'s	From Account #	
$2,818.80	4215-110	Comm. Center-Salaries	$22,744.33	4160-140	Unclass. P & B Salary Adj.
$5,711.47	4210-110	Police-Salaries-Officers			
$14,214.06	4310-110	Public Works-Salaries			
$22,744.33			**$22,744.33**		

John Hodge made a motion to make the following Additional Appropriation in the amount of $250,000.00 (Town Meeting Required) from the 2009/2010 budget surplus. Susan Chapman seconded the motion. (Such document to be attached to the minutes of this meeting)

Vote: 2-0-1 (Motion approved-Monika Thiel abstained)

$'s	To Account #		$'s	From Account #	
$250,000.00	301-4330-742-1	Cap & Non-Bridge and Drainage	$250,000.00	Town Expenditure Surplus	Appropriation of surplus funds to Capital and Non-Recurring Fund.
$250,000.00			**$250,000.00**		

John Hodge made a motion to make the following Additional Appropriation in the amount of $7,228.40 (Town Meeting Required) Susan Chapman seconded the motion. (Such document to be attached to the minutes of this meeting)

Vote: 2-0-1 (Motion approved-Monika Thiel abstained)

$'s	To Account #		$'s	From Account #	
$7,228.40	301-4220-7	Cap & Non Town Properties	$7,228.40	301-4340-7	Cap & Non-Fire Companies
$7,228.40			**$7,228.40**		

John Hodge made a motion to make a transfer from the Town Properties Capital Budget in the amount of $27,234.91 for a Mobile Generator ($23,234.91) and Carpentry/Paint Repairs Town Hall ($4,000.00). Susan Chapman seconded the motion. (Such document to be attached to the minutes of this meeting.)

Vote: 2-0-1 (Motion approved-Monika Thiel abstained)

Discussion and vote to set Town Meeting date

John Hodge made a motion to approve the following Warning for a Town Meeting. Susan Chapman seconded the motion.

Vote: 2-0-1 (Motion approved-Monika Thiel abstained)

WARNING

Notice is hereby given to the electors of the Town of New Fairfield and those qualified to vote at Town Meetings that a Special Town Meeting will be held on Wednesday, September 8th 2010 at 7:30 P.M. in the Community Room @ 33 Route 37 for the following purposes to wit:

1. To consider and take action upon an authorization to apply $250,000 surplus (from the FY ending 6/30/2010) as an additional appropriation to Cap & Non-Bridge & Drainage project. .

2. To consider and take action upon a resolution for an additional appropriation from Cap & Non-Fire Companies to Cap & Non-Town Properties in the amount of $7,228.40 for Town Hall Air Conditioning replacement.

Public Comment- None

General Discussion: Items to be brought up by selectmen for future agendas
It was decided that there will be a discussion of the swim docks at the Town beach at the next meeting.

Selectman Monika Thiel noted that the selectmen attended the "Back to School Convocation" today and reminded everyone to drive safely now that school has started.

Adjournment
Susan Chapman made a motion to adjourn the meeting at 8:11pm. John Hodge seconded the motion.
Vote: 3-0-0 (Motion approved)

Respectfully submitted,

Suzanne Kloos

NEW FAIRFIELD THIS WEEK

Diabetes Informational Session at the Senior Center Thursday August 26th.
Diane Fenwick, Blood Pressure Monitoring, Bill Malave of Candlewood Drugs, Naveen Parupalli, Pharmacist at Candlewood Drugs, Lakshman Paidi, Pharmacist at Candlewood Drugs, Kathy Hull, Director of New Fairfield Senior Center, Josh Farazmand of Pharmacy Plus Network, Mark Strollo of Bayer Health Care and Sue Ann Ciatto of New Fairfield Physical Medicine and Rehabilitation.

CANDLEWOOD DRUGS SPONSORS DIABETES INFORMATIONAL SESSION

Continued from page 1

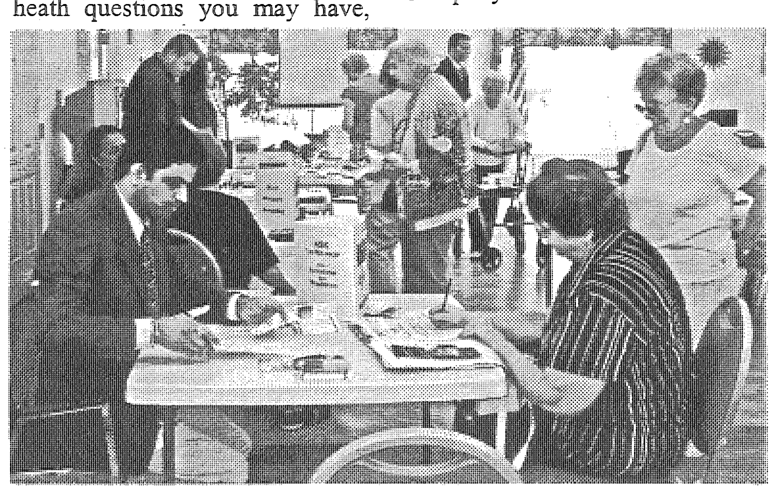
use. He spoke about how having an accurate reading of your blood level is the first step for diabetics when it comes to managing medications and diet and the benefits of the Contour Meter which is a multi-site testing meter which can be utilized on several areas of the body and can store past readings and print out reading histories on a computer.

During the informative session, visitors were also able check their blood pressure and see a display of diabetic footwear. They were also able to speak directly to each of the presenters and sit with pharmacists to answer any questions they had regarding how to know if they have diabetes and how best to manage and live well with diabetes.

If you missed the session, no worries, you can stop in or call Candlewood Drugs anytime with questions you may have in regard to your mediations and how they interact with each other; with questions on glucose meters and how to read them; and guidance on living with diabetes as well as any health related questions they may help with.

You can also call dietician Sue Ann Ciatto, of PMR NY&CT, who has an office in the Fairwood Professional Building, in New Fairfield. Sue Ann will also discuss if Medicare will cover fees for you, as they do cover nutritionists for diabetes patients. She can be reached at 203-312-0210.

Candlewood Drugs is located at 11 Route 37. You can stop in or call them at 203-312-9999. In addition to helping with any heath questions you may have, keep in mind they have a dedicated driver who will pick up your prescription for any patron either at your home, place of business or at the Senior Center, return to the pharmacy for filling it and deliver it back to you. They are a full-service pharmacy offering a wide selection of health and beauty aids, including compression hose, braces, canes, and wheelchairs as well as a vitamin wellness center and a large assortment of gift items including products from Crabtree and Evelyn, Savanna Bee Company and more.



Diabetes Informational Session at the Senior Center Thur. August 26.

SUPERINTENDENT DR. ALICIA ROY

Continued from page 1

be formatted and overlaid to present new sides to the student learning experience that will help school staff plan for better delivery of teaching and support services.

Apart from the move towards a standards-based report card and the technological focus on data warehousing and data management, Dr. Roy was also very enthusiastic about the appointment of Ms. Barbara Mechler as Assistant School Superintendent. Dr. Roy said Ms. Mechler's strong background in literacy will be a great advantage for the district as she envisions a student body that is competent in both numeracy and literacy skills, as early as in the primary grades. The new building renovation projects are also well underway, with the third floor Science Wing of the high school all set to welcome students this September, and the Butler Wing of the elementary school ready for its transformation.

"We're taking what we already have and working it within the systems we've created," Dr. Roy concludes. "We already have the framework. All we have to do now is strengthen this framework and build up the structure, and people are poised to do some great work."

With 23 years of working as an educator, a Ph.D. in Educational Leadership, and a track record of astute project management, Dr. Roy's vision for the district revolves around helping students achieve their individual goals, the highest goals that they should be achieving. And it's a goal that is very much within grasp, given the changes that have already been put in place.

"We can finish what we started," she states confidently. "We can achieve our goals."

Gladys Detlor and Chris Murphy

CN Reporter Alex Messerle Follows Congressman Chris Murphy on the Campaign Trail.

Louise Mallin and Chris Murphy

Have Ideas About How the Town Responds to Natural Disasters?

Come Share Your Ideas Sept. 7th at a Public Meeting On Natural Disaster Mitigation in New Fairfield

There will be a public meeting at 7PM on Sept. 7th in the Senior Center Community Room to discuss ways to minimize the effects of natural disasters in town.

New Fairfield is preparing a plan to identify natural hazards and ways the town can reduce the impact of natural disasters. The town is also in the process of preparing a grant application to remedy some of those areas.

The town and consultants from the firm of Milone and MacBroom will be seeking suggestions from the public about possible local natural hazards from hurricanes, floods, severe thunderstorms, icing and/or earthquakes.

A plan will then be developed to identify town projects that can be undertaken prior to a disaster to reduce loss and damages.

For info. and suggestions, please attend the meeting on Sept. 7th or contact Jean Flynn in the town's Office of Emergency Management at oem@newfairfield.org or 203-312-5725.

Meeting Minutes

PRE-DISASTER NATURAL HAZARD MITIGATION PLAN FOR NEW FAIRFIELD
Initial Data Collection Meeting
August 20, 2010

I. Welcome & Introductions

The following individuals attended the data collection meeting:

- ❑ David Murphy, P.E., Milone & MacBroom, Inc. (MMI)
- ❑ Jenn Hoyle, Milone & MacBroom, Inc.
- ❑ Jean Flynn, Town of New Fairfield Office of Emergency Management
- ❑ Joe Rzasa, Town of New Fairfield PWD Highway Foreman
- ❑ Maria Horowitz, Town of New Fairfield Zoning Enforcement Officer
- ❑ Christopher Baldwin, Town of New Fairfield Building Official
- ❑ Steve Lazarus, Lazarus & Sargeant Architects (New Fairfield Senior Center architect)
- ❑ Lisa Low, Lisa Low & Associates (Town of New Fairfield grant administration)

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

Mr. Murphy from MMI briefly described the basis for the natural hazard planning process and possible outcomes, including the role of the completed plan in grant application support for The Town of New Fairfield (Town).

III. Project Scope and Schedule

The project scope was described, including project initiation and data collection, the public meeting, development of recommendations, and the FEMA Review and Plan (the Plan) adoption. An aggressive four-month schedule was discussed and selected due to the goal of approval by the Town Board of Selectmen on December 5, 2010.

Ms. Flynn is the primary point of contact for the Town. MMI agreed to work with Ms. Low prior to plan completion to provide access to the flooding hazard information in the plan for assistance in her grant application process.

The informational public meeting is scheduled for September 7, 2010 at 7:00 PM at the New Fairfield Senior Center (per Ms. Flynn on August 23, 2010). Ms. Flynn will attend to give opening remarks. Ms. Flynn will ensure that the press release appears in *Citizen News* (weekly paper), and potentially on the public access television station as well as on the town website (with help from the town Librarian). Mr. Murphy will provide examples of public meeting notifications from similar projects. Ms. Low and Ms. Flynn discussed the possibility of First Selectmen Mr. John Hodge making an announcement about the public meeting for the Hazard Mitigation Plan during the next regularly scheduled Board of Selectmen meeting (currently scheduled for Monday August 30, 2010).

Mr. Murphy agreed to send a draft of the presentation for the public meeting to Ms. Flynn for review and comments prior to the meeting.

IV. Hazards to Address

The New Fairfield plan will address flooding, hurricanes and tropical storms, winter storms and nor'easters, summer storms and tornadoes, earthquakes, dam failure, and wildfires. No additional plan sections were discussed.

Noted Flooding and/or Drainage Problem Areas

- There are two properties with reported losses that will be subjects of upcoming grant applications for assistance funding:
    1. Candlewood Corners: due to under-sized culverts draining watershed above Route 39 at intersection with Sawmill Road. Flooding at this intersection has caused damage to commercial properties.
    2. East Lake- 3 locations (Williams Road, Old Farms Drive, and Smoke Hill Drive). According to Mr. Rzasa, most of this flooding is due to undersized culverts along Ball Pond Brook. These sites tend to flood at flow rates above the predicted 50-year storm levels. Ms. Hoyle will view the site on the field tour with Ms. Flynn and Mr. Rzasa (date to be determined) and MMI will review the *Flood Study of East Lake Brook* completed by Cardinal Engineering Associated in March, 2009 for further project details to be included in the Plan.

- Other Problem Areas:
    - There is an icing problem at the northern end of Shortwoods Road near Pootatuck State Park.
    - Road drainage wiped out Bigelow Road during hurricane Floyd.
    - The retention pond at Stone Brook Estates (off Fairfield Drive, between Ball Pond and the New York State border) overtops and floods Albion Drive

- DPW has proactive mitigation programs for flooding including:
    - Checking catch basins and culverts before storms, and
    - Annual cleaning of 300 to 600 catch basins and conveyance pipes per year on a rotating basis with a vacuum truck. They are sure to clear trouble spot at least once a year, and proceed to clear as many locations as possible per summer season.

- Birch Drive property- the Town solved flooding by building up the road.

- In the March 30-31, 2010 storm one property in town got individual assistance from DEP/FEMA. MMI to contact DEMHS to identify property.

Emergency Response Capabilities & Evacuation Routes

- Public complaints go to the police first, then Public Works, then the Fire Department if necessary (for pump-outs). Each department tracks its complaints separately and logs them electronically.

- The "Alert Now" rapid communication system is in place to enable quick message alerts from the Town to enrolled citizens. The State also has the Everbridge system in place for New Fairfield for emergency notification from the State.

Critical Facilities

- Critical Facilities include:

    - The New Fairfield High School and Middle School are the main Red Cross-recognized shelter facilities. The buildings are connected and share facilities. There is a generator on site.
    - The Senior Center is also a shelter. This site is handicapped enabled (including a handicap enabled shower), has a generator, and a 250-person capacity.
    - The Methodist Church is the final shelter facility.
    - The Town Hall and Annex.
    - Three Fire Stations:
        - 302 Ball Pond Road encompasses the Public Safety Complex including the police department (Company A) and the Emergency Operations Center (EOC)
        - 7 Fairfield Drive (Ball Pond Volunteer Fire Department)
        - 255 Route 39 (Squantz Engine Company Volunteer Fire Department)

- To the best of the knowledge of meeting attendees, none of the critical facilities are in the floodplain.

- A communication tower network is currently being built. Two are in place, one at the Girl Scout Camp on Bogus Hill Road and one at the EOC, one will be at the fire department (Squantz Engine Company), and the fourth location is to be determined.

Problem Areas for Wind Damage

- The wind load criterion for buildings is 95 miles per hour. According to Mr. Baldwin, most of the Critical Facilities meet this requirement except the Town Hall and Annex. Meeting participants were unsure about the schools.

- The Town has a tree warden who inspects trees for risk to power lines in conjunction with Public Works staff.

- The police department is often the first agency to call utilities when a limb is at risk or falls on a power line.

- Meeting participants characterized CL&P as proactive with respect to tree management in New Fairfield.

- Where utilities have not been constructed underground or moved underground, it is in locations where it would otherwise be difficult to put them there in the first place. No need for a recommendation on underground utilities.

Problems Due to Snow and Ice

- Plowing: DOT covers Routes 37 and 39, Fairfield Drive, and Shortwoods Drive at the State Park. The Town is responsible for the remaining road except private roads, which are plowed by hired contractors.

- The Town will assist with private roads when necessary to allow for emergency access.

- The Town has distinct microclimates with snow at high elevations when it is raining elsewhere. The police department helps notify public works about snow accumulation, and public works systematically checks high elevation locations during precipitation events.

Dams

- No known problems.

- Meeting participants were unclear as to who owns (and therefore, who is responsible for EOP) Squantz Pond dam.

- Unclear if there is an EOP for the Margerie Lake dam (controlled by the Danbury Water Department)

Wildfires and Fire Protection

- All subdivisions must have fire suppression water storage (underground or dry hydrants)

- A wildfire risk area map should include the state forests, areas with poor access, densely forested areas (especially the YMCA property off Route 37), and Vaughn's Neck.

- The Town has 3 boats for emergency access: one at Town Park, one at Ball Pond, and one at the Squantz Engine Company (The one has the capability to fight fires).

- The old landfill between Bigelow Road and Warwick Road is a fire risk area. It is 50 acres surrounded by development.

Development Trends

- There are several developments that were recently built (<5 years old)
    - Spruce Ridge (Shortwoods Drive at Walnut Ridge Road)
    - Red Fox Court (Shortwoods Drive above Pearse Lake)
    - Titticus Mountain Road/Madeline Drive
    - Sugar Maple (off Warwick Road)
    - Dunham Pond

- There are some large parcels left, but nothing in discussion for subdivision or development.

- One existing building is a potential redevelopment for low income housing: Breezy View off Ball Pond Road at Renda Street

V. Data Needs

- Ms. Flynn to provide the New Fairfield Emergency Operations Plan, and a town hydrant location map.

- Ms. Horowitz to provide a zoning map.

- MMI to contact WMC Engineering for the Sawmill Bridge engineering report.

- MMI to contact Tim Simpkins, the New Fairfield Director of Health, who is a long-standing town employee and would have valuable information about natural hazards in New Fairfield.

VI. Acquisitions

Flood Study of East Lake Brook New Fairfield, CT—March, 2009
Report of Storm Damage to Town Property (Tropical Storm Floyd)—September, 1999

Pre-Disaster Natural Hazard Mitigation Plan
New Fairfield, Connecticut

Presented by:
David Murphy, P.E. – Associate

September, 7, 2010

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History of Hazard Mitigation Planning

Town of NEW FAIRFIELD Connecticut

- **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

FEDERAL EMERGENCY MANAGEMENT AGENCY

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History of Hazard Mitigation Planning

Town of NEW FAIRFIELD Connecticut

- Local municipalities must have a FEMA-approved Hazard Mitigation Plan in place to receive Federal Grant Funds for Hazard Mitigation Projects
  - PDM (Pre-Disaster Mitigation)
  - HMGP (Hazard Mitigation Grant Program)
  - FMA (Flood Mitigation Assistance)
  - RFC (Repetitive Flood Claims)
  - SRL (Severe Repetitive Loss)

PDM PRE-DISASTER MITIGATION

HMGP HAZARD MITIGATION GRANT PROGRAM

FMA FLOOD MITIGATION ASSISTANCE

RFC REPETITIVE FLOOD CLAIMS

SRL SEVERE REPETITIVE LOSS

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History of Hazard Mitigation Planning

Town of NEW FAIRFIELD Connecticut

State	Description	Grant
Connecticut	Home elevations	$641,025
Connecticut	Culvert replacement	$500,000
Connecticut	Home acquisition	$411,000
Connecticut	East Haven home elevation	$75,206
Connecticut	Home elevation	$64,575
Connecticut	Home elevation	$56,700
Maine	Floodplain acquisition and structure removal	$2,157,678
Massachusetts	Downtown flood mitigation/culvert replacement	$3,000,000
Massachusetts	Pond flood hazard project	$1,745,700
Massachusetts	Flood hazard mitigation project	$1,079,925
Massachusetts	Culvert project	$525,000
Massachusetts	Housing elevation and retrofit	$473,640
Massachusetts	Housing elevation and retrofit	$449,935
Massachusetts	Road mitigation project	$186,348
Massachusetts	Flood mitigation project	$145,503
New Hampshire	Water planning for firefighting	$134,810
New Hampshire	Culvert project	$112,500
New Hampshire	Box culvert project	$102,000
New Hampshire	Culvert project	$72,750
New Hampshire	Dry hydrants	$15,251
New York	Beach road elevation	$1,792,521
New York	Subdivision utilities: overhead to underground	$300,767
New York	WWTP Floodwall construction	$223,200
New York	Culvert project	$122,664
Vermont	Fluvial erosion risk assessment	$337,498
Vermont	Road mitigation project	$140,441
Vermont	Inundation & erosion controls to a public building	$99,188

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What is a Natural Hazard?

Town of NEW FAIRFIELD Connecticut

- An extreme natural event that poses a risk to people, infrastructure, and resources

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What is Hazard Mitigation?

Town of NEW FAIRFIELD Connecticut

- ***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

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Long-Term Goals of Hazard Mitigation

- Reduce loss of life and damage to 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

Town of NEW FAIRFIELD Connecticut

- Identify natural hazards that could occur in New Fairfield
- Evaluate the vulnerability of structures and populations and identify critical facilities and areas of concern
- Assess adequacy of mitigation measures currently in place such as regulations and emergency services
- Evaluate potential mitigation measures that could be undertaken to reduce risk and vulnerability
- Develop recommendations for future mitigation actions

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Critical Facilities in New Fairfield

Town of NEW FAIRFIELD Connecticut

- Public Safety Complex / EOC
- High School / Middle School
- Senior center
- Town Hall & Annex

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Critical Facilities in New Fairfield

Town of NEW FAIRFIELD Connecticut

- Fire Stations
  - Company A
  - Ball Pond
  - Squantz
- Methodist Church
- Public Works

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Potential Mitigation Categories

Town of NEW FAIRFIELD Connecticut

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Potential Mitigation Measures

Town of NEW FAIRFIELD Connecticut

- Provide Emergency Notification System such as the AlertNow System
- Adopt local legislation that limits or regulates development in vulnerable areas
- Public education programs – dissemination of public safety information
- Construction of structural measures
- Replace undersized bridge and culverts
- Preserve critical land areas and natural systems
- Elevate or remove flood-prone buildings
- Replace overhead utilities with underground utilities
- Install dry hydrants

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Primary Natural Hazards Facing New Fairfield

Town of NEW FAIRFIELD Connecticut

- Flooding
- Winter storms, nor'easters, heavy snow, blizzards, ice storms
- Hurricanes, tropical storms
- Summer storms, tornadoes, thunderstorms, lightning, hail
- Dam failure
- Wildfires
- Earthquakes

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Hurricanes and Tropical Storms

Town of NEW FAIRFIELD Connecticut

- Winds
- Heavy rain / flooding

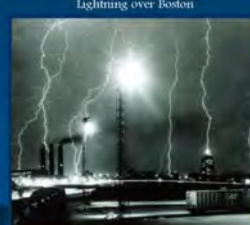
MILONE & MACBROOM®

Summer Storms and Tornadoes

Town of NEW FAIRFIELD Connecticut

- Heavy wind / tornadoes / downbursts
- Lightning
- Heavy rain
- Hail

Flooding in MN



Lightning over Boston

Tornado in KS

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Winter Storms and Nor'easters

- Blizzards and nor'easters
- Heavy snow and drifts
- Freezing rain / ice




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Dam Failure

- Severe rains or earthquakes can cause failure
- Possibility of loss of life and millions of dollars in property damage


Milone & MacBroom®

Wildfires

Town of NEW FAIRFIELD Connecticut

- Fire
- Heat
- Smoke
- April is the month of maximum risk in Connecticut

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Earthquakes

Town of NEW FAIRFIELD Connecticut

- 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

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Area-Specific Problems
Town of NEW FAIRFIELD Connecticut
East Lake Brook Corridor
▪ Undersized culverts, Overbank flooding
▪ Properties with damages / losses
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Area-Specific Problems
Town of NEW FAIRFIELD Connecticut
Candlewood Corners
▪ Undersized culverts
▪ Poor drainage
▪ Heavy runoff
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Area-Specific Problems

Town of NEW FAIRFIELD Connecticut

Bigelow Corners

- Undersized culverts, Poor drainage
- Heavy runoff

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Next Steps

Town of NEW FAIRFIELD Connecticut

- 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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Questions & Additions

Town of NEW FAIRFIELD Connecticut

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Storm Nicole Field Reconnaissance

David Murphy

October 1, 2010

New Fairfield Natural Hazard Mitigation Plan

Storm Nicole consisted of the remnants of a tropical storm combined with a low pressure system. Widespread and heavy rain stretched along the entire eastern United States. The heaviest rain occurred in New Fairfield in the early morning of October 1, 2010, with rainfall continuing throughout the day. The field reconnaissance was timed to correspond to the end of the heavy rain, in mid-morning.

New Fairfield was entered at its northwest corner (Route 37) and traversed generally from northwest to southeast, including the following roads: *Route 37, Bigelow Road, Ball Pond Road (Route 39), Barnum Road, Smoke Hill Drive, Old Farm Road, Williams Road, Indian Hill Road, Gillotti Road, the downtown area, and the Candlewood Corners area (Route 39 and Saw Mill Road).*

Target areas included those previously identified by Town officials: Bigelow Corners, East Lake Brook, and Candlewood Corners. High flows were observed, but flooding was not observed. Eleven photographs were taken as described below:

1. Ball Pond Brook was high but completely conveyed by the culverts at Route 37.
2. Same as #1
3. A different stream crosses under Route 37 on the south side of the house at Bigelow Corners. This stream appears to be conveyed under the road through a different type of structure that was completely submerged. The water was almost at the edge of the road. A slightly more severe storm would have caused the stream to cross the road. The roadside is eroded and armored with riprap directly across the road, indicating that the stream does cross the road under severe weather conditions.
4. Different view of the other stream
5. Road surface above the stream
6. Downstream view of the other stream; note road shoulder erosion
7. East Lake Brook at Smoke Hill Drive
8. East Lake Brook at Smoke Hill Drive
9. East Lake Brook at Old Farm Road
10. East Lake Brook at Williams Road (at the property where damage has occurred)
11. East Lake Brook at Williams Road

Candlewood Corners was visited, but flooding was not occurring. The small stream was flowing and its culverts were handling all the water. Water was not flowing down the side of the road or onto the commercial properties. This area probably responds very quickly under intense rainfall events.

1. Ball Pond Brook at Bigelow Corners

2. Ball Pond Brook at Bigelow Corners

3. Other stream or separate part of Ball Pond Brook at Bigelow Corners

4. Other stream or separate part of Ball Pond Brook at Bigelow Corners

5. Bigelow Corners

6. Other stream or separate part of Ball Pond Brook at Bigelow Corners

7. East Lake Brook at Smoke Hill Drive

8. East Lake Brook at Smoke Hill Drive

9. East Lake Brook at Old Farm Road

10. East Lake Brook at Williams Road

 11. East Lake Brook at Williams Road	

APPENDIX C
PHOTOS OF NEW FAIRFIELD STORM DAMAGE

PWD COPY

Town of New Fairfield
Public Works Department

Report of Storm Damage to Town Property

Tropical Storm Floyd
September 16-17, 1999

Presented to:

Town of New Fairfield
Board of Selectmen

Prepared by:

Dale Coté
and
Jackie Thayer

September 24, 1999

Town of New Fairfield
Public Works Department

Tropical Storm Floyd September 16-17, 1999
Storm Damage

After moving up the Eastern Coast of the United States and causing billions of dollars worth of damages, and then being downgraded to a Tropical Storm, Floyd made its presence known in the Town of New Fairfield around 2:00 p.m., September 16, 1999.

During the two days prior to the storm, the Public Works Department devoted their time to clean catch basin tops, swales and culverts from debris, and cut down any trees or limbs that could possibly fall during the high winds.

Roughly around 5:00 p.m. the severe rains had caused almost every watercourse, body of water, and wetland area to overtop its banks and flood many, many locations. Luckily, the high winds that were predicted never really materialized. The 10.76" of rain that fell, and collected into those watercourses caused them to completely flood. Areas that these watercourses crossed underneath roads, via bridges or pipe culverts, sustained major damage. In many areas, the water was much more than the crossings could handle, causing the roads to be flooded over. Once under the rushing water, the roads and culverts eventually failed, causing major washouts that closed roads until they could be attended to after the water receded. The force of this water was so great, that it actually ripped wooded guide posts out of the ground, carried rocks away that were over three feet in diameter, and carved shoulders and pavement away with ease.

The town's road system was damaged in many other locations that were not near any watercourses. During the rain, the edges or gutters of the roads were eroded away from the velocity of the water. At some locations, after the edges of the pavement were exposed, water then traveled underneath the asphalt, causing sinkholes, buckling, and collapsed areas. With the water also came siltation. This silt was also carried (shoved) underneath the asphalt and caused the road to heave up in several locations. At other locations, catch basins were ripped apart, paved swales were turned into huge craters at the edges of the road.

By 8:00 p.m. that night, Beaver Bog Road had failed in three locations, two of which, the road was totally washed away, losing approximately 500CY of material. The third location has been badly buckled as described above. Smoke Hill Road, at the bridge was closed due to the total washout of 1 ½ lanes, Old Farm Road, at its bridge was closed due to the loss of one lane. Many other sites had two to four feet of silt, topsoil, raw septic, and other materials covering the roads entirely. The department was also responding to many locations where sandbags were needed, trees had fallen, and drainage structures were clogged with fresh debris.

As soon as the water receded enough to allow for repairs to be made, the department started getting the roads open one by one. All hazardous areas that could not be attended to were barricaded until repairs were made. As of this date, all roads are open to two-lane traffic, and all major washouts within the travel lanes are secured and safe for the public. We are currently stabilizing areas where roads are vulnerable to further damage as time goes on.

Everyone in the Public Works Department, Police Department, and the Fire Department did an outstanding job managing the unmanageable. If it were not for everyone's professionalism, skill, experience, and quick thinking, the damages could have easily doubled. The damages that our infrastructure sustained due to this storm are great, and widespread. The repairs will take the rest of the fall to complete, at the least. I have compiled a list of all the damages that have been documented to date. I have also provided pictures when possible. Bear in mind that even after re-inspecting all 66 miles of road, which new problems are being discovered, and reported from residents every day.

The News-Times

ATURDAY
tember 18, 1999

Volume 116, No. 261 © Copyright 1999 • The News-Times, Danbury, Connecticut

AT THE NEWSSTAND 50¢

Storm of the century

By Robert Miller
THE NEWS-TIMES

DANBURY — Although nearly 500 days are still left in this century, the record Tropical Storm Floyd set in the city yesterday — 9.6 inches of rain — seems likely to stand into 2001 and decades after that.

According to the Connecticut Weather Center, that's the most rain the city has ever received in a single day, easily beating one-day totals from such fabled storms as the Hurricane of 1938, the Great Flood of 1955 and the October floods of the same year which, while not as devastating statewide as the Great Flood that August, proved far more destructive to the city.

"It's rather incredible," said weather center meteorologist Bill Jacquemin.

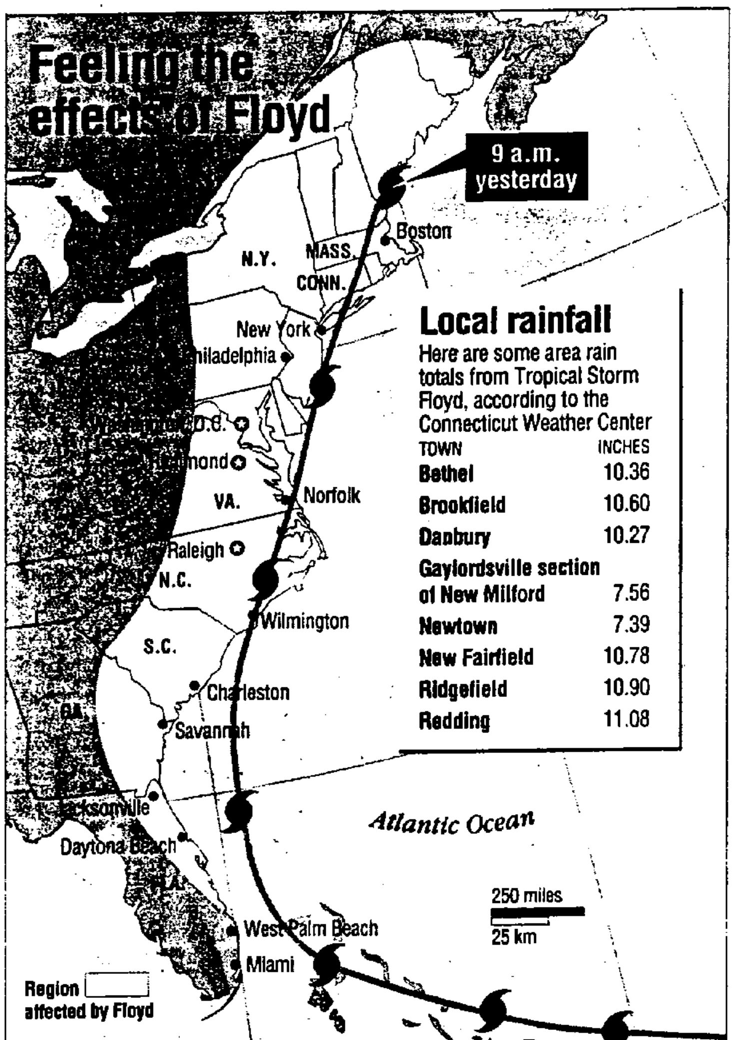
Combined with the rain that began falling Wednesday night and continued into yesterday morning, the city received a total of 10.27 inches. That's more than the 9.98 inches that fell on the city in 1938 during a hurricane that's considered one of the great natural disasters in the history of the United States.

It's also more than the 4.5 inches the city got in August, 1955, when Hurricane Diane inundated the state; it's almost as much as the 10.33 inches that completely flooded western Connecticut from Danbury to Norwalk on October 15-16 1955, causing millions of dollars of damage.

The city fared better than its neighbors to the south and west; Jacquemin said Carmel, N.Y., got about a foot of rain, while a town in New Jersey got 13 inches.

Usually, hurricanes and tropical storms send different types of weather to the different areas covered by the storm, Jacquemin said. Towns east of the storm center generally get more wind; areas northwest of the storm usually get more rain.

With Floyd — downgraded to a tropical storm, as was Diane in 1955 — moving off the Connecticut shoreline, that put western Connecticut and Putnam County, N.Y., into the northwest quadrant, and made them targets for a top-notch drenching.



SOURCE: Accu-Weather
The News-Times/AP

But Jacquemin said a cold front stationed just to the west of the region cooled the air, squeezing even more rain out of the storm, as did the cooling effect of moving tropical air over land.

In fact, he said, Thursday's storm was hardly tropical — it was more like a late-summer nor'easter.

"We were at 55 degrees, while some parts of the state were in the 70's during the storm," he said.

A fast-moving mass of dry air moved in yesterday morning, Jacquemin said.

The winds from that front proved stronger than those accompanying Floyd on Thursday.

"We hit 44 mph Friday, compared to 34 mph at 6:28 p.m. Thursday," he said.

"And the winds Friday morning were consistently high, at about 25 mph."

Northeast Utilities saw the number of electric power outages climb throughout the day yesterday. It had about 500 crews on hand to restore power.

Northeast Utilities spokesman Frank Poirot said that early yesterday morning the number of outages reached 52,000 state-wide. As the morning wind knocked down rain-soaked trees, that number rose steadily to about 69,000 by the end of the day.

That number was dwarfed by Hurricane Gloria in 1985, which left 534,485 people in the state without power.

While Floyd's rain closed several area roads and flooded more than 300 homes, it did have its benefits.

For one thing, said Paul Galvin, general foreman with the city's Public Utilities Department, it should completely fill the city's reservoirs, which at the peak of the summer drought were down to about 60 percent capacity.

"That water will be draining from the watershed into the reservoirs for the next month," he said. "We'll be at full capacity going into the winter."

And the storm proved that the city's flood control system works. After the 1955 floods, the city's center was rebuilt, tearing up several older neighborhoods.

At the same time, it built a high-walled concrete channel to carry the Still River through downtown.

Retired City Engineer Jack Schweitzer, who helped design the flood-control system, said yesterday it worked as planned.

"It was supposed to move large quantities of water away from the center of the city without flooding," Schweitzer said. "That was the way we designed it."

The News-Times

SATURDAY
September 18, 1999

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AT THE NEWSSTAND 50¢

New Fairfield's unwelcome visitor does heavy damage

By Marietta Homayonpour
THE NEWS-TIMES

NEW FAIRFIELD — Blame a transient named Floyd who came to town one day and left the next day for the major road, bridge and beach damage here, a house fire, a partially collapsed house foundation and even a floating septic tank.

"Nobody ever remembers damage like this," said First Selectman Patty Gay. The tropical storm dropped 10.78 inches of rain on the town.

The damage was "a lot bigger than you and I could have imagined," said David Raines, the town's director of emergency management.

Most of the damage was from flooding. Roads became rivers and some basements became swimming pools.

On Musket Ridge Road one lane of a town bridge was closed yesterday after large chunks of it collapsed and were washed away. Part of Beaver Bog Road was closed because the blacktop caved in and Raines said there was a voluntary evacuation of eight houses on the road Thursday night.

Town insurance covers only buildings, not bridges or roads.

▸ NEW FAIRFIELD, Page A-3

▷ New Fairfield hit hard by storm

Continued from Page A-1

But Gay and Raines said they have contacted the Federal Emergency Management Agency and expect an assessment team to visit the town in the next few days. Gay also is asking the Board of Finance to call a meeting on the cost of immediate repairs.

On Cypress Street, part of a house foundation collapsed Thursday, injuring one resident who was taken to the hospital, where she remained yesterday for observation, according to her family.

"The building was down-sloped from the street, and a tremendous amount of water came over it," said town Building Inspector Ron Malmberg. Approximately 20 feet of the 10-inch-thick block wall foundation were pushed out by the force of the rushing water.

A fire Thursday that damaged the basement of a North Drive home was the result of flooding, said the town's fire marshal, Mike Crawford. A gasoline container with a loose cap tipped over as it floated in the flooded basement, and the gasoline spilled out and touched an ignition source. No one was injured.

Some of the worst damage was at the town park on Route 39 where the south beach was washed away and a 100-foot-long, 3-foot-wide drainage pipe that had been under the sand was apparently raised by rushing water and the sand around it washed away.

Two septic tanks were exposed by the heavy rains, said Gay, one on Keplers Way and one in the Candlewood Knolls community. Then there was the rogue septic tank on Paradise Court. Gay said a newly-installed tank apparently floated away and discharged its effluent into another house in the area.

Many houses in town escaped with no water damage. But others made up for it.

"The house was completely surrounded by water," said Vincent Zackeo, who moved into his raised ranch on Williams Road only two months ago. Zackeo pointed to the white paint marks he made on several trees to show the height of the water that rushed around and into his house from the road Thursday night. Some marks were more than 5 feet off the ground.

In the basement, which Zackeo had just refinished, the water rose to 4 feet and he found a refrigerator and motorcycle floating in the garage. As he looked into a nearby stream, Zackeo saw a child's toy from his house and a handrail he made that had been in his garage.

The worst news came yesterday when Zackeo called his insurance company and discovered there's no flood insurance in his policy. Because his house is not in a flood zone, Zackeo said he was told flood insurance is not automatic.

Across town on Hilltop Drive, Dawn Sarles pointed to her chest to show how high the water was in her basement Thursday night.

"The fire department was wonderful," said Sarles. "But the water would come in as soon as they pumped it out." She said firefighters tried for 45 minutes "but the water wasn't moving."

Firefighters returned yesterday, said Sarles, and removed the remaining water.

She has a sump pump but it couldn't handle the volume of water. To make matters worse, her water tank tipped over in the rising water, breaking the pipes and temporarily making the house unlivable. But Sarles said she and her family were grateful for the "wonderful neighbors who took us in."

First Selectman Gay also sounded an upbeat note in the wake of Floyd. The damage could have been much worse if the winds had been higher or the weather much colder, she said.

"All in all, we were fortunate. We've contacted the state and we'll get through this," she said.

Town of New Fairfield
Public Works Department

Tropical Storm Floyd September 16-17, 1999
Storm Damage

Damage to Town Roads

The following is a list of town roads that sustained damage due to Tropical Storm Floyd. Most of the drainage systems were not able to handle the road drainage, which caused severe damage to road surfaces.

ADDRESS	DESCRIPTION	COST
Musket Ridge Road #13	Culvert was overtopped, washing out drainage structure and road.	$3,000.00
Rocky Hill Road, various locations	Road and shoulders have washed out in numerous locations along the gutter-line, undermining the pavement.	$2,100.00
Woods Way Road	Pavement has been torn away by storm water.	$2,100.00
Brookside Drive	Culvert overtopped, washing out culvert outlet, shoulder, and pavement	$1,800.00
Smoke Hill Drive	Culvert overtopped, washing out one lane of road, shoulder, and retaining wall.	$2,300.00
Old Farm Road	Culvert overtopped, washing out one lane of road, shoulder, and retaining wall.	$1,500.00
South Beach Area	Heavy damage. Major beach erosion. 36" drainage pipe has floated out of its trench. Rip-Rap inlet destroyed.	$7,800.00

ADDRESS	DESCRIPTION	COST
Intersection of Meeting House Hill Circle and Gillotti Road	Water damaged private road, causing water to flow underneath the new pavement causing sinkholes and heaving pavement up near catch basin.	$2,400.00
Jennifer Drive #7	Utility trench flooded out and acted as a curtain drain. Sinkholes have developed over exposed utilities.	$200.00
Memorial Fields	Stone from curtain drain ejected from its trench. Clay from infield washed into outfield. Needs to be re-graded and crowned.	$1,100.00
Shortwoods Road, various location.	Many areas washed out along gutter-line. In a large section of curtain drain all the stone has washed out of the trench, over road.	$2,600.00
Bigelow Road #36	Washout and pavement failure at catch basin.	$1,500.00
Beaver Bog Area #1	Major road failure at stream crossing. Road completely gone over a 50' long, 9' deep section. Large retaining wall needs to be built to support road.	$7,000.00
Beaver Bog Area #2	Major road failure at stream crossing. 1 1/2 lanes of road completely gone over a 50' long, 9' deep section. Retaining wall needs to be built to support road.	$4,000.00
Indian Hill Lane and Road, four locations.	Gutters of road washed out. Sinkholes have formed. A catch basin has collapsed.	$3,400.00
Gillotti Road.	New shoulder washed away.	$4,700.00
Gillotti Road, neat Jessie Street	New pavement buckled up from water saturation.	$2,400.00
Bear Mountain Road, various locations	Road and shoulders have washed out in numerous locations along the gutter-line, undermining the pavement.	$2,100.00
Overbrook Drive and Bridgeview Drive	Road and shoulders have washed out in numerous locations along the gutter-line and in the travel lane, undermining the pavement.	$6,500.00
Pine Hill Road #182, #208	Road and shoulders have washed out along the gutter-line, undermining the pavement. Silt has washed into residents property.	$2,300.00

ADDRESS	DESCRIPTION	COST
Cottontail Road	Gutter-line has washed out, hole forming in pavement.	$1,100.00
Sherry Lane #14	Resident's septic failure caused water to run underneath pavement, causing major two-foot. collapses over a 200 foot length of road.	$6,500.00
Old Orchard Road #13	Shoulder washed out onto road.	$750.00
Petit Street, Various locations	Road and shoulders have washed out in numerous locations along the gutter-line and in the travel lane, undermining the pavement.	$3,800.00
Intersection of Alexandria Drive and Rocky Hill Road	Shoulder washed out and undermined.	$550.00
Candle Hill Road, various locations	Road and shoulders have washed out in numerous locations along the gutter-line, undermining the pavement.	$2,400.00
Woodcreek Road #67	Eroded gutter and shoulder.	$400.00
Dick Finn Road.	Remove buildup of silt on road and driveway	$350.00
Shortwoods #2	Heavy water flow caused a catch basin to fail, allow water to get underneath pavement, undermining it. Pavement at bottom of hill is being lifted up from silt being pushed underneath it.	$8,880.00
Hardscrabble Road, various locations	Road and shoulders have washed out in numerous locations along the gutter-line and in the travel lane, undermining the pavement.	$5,500.00
Quaker Road, various locations	Road and shoulders have washed out in numerous locations along the gutter-line and in the travel lane, undermining the pavement.	$3,200.00
Beaver Bog #19	Heavy water flow caused a paved apron and shoulder to fail, allow water to get underneath pavement, undermining it. Pavement at bottom of hill is being lifted up from silt being pushed underneath it.	$7,200.00
Rita Drive.	Several washouts along gutter-line, silt over road.	$1,050.00
Spring Drive	Debris in road	$250.00

ADDRESS	DESCRIPTION	COST
Oakwood Drive, various locations	Road and shoulders have washed out in numerous locations along the gutter-line and in the travel lane, undermining the pavement.	$2,600.00
Various drainage inlets, outlets, catch basins and swales.	Remove debris that has built up from storm, town-wide.	$7,360.00
Tree removal, various locations	Trees have fallen down, or are dangerously leaning after the storm. These need to be contracted out.	$4,400.00
Douglas Lane, Jewel Lane, Roseton Road, Albion Road, Berwick Road, Ball Pond Road East	Road and shoulders have washed out in numerous locations along the gutter-line and in the travel lane, undermining the pavement.	$12,830.00
Various drainage pipes	Pipes have clogged due to logs, gravel from driveways, and other debris, town-wide.	$4,200.00
Arden Ave.	Total pavement failure due to storm water. Drainage swales have filled in due to silt. Minor damage to drainage piping.	$4,400.00

TOTAL: $138,520.00

Town of New Fairfield
Public Works Department

Tropical Storm Floyd September 16-17, 1999
Storm Damage

Photographs

Contractor working on Saturday, September 18, 1999 building new retaining wall and new section of road.

Catch bason on Shortwoods Road which has been collapsed due to water.

One of several areas on Shortwoods Road that are washed out. Pavement is undermined 18 inches into the travel lane. This is the typical type of damage at approximately 30 other locations

Area of Shortwoods Road where all the stone from a curtain drain has been washed out of its trench. Approximately 100 cubic yards could not be removed.

Second view of exposed curtain drain on Shortwoods Road.

South Beach area showing major erosion of sand and earth. Pipe has been exposed and lifed out of the trench.

Second view of South Beach.

Third view of South Beach. The pipe has floated high enough to disloge the fence.

Complete septic failure and washout at Paradise Court. This photo was taken after the Highway Department removed two feet of topsoil, silt and septic sand from the road.

Brookside Drive where the culvert has washed out. Shoulder, pavement and headwall damaged.

Bigelow Road: shoulder, pavement wahsed out, pipe exposed. This is typical of many areas.

Jennifer Drive. Water was so severe that utility trench acted as a curtain drain, causing sink holes directly over utilities.

Beaver Bog Area 1. Where I am standing the pavememnt should be one foot over my head

Second view of Beaver Bog Area 1.

Third view of Beaver Bog Area 1.

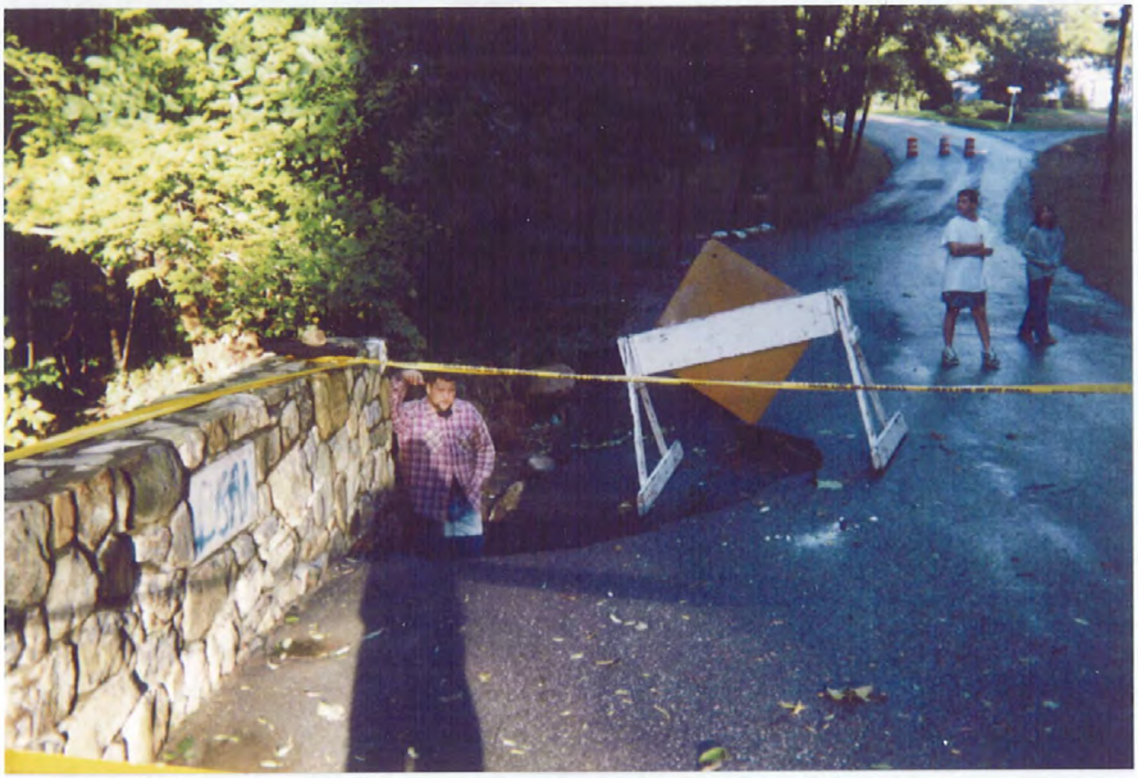
Intersection of Meeting House Circle, where the pavement is buckled and undermined. Note how the silt has pushed the pavement up around the catch basin.

View of Beaver Bog Area 2. Road is undermined to the center line.

Second view of Area 2 at Beaver Bog.

Old Farm Road at the culvert. The headwall has washed away.

Second view of Old Farm Road.



Smoke Hill Road at the bridge.

Second view of Smoke Hill. The headwall is gone. Drainage is exposed.

Rocky Hill Road. Eroded and undermined at the edge of the pavement. Typical of several areas at this road.

Second view of Rocky Hill Road.

Area of Rocky Hill Road where the water flowed over the road, destroying the shoulder. If rains continued this would be collapsed similar to Beaver Bog.

Second view of Rocky Hill Road, across the street from the destroyed shoulder.

Woods Way, where the water caused up to four layers of asphalt to rip apart.

Musket Ridge Road. Three 60 inch pipes could not handle the water. The headwall at the outlet is gone, the shoulder and one lane of the road is heavily damaged.

Second view of Musket Ridge Road.

APPENDIX D
HAZUS-MH ANALYSIS

HAZUS-MH: Flood Event Report

Region Name:	New Fairfield
Flood Scenario:	NewFF100
Print Date:	Wednesday, February 09, 2011

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 20 square miles and contains 250 census blocks. The region contains over 5 thousand households and has a total population of 13,953 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 5,629 buildings in the region with a total building replacement value (excluding contents) of 1,228 million dollars (2006 dollars). Approximately 93.21% of the buildings (and 89.10% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 5,629 buildings in the region which have an aggregate total replacement value of 1,228 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	1,093,784	89.1%
Commercial	90,957	7.4%
Industrial	20,351	1.7%
Agricultural	3,022	0.2%
Religion	9,740	0.8%
Government	4,100	0.3%
Education	5,570	0.5%
Total	**1,227,524**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	200,026	83.3%
Commercial	27,848	11.6%
Industrial	6,293	2.6%
Agricultural	775	0.3%
Religion	0	0.0%
Government	2,082	0.9%
Education	3,129	1.3%
Total	**240,153**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire station, 1 police station and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	New Fairfield
Scenario Name:	NewFF100
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

HAZUS estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**0**		**0**		**0**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	1	0	0	0
Hospitals	0	0	0	0
Police Stations	1	0	0	0
Schools	5	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 546 tons of debris will be generated. Of the total amount, Finishes comprises 34% of the total, Structure comprises 39% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 22 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 43 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 26 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 5.58 million dollars, which represents 2.32 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 5.53 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 64.81% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	2.42	0.43	0.05	0.00	2.91
	Content	1.20	1.31	0.09	0.00	2.60
	Inventory	0.00	0.01	0.01	0.00	0.02
	Subtotal	**3.62**	**1.76**	**0.16**	**0.01**	**5.53**
Business Interruption						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental Income	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.04	0.04
	Subtotal	**0.00**	**0.01**	**0.00**	**0.04**	**0.05**
ALL	**Total**	**3.62**	**1.76**	**0.16**	**0.05**	**5.58**

Appendix A: County Listing for the Region

Connecticut

- Fairfield

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	13,953	1,093,784	133,740	1,227,524
Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**
Total Study Region	**13,953**	**1,093,784**	**133,740**	**1,227,524**

HAZUS-MH: Hurricane Event Report

Region Name:	New Fairfield
Hurricane Scenario:	UN-NAMED-1938-4
Print Date:	Monday, February 07, 2011

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 25.02 square miles and contains 3 census tracts. There are over 4 thousand households in the region and has a total population of 13,953 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 5 thousand buildings in the region with a total building replacement value (excluding contents) of 1,228 million dollars (2006 dollars). Approximately 93% of the buildings (and 89% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 5,629 buildings in the region which have an aggregate total replacement value of 1,228 million (2006 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	1,093,784	89.1%
Commercial	90,957	7.4%
Industrial	20,351	1.7%
Agricultural	3,022	0.2%
Religious	9,740	0.8%
Government	4,100	0.3%
Education	5,570	0.5%
Total	**1,227,524**	**100.0%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	UN-NAMED-1938-4
Type:	Historic
Max Peak Gust in Study Region:	90 mph

Building Damage

General Building Stock Damage

HAZUS estimates that about 21 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 1 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	22	93.52	1	5.23	0	0.89	0	0.34	0	0.02
Commercial	226	94.65	11	4.62	2	0.66	0	0.06	0	0.00
Education	6	95.69	0	4.07	0	0.24	0	0.00	0	0.00
Government	5	95.37	0	4.32	0	0.31	0	0.00	0	0.00
Industrial	92	95.04	4	4.51	0	0.42	0	0.04	0	0.00
Religion	10	94.68	1	4.93	0	0.37	0	0.01	0	0.00
Residential	4,894	93.27	334	6.37	18	0.34	0	0.00	1	0.01
Total	**5,256**		**352**		**20**		**0**		**1**	

Table 3: Expected Building Damage by Building Type

Building	None		Minor		Moderate		Severe		Destruction	
Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	15	95.25	1	4.42	0	0.33	0	0.00	0	0.00
Masonry	213	93.54	13	5.79	1	0.61	0	0.05	0	0.01
MH	6	99.02	0	0.77	0	0.17	0	0.00	0	0.05
Steel	153	95.07	7	4.27	1	0.59	0	0.06	0	0.00
Wood	4,638	93.31	315	6.34	17	0.33	0	0.00	1	0.01

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
Fire Stations	1	0	0	1
Police Stations	1	0	0	1
Schools	5	0	0	5

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 5,819 tons of debris will be generated. Of the total amount, Brick/Wood comprises 11% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 25 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 6.3 million dollars, which represents 0.52 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 6 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 95% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	5,662.16	138.66	22.21	31.53	5,854.56
	Content	136.34	25.99	7.94	6.00	176.27
	Inventory	0.00	0.66	1.26	0.32	2.25
	Subtotal	**5,798.50**	**165.31**	**31.41**	**37.85**	**6,033.08**
Business Interruption Loss						
	Income	0.00	18.31	0.06	3.12	21.49
	Relocation	145.63	21.57	1.00	3.08	171.29
	Rental	57.54	12.64	0.06	0.23	70.47
	Wage	0.00	21.96	0.10	7.33	29.39
	Subtotal	**203.18**	**74.47**	**1.23**	**13.76**	**292.64**
Total						
	Total	**6,001.68**	**239.79**	**32.64**	**51.61**	**6,325.72**

Appendix A: County Listing for the Region

Connecticut
- Fairfield

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars) Residential	Non-Residential	Total
Connecticut				
Fairfield	13,953	1,093,784	133,740	1,227,524
Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**
Study Region Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**

HAZUS-MH: Hurricane Event Report

Region Name:	New Fairfield
Hurricane Scenario:	Probabilistic 1000-year Return Period
Print Date:	Monday, February 07, 2011

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

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The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 25.02 square miles and contains 3 census tracts. There are over 4 thousand households in the region and has a total population of 13,953 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 5 thousand buildings in the region with a total building replacement value (excluding contents) of 1,228 million dollars (2006 dollars). Approximately 93% of the buildings (and 89% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 5,629 buildings in the region which have an aggregate total replacement value of 1,228 million (2006 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	1,093,784	89.1%
Commercial	90,957	7.4%
Industrial	20,351	1.7%
Agricultural	3,022	0.2%
Religious	9,740	0.8%
Government	4,100	0.3%
Education	5,570	0.5%
Total	**1,227,524**	**100.0%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

HAZUS estimates that about 744 buildings will be at least moderately damaged. This is over 13% of the total number of buildings in the region. There are an estimated 80 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy : 1000 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	12	51.23	7	27.69	3	13.02	2	6.83	0	1.23
Commercial	131	54.93	59	24.50	39	16.14	10	4.39	0	0.04
Education	4	58.74	1	23.87	1	14.55	0	2.84	0	0.00
Government	3	57.03	1	23.34	1	15.96	0	3.67	0	0.00
Industrial	54	55.71	23	23.35	16	16.34	4	4.48	0	0.12
Religion	6	54.18	3	27.85	2	14.63	0	3.34	0	0.00
Residential	2,825	53.83	1,757	33.49	501	9.55	85	1.62	79	1.51
Total	**3,035**		**1,850**		**562**		**102**		**80**	

Table 3: Expected Building Damage by Building Type : 1000 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	9	56.67	4	22.48	3	16.93	1	3.92	0	0.00
Masonry	123	54.11	64	28.21	31	13.79	7	3.00	2	0.88
MH	5	75.15	1	11.14	1	9.36	0	0.65	0	3.69
Steel	90	55.94	34	21.40	28	17.25	9	5.37	0	0.04
Wood	2,676	53.85	1,673	33.66	469	9.43	78	1.57	74	1.49

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
Fire Stations	1	0	0	0
Police Stations	1	0	0	0
Schools	5	0	0	0

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 30,098 tons of debris will be generated. Of the total amount, Brick/Wood comprises 26% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 311 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 14 households to be displaced due to the hurricane. Of these, 2 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 85.0 million dollars, which represents 6.93 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 85 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 92% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	54,012.27	2,431.51	577.20	552.45	57,573.44
	Content	16,351.57	1,139.90	376.02	247.73	18,115.22
	Inventory	0.00	28.10	54.69	8.49	91.28
	Subtotal	**70,363.84**	**3,599.52**	**1,007.90**	**808.67**	**75,779.93**
Business Interruption Loss						
	Income	1.41	120.30	4.91	16.51	143.12
	Relocation	6,029.29	476.87	55.10	106.11	6,667.37
	Rental	1,868.64	261.18	4.50	8.36	2,142.68
	Wage	3.32	134.56	8.41	157.47	303.77
	Subtotal	**7,902.65**	**992.91**	**72.93**	**288.45**	**9,256.95**
Total						
	Total	**78,266.49**	**4,592.43**	**1,080.83**	**1,097.12**	**85,036.88**

Appendix A: County Listing for the Region

Connecticut
- Fairfield

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
Fairfield	13,953	1,093,784	133,740	1,227,524
Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**
Study Region Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**

HAZUS-MH: Hurricane Event Report

Region Name:	New Fairfield
Hurricane Scenario:	Probabilistic 500-year Return Period
Print Date:	Monday, February 07, 2011

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 25.02 square miles and contains 3 census tracts. There are over 4 thousand households in the region and has a total population of 13,953 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 5 thousand buildings in the region with a total building replacement value (excluding contents) of 1,228 million dollars (2006 dollars). Approximately 93% of the buildings (and 89% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 5,629 buildings in the region which have an aggregate total replacement value of 1,228 million (2006 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	1,093,784	89.1%
Commercial	90,957	7.4%
Industrial	20,351	1.7%
Agricultural	3,022	0.2%
Religious	9,740	0.8%
Government	4,100	0.3%
Education	5,570	0.5%
Total	**1,227,524**	**100.0%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

HAZUS estimates that about 250 buildings will be at least moderately damaged. This is over 4% of the total number of buildings in the region. There are an estimated 17 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy : 500 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	17	72.40	4	18.44	1	5.99	1	2.82	0	0.36
Commercial	181	75.76	40	16.84	15	6.40	2	0.99	0	0.01
Education	5	78.74	1	15.92	0	4.97	0	0.37	0	0.00
Government	4	77.61	1	16.13	0	5.74	0	0.52	0	0.00
Industrial	74	76.59	16	16.34	6	6.16	1	0.87	0	0.03
Religion	8	75.47	2	18.60	1	5.38	0	0.54	0	0.00
Residential	3,862	73.61	1,163	22.16	190	3.62	15	0.29	17	0.32
Total	**4,152**		**1,227**		**214**		**19**		**17**	

Table 3: Expected Building Damage by Building Type : 500 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	12	77.34	3	15.95	1	6.16	0	0.55	0	0.00
Masonry	169	74.13	44	19.44	13	5.58	2	0.67	0	0.19
MH	5	90.53	0	5.59	0	2.88	0	0.08	0	0.93
Steel	124	76.75	25	15.31	11	6.75	2	1.18	0	0.01
Wood	3,660	73.65	1,104	22.21	176	3.55	14	0.29	16	0.31

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
Fire Stations	1	0	0	0
Police Stations	1	0	0	0
Schools	5	0	0	0

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 12,972 tons of debris will be generated. Of the total amount, Brick/Wood comprises 23% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 120 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 28.4 million dollars, which represents 2.32 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 28 million dollars. 2% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 92% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	20,331.41	821.89	180.30	194.98	21,528.58
	Content	3,773.38	289.67	101.10	67.07	4,231.22
	Inventory	0.00	7.54	15.18	3.04	25.76
	Subtotal	**24,104.78**	**1,119.10**	**296.59**	**265.09**	**25,785.56**
Business Interruption Loss						
	Income	0.00	103.51	2.56	18.29	124.35
	Relocation	1,472.64	167.75	18.45	36.41	1,695.24
	Rental	463.30	91.10	1.54	2.76	558.70
	Wage	0.00	109.77	4.49	152.14	266.39
	Subtotal	**1,935.94**	**472.12**	**27.03**	**209.60**	**2,644.68**
Total						
	Total	**26,040.72**	**1,591.22**	**323.62**	**474.69**	**28,430.24**

Appendix A: County Listing for the Region

Connecticut

- Fairfield

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
Fairfield	13,953	1,093,784	133,740	1,227,524
Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**
Study Region Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**

HAZUS-MH: Hurricane Event Report

Region Name: New Fairfield

Hurricane Scenario: Probabilistic 200-year Return Period

Print Date: Monday, February 07, 2011

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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Note:
Appendix A contains a complete listing of the counties contained in the region.

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There are an estimated 5 thousand buildings in the region with a total building replacement value (excluding contents) of 1,228 million dollars (2006 dollars). Approximately 93% of the buildings (and 89% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 5,629 buildings in the region which have an aggregate total replacement value of 1,228 million (2006 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

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Occupancy	Exposure ($1000)	Percent of Tot
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Agricultural	3,022	0.2%
Religious	9,740	0.8%
Government	4,100	0.3%
Education	5,570	0.5%
Total	**1,227,524**	**100.0%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

HAZUS estimates that about 34 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the region. There are an estimated 1 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy : 200 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	22	91.48	2	6.68	0	1.28	0	0.51	0	0.04
Commercial	222	93.01	14	5.89	2	1.00	0	0.10	0	0.00
Education	6	94.43	0	5.15	0	0.42	0	0.00	0	0.00
Government	5	93.92	0	5.51	0	0.57	0	0.01	0	0.00
Industrial	91	93.48	6	5.74	1	0.72	0	0.06	0	0.00
Religion	10	92.94	1	6.39	0	0.65	0	0.02	0	0.00
Residential	4,789	91.27	428	8.16	28	0.54	1	0.02	1	0.02
Total	**5,144**		**451**		**32**		**1**		**1**	

Table 3: Expected Building Damage by Building Type : 200 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	15	93.86	1	5.55	0	0.59	0	0.01	0	0.00
Masonry	209	91.68	17	7.32	2	0.92	0	0.07	0	0.01
MH	6	98.43	0	1.17	0	0.30	0	0.00	0	0.09
Steel	151	93.55	9	5.41	2	0.94	0	0.11	0	0.00
Wood	4,538	91.30	405	8.14	26	0.53	0	0.01	1	0.02

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
Fire Stations	1	0	0	1
Police Stations	1	0	0	1
Schools	5	0	0	5

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 6,293 tons of debris will be generated. Of the total amount, Brick/Wood comprises 13% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 33 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 7.6 million dollars, which represents 0.62 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 8 million dollars. 1% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 95% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	6,738.19	184.13	31.44	41.79	6,995.55
	Content	266.33	37.52	11.99	7.68	323.52
	Inventory	0.00	0.92	1.91	0.49	3.32
	Subtotal	**7,004.52**	**222.56**	**45.33**	**49.96**	**7,322.38**
Business Interruption Loss						
	Income	0.00	17.92	0.14	3.05	21.11
	Relocation	160.90	24.23	1.88	3.70	190.71
	Rental	59.73	12.64	0.14	0.24	72.75
	Wage	0.00	21.56	0.23	7.18	28.97
	Subtotal	**220.63**	**76.35**	**2.39**	**14.17**	**313.54**
Total						
	Total	**7,225.16**	**298.91**	**47.72**	**64.13**	**7,635.92**

Appendix A: County Listing for the Region

Connecticut

- Fairfield

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
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HAZUS-MH: Hurricane Event Report

Region Name:	New Fairfield
Hurricane Scenario:	Probabilistic 100-year Return Period
Print Date:	Monday, February 07, 2011

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Total	**1,227,524**	**100.0%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

HAZUS estimates that about 4 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy : 100 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	23	97.85	0	1.89	0	0.20	0	0.06	0	0.00
Commercial	234	98.07	4	1.77	0	0.16	0	0.01	0	0.00
Education	6	98.34	0	1.63	0	0.03	0	0.00	0	0.00
Government	5	98.22	0	1.74	0	0.04	0	0.00	0	0.00
Industrial	95	98.16	2	1.78	0	0.06	0	0.00	0	0.00
Religion	11	98.22	0	1.72	0	0.06	0	0.00	0	0.00
Residential	5,137	97.90	107	2.04	3	0.06	0	0.00	0	0.00
Total	**5,511**		**114**		**3**		**0**		**0**	

Table 3: Expected Building Damage by Building Type : 100 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	16	98.15	0	1.82	0	0.03	0	0.00	0	0.00
Masonry	223	97.73	5	2.13	0	0.13	0	0.01	0	0.00
MH	6	99.86	0	0.11	0	0.03	0	0.00	0	0.00
Steel	158	98.13	3	1.74	0	0.12	0	0.01	0	0.00
Wood	4,867	97.92	101	2.02	3	0.06	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
Fire Stations	1	0	0	1
Police Stations	1	0	0	1
Schools	5	0	0	5

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,409 tons of debris will be generated. Of the total amount, Brick/Wood comprises 18% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 10 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 3.2 million dollars, which represents 0.26 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 3 million dollars. 0% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 98% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	2,945.45	52.36	6.10	11.20	3,015.10
	Content	3.57	4.14	0.73	0.39	8.84
	Inventory	0.00	0.08	0.15	0.05	0.28
	Subtotal	**2,949.02**	**56.57**	**6.99**	**11.64**	**3,024.22**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	122.47	1.18	0.10	0.12	123.87
	Rental	42.62	0.00	0.00	0.00	42.62
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**165.09**	**1.18**	**0.10**	**0.12**	**166.49**
Total						
	Total	**3,114.11**	**57.75**	**7.09**	**11.76**	**3,190.70**

Appendix A: County Listing for the Region

Connecticut
- Fairfield

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars) Residential	Non-Residential	Total
Connecticut				
Fairfield	13,953	1,093,784	133,740	1,227,524
Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**
Study Region Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**

HAZUS-MH: Hurricane Event Report

Region Name:	New Fairfield
Hurricane Scenario:	Probabilistic 50-year Return Period
Print Date:	Monday, February 07, 2011

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 25.02 square miles and contains 3 census tracts. There are over 4 thousand households in the region and has a total population of 13,953 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 5 thousand buildings in the region with a total building replacement value (excluding contents) of 1,228 million dollars (2006 dollars). Approximately 93% of the buildings (and 89% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 5,629 buildings in the region which have an aggregate total replacement value of 1,228 million (2006 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	1,093,784	89.1%
Commercial	90,957	7.4%
Industrial	20,351	1.7%
Agricultural	3,022	0.2%
Religious	9,740	0.8%
Government	4,100	0.3%
Education	5,570	0.5%
Total	**1,227,524**	**100.0%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

HAZUS estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy : 50 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	24	99.55	0	0.44	0	0.01	0	0.00	0	0.00
Commercial	238	99.47	1	0.52	0	0.01	0	0.00	0	0.00
Education	6	99.49	0	0.51	0	0.00	0	0.00	0	0.00
Government	5	99.44	0	0.56	0	0.00	0	0.00	0	0.00
Industrial	96	99.45	1	0.55	0	0.00	0	0.00	0	0.00
Religion	11	99.54	0	0.45	0	0.01	0	0.00	0	0.00
Residential	5,237	99.81	10	0.18	0	0.00	0	0.00	0	0.00
Total	**5,617**		**12**		**0**		**0**		**0**	

Table 3: Expected Building Damage by Building Type : 50 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	16	99.40	0	0.60	0	0.00	0	0.00	0	0.00
Masonry	227	99.55	1	0.44	0	0.01	0	0.00	0	0.00
MH	6	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	160	99.42	1	0.57	0	0.01	0	0.00	0	0.00
Wood	4,961	99.82	9	0.18	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
Fire Stations	1	0	0	1
Police Stations	1	0	0	1
Schools	5	0	0	5

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 39 tons of debris will be generated. Of the total amount, Brick/Wood comprises 100% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 2 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 0.9 million dollars, which represents 0.08 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 1 million dollars. 0% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 98% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	905.11	12.26	2.04	2.24	921.65
	Content	0.65	0.00	0.00	0.00	0.65
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**905.76**	**12.26**	**2.04**	**2.24**	**922.30**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.12	0.08	0.00	0.01	0.20
	Rental	0.07	0.00	0.00	0.00	0.07
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.18**	**0.08**	**0.00**	**0.01**	**0.27**
Total						
	Total	**905.95**	**12.34**	**2.04**	**2.25**	**922.57**

Appendix A: County Listing for the Region

Connecticut
- Fairfield

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
Fairfield	13,953	1,093,784	133,740	1,227,524
Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**
Study Region Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**

HAZUS-MH: Hurricane Event Report

Region Name: New Fairfield

Hurricane Scenario: Probabilistic 20-year Return Period

Print Date: Monday, February 07, 2011

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 25.02 square miles and contains 3 census tracts. There are over 4 thousand households in the region and has a total population of 13,953 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 5 thousand buildings in the region with a total building replacement value (excluding contents) of 1,228 million dollars (2006 dollars). Approximately 93% of the buildings (and 89% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 5,629 buildings in the region which have an aggregate total replacement value of 1,228 million (2006 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	1,093,784	89.1%
Commercial	90,957	7.4%
Industrial	20,351	1.7%
Agricultural	3,022	0.2%
Religious	9,740	0.8%
Government	4,100	0.3%
Education	5,570	0.5%
Total	**1,227,524**	**100.0%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

HAZUS estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy : 20 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	24	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	239	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	6	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	5	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	97	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	11	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	5,247	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**5,629**		**0**		**0**		**0**		**0**	

Table 3: Expected Building Damage by Building Type : 20 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	16	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	228	100.00	0	0.00	0	0.00	0	0.00	0	0.00
MH	6	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	161	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	4,970	100.00	0	0.00	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
Fire Stations	1	0	0	1
Police Stations	1	0	0	1
Schools	5	0	0	5

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0 tons of debris will be generated. Of the total amount, Brick/Wood comprises 0% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 0.0 million dollars, which represents 0.00 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 0 million dollars. 0% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 0% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	0.00	0.00	0.00	0.00	0.00
	Content	0.00	0.00	0.00	0.00	0.00
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Total						
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Appendix A: County Listing for the Region

Connecticut
- Fairfield

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
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Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**
Study Region Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**

HAZUS-MH: Hurricane Event Report

Region Name:	New Fairfield
Hurricane Scenario:	Probabilistic 10-year Return Period
Print Date:	Monday, February 07, 2011

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Building Stock

HAZUS estimates that there are 5,629 buildings in the region which have an aggregate total replacement value of 1,228 million (2006 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

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Religious	9,740	0.8%
Government	4,100	0.3%
Education	5,570	0.5%
Total	**1,227,524**	**100.0%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

HAZUS estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy : 10 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	24	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	239	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	6	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	5	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	97	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	11	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	5,247	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**5,629**		**0**		**0**		**0**		**0**	

Table 3: Expected Building Damage by Building Type : 10 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	16	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	228	100.00	0	0.00	0	0.00	0	0.00	0	0.00
MH	6	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	161	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	4,970	100.00	0	0.00	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
Fire Stations	1	0	0	1
Police Stations	1	0	0	1
Schools	5	0	0	5

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0 tons of debris will be generated. Of the total amount, Brick/Wood comprises 0% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 0.0 million dollars, which represents 0.00 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 0 million dollars. 0% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 0% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	0.00	0.00	0.00	0.00	0.00
	Content	0.00	0.00	0.00	0.00	0.00
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Total						
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Appendix A: County Listing for the Region

Connecticut
- Fairfield

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars) Residential	Non-Residential	Total
Connecticut				
Fairfield	13,953	1,093,784	133,740	1,227,524
Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**
Study Region Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**

HAZUS-MH: Hurricane Event Report

Region Name: New Fairfield

Hurricane Scenario: GLORIA

Print Date: Monday, February 07, 2011

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 25.02 square miles and contains 3 census tracts. There are over 4 thousand households in the region and has a total population of 13,953 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 5 thousand buildings in the region with a total building replacement value (excluding contents) of 1,228 million dollars (2006 dollars). Approximately 93% of the buildings (and 89% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 5,629 buildings in the region which have an aggregate total replacement value of 1,228 million (2006 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	1,093,784	89.1%
Commercial	90,957	7.4%
Industrial	20,351	1.7%
Agricultural	3,022	0.2%
Religious	9,740	0.8%
Government	4,100	0.3%
Education	5,570	0.5%
Total	**1,227,524**	**100.0%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 5 schools, 1 fire stations, 1 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	GLORIA
Type:	Historic
Max Peak Gust in Study Region:	76 mph

Building Damage

General Building Stock Damage

HAZUS estimates that about 1 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	24	99.13	0	0.81	0	0.04	0	0.01	0	0.00
Commercial	237	99.07	2	0.88	0	0.04	0	0.00	0	0.00
Education	6	99.20	0	0.80	0	0.00	0	0.00	0	0.00
Government	5	99.10	0	0.90	0	0.00	0	0.00	0	0.00
Industrial	96	99.08	1	0.91	0	0.01	0	0.00	0	0.00
Religion	11	99.17	0	0.80	0	0.02	0	0.00	0	0.00
Residential	5,213	99.35	34	0.64	1	0.01	0	0.00	0	0.00
Total	**5,591**		**37**		**1**		**0**		**0**	

Table 3: Expected Building Damage by Building Type

Building	None		Minor		Moderate		Severe		Destruction	
Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	16	99.05	0	0.95	0	0.00	0	0.00	0	0.00
Masonry	226	99.06	2	0.90	0	0.04	0	0.00	0	0.00
MH	6	99.97	0	0.02	0	0.01	0	0.00	0	0.00
Steel	159	99.05	1	0.93	0	0.03	0	0.00	0	0.00
Wood	4,938	99.36	31	0.63	1	0.01	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
Fire Stations	1	0	0	1
Police Stations	1	0	0	1
Schools	5	0	0	5

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 456 tons of debris will be generated. Of the total amount, Brick/Wood comprises 18% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 3 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 1.7 million dollars, which represents 0.14 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 2 million dollars. 0% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 98% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	1,705.69	25.15	4.17	5.46	1,740.47
	Content	1.42	0.00	0.00	0.00	1.42
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**1,707.11**	**25.15**	**4.17**	**5.46**	**1,741.89**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	2.01	0.33	0.01	0.03	2.38
	Rental	1.90	0.00	0.00	0.00	1.90
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**3.91**	**0.33**	**0.01**	**0.03**	**4.28**
Total						
	Total	**1,711.02**	**25.48**	**4.18**	**5.49**	**1,746.16**

Appendix A: County Listing for the Region

Connecticut
- Fairfield

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
Fairfield	13,953	1,093,784	133,740	1,227,524
Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**
Study Region Total	**13,953**	**1,093,784**	**133,740**	**1,227,524**

HAZUS-MH: Earthquake Event Report

Region Name: New Fairfield

Earthquake Scenario: Portland 5.7

Print Date: February 07, 2011

Totals only reflect data for those census tracts/blocks included in the user's study region.

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General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 25.01 square miles and contains 3 census tracts. There are over 4 thousand households in the region with a total population of 13,953 people (2002 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 5 thousand buildings in the region with a total building replacement value (excluding contents) of 1,227 (millions of dollars). Approximately 93.00 % of the buildings (and 89.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 164 and 0 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are 5 thousand buildings in the region which have an aggregate total replacement value of 1,227 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 89% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of 0 beds. There are 5 schools, 1 fire stations, 1 police stations and 0 emergency operation facilities. With respect to HPL facilities, there are 1 dams identified within the region. Of these, 0 of the dams are classified as 'high hazard'. The inventory also includes 0 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 164.00 (millions of dollars). This inventory includes over 23 kilometers of highways, 4 bridges, 398 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	4	7.20
	Segments	1	157.50
	Tunnels	0	0.00
		Subtotal	**164.70**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	0	0.00
		Subtotal	**0.00**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	0	0.00
	Runways	0	0.00
		Subtotal	**0.00**
		Total	**164.70**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	4.00
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**4.00**
Waste Water	Distribution Lines	NA	2.40
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**2.40**
Natural Gas	Distribution Lines	NA	1.60
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**1.60**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	0	0.00
		Subtotal	**0.00**
		Total	**8.00**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Portland 5.7
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.60
Latitude of Epicenter	41.60
Earthquake Magnitude	5.70
Depth (Km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	CEUS Event

Building Damage

HAZUS estimates that about 13 buildings will be at least moderately damaged. This is over 0.00 % of the total number of buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	23	0.42	1	0.90	0	1.29	0	1.70	0	0.96
Commercial	230	4.15	7	9.73	2	16.95	0	23.32	0	16.98
Education	6	0.10	0	0.22	0	0.37	0	0.48	0	0.43
Government	5	0.09	0	0.18	0	0.31	0	0.39	0	0.25
Industrial	94	1.69	2	3.56	1	6.12	0	7.81	0	4.57
Other Residential	191	3.44	4	6.56	1	11.19	0	12.64	0	12.26
Religion	11	0.19	0	0.45	0	0.88	0	1.30	0	1.22
Single Family	4,989	89.92	53	78.39	8	62.90	1	52.36	0	63.34
Total	**5,548**		**67**		**12**		**1**		**0**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	4,987	89.89	45	66.69	4	31.40	0	0.00	0	0.00
Steel	173	3.12	4	5.29	1	8.02	0	7.97	0	0.00
Concrete	29	0.52	1	0.90	0	1.18	0	0.56	0	0.00
Precast	10	0.19	0	0.60	0	1.91	0	3.40	0	0.00
RM	44	0.79	1	1.47	0	3.68	0	4.93	0	0.00
URM	293	5.28	16	23.87	6	51.55	1	82.65	0	100.00
MH	12	0.21	1	1.19	0	2.27	0	0.49	0	0.00
Total	**5,548**		**67**		**12**		**1**		**0**	

*Note:
RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 0 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**At Least Moderate Damage > 50%**	**Complete Damage > 50%**	**With Functionality > 50% on day 1**
Hospitals	0	0	0	0
Schools	5	0	0	5
EOCs	0	0	0	0
PoliceStations	1	0	0	1
FireStations	1	0	0	1

Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	1	0	0	1	1
	Bridges	4	0	0	4	4
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	199	0	0
Waste Water	120	0	0
Natural Gas	80	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	4,638	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.000 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 79.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**0**	**0**	**0**	**0**
2 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**0**	**0**	**0**	**0**
5 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**0**	**0**	**0**	**0**

Economic Loss

The total economic loss estimated for the earthquake is 1.14 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 1.14 (millions of dollars); 16 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 72 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.00	0.03	0.00	0.00	0.04
	Capital-Related	0.00	0.00	0.02	0.00	0.00	0.03
	Rental	0.01	0.01	0.02	0.00	0.00	0.04
	Relocation	0.04	0.00	0.03	0.00	0.01	0.08
	Subtotal	**0.05**	**0.01**	**0.11**	**0.00**	**0.01**	**0.19**
Capital Stock Losses							
	Structural	0.11	0.00	0.04	0.01	0.01	0.17
	Non_Structural	0.48	0.02	0.07	0.01	0.02	0.59
	Content	0.14	0.00	0.03	0.01	0.01	0.19
	Inventory	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.73**	**0.02**	**0.13**	**0.03**	**0.03**	**0.95**
	Total	**0.78**	**0.04**	**0.24**	**0.03**	**0.04**	**1.14**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 14 presents the results of the region for the given earthquake.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	157.53	$0.00	0.00
	Bridges	7.21	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Subtotal	**164.70**	**0.00**	
Railways	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	0.00	$0.00	0.00
	Runways	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
	Total	**164.70**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	4.00	$0.00	0.01
	Subtotal	**3.99**	**$0.00**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	2.40	$0.00	0.01
	Subtotal	**2.39**	**$0.00**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	1.60	$0.00	0.01
	Subtotal	**1.60**	**$0.00**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Communication	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
	Total	**7.98**	**$0.00**	

Table 14. Indirect Economic Impact with outside aid
(Employment as # of people and Income in millions of $)

LOSS		Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Second Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.01
Third Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.01
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.01
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.01
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	0	-0.01

Appendix A: County Listing for the Region

Fairfield,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	Fairfield	13,953	1,093	133	1,227
Total State		**13,953**	**1,093**	**133**	**1,227**
Total Region		**13,953**	**1,093**	**133**	**1,227**

HAZUS-MH: Earthquake Event Report

Region Name: New Fairfield

Earthquake Scenario: Haddam 5.7

Print Date: February 07, 2011

Totals only reflect data for those census tracts/blocks included in the user's study region.

Disclaimer:
The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 25.01 square miles and contains 3 census tracts. There are over 4 thousand households in the region with a total population of 13,953 people (2002 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 5 thousand buildings in the region with a total building replacement value (excluding contents) of 1,227 (millions of dollars). Approximately 93.00 % of the buildings (and 89.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 164 and 0 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are 5 thousand buildings in the region which have an aggregate total replacement value of 1,227 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 89% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of 0 beds. There are 5 schools, 1 fire stations, 1 police stations and 0 emergency operation facilities. With respect to HPL facilities, there are 1 dams identified within the region. Of these, 0 of the dams are classified as ‘high hazard’. The inventory also includes 0 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 164.00 (millions of dollars). This inventory includes over 23 kilometers of highways, 4 bridges, 398 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	4	7.20
	Segments	1	157.50
	Tunnels	0	0.00
		Subtotal	**164.70**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	0	0.00
		Subtotal	**0.00**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	0	0.00
	Runways	0	0.00
		Subtotal	**0.00**
		Total	**164.70**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	4.00
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**4.00**
Waste Water	Distribution Lines	NA	2.40
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**2.40**
Natural Gas	Distribution Lines	NA	1.60
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**1.60**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	0	0.00
		Subtotal	**0.00**
		Total	**8.00**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Haddam 5.7
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.55
Latitude of Epicenter	41.47
Earthquake Magnitude	5.00
Depth (Km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	CEUS Event

Building Damage

Building Damage

HAZUS estimates that about 0 buildings will be at least moderately damaged. This is over 0.00 % of the total number of buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	24	0.43	0	1.24	0	1.38	0	0.94	0	0.00
Commercial	239	4.24	0	16.64	0	21.10	0	19.19	0	0.00
Education	6	0.11	0	0.38	0	0.48	0	0.47	0	0.00
Government	5	0.09	0	0.30	0	0.35	0	0.29	0	0.00
Industrial	97	1.72	0	5.85	0	6.77	0	5.32	0	0.00
Other Residential	197	3.50	0	11.02	0	14.17	0	11.71	0	0.00
Religion	11	0.20	0	0.89	0	1.28	0	1.29	0	0.00
Single Family	5,049	89.72	1	63.67	0	54.46	0	60.79	0	0.00
Total	**5,627**		**2**		**0**		**0**		**0**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	5,036	89.49	1	29.64	0	0.00	0	0.00	0	0.00
Steel	177	3.15	0	7.16	0	5.16	0	0.00	0	0.00
Concrete	30	0.53	0	0.84	0	0.40	0	0.00	0	0.00
Precast	11	0.19	0	1.19	0	2.27	0	3.68	0	0.00
RM	45	0.80	0	2.35	0	4.09	0	0.00	0	0.00
URM	315	5.60	1	56.55	0	86.04	0	96.32	0	0.00
MH	13	0.23	0	2.26	0	2.04	0	0.00	0	0.00
Total	**5,627**		**2**		**0**		**0**		**0**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 0 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	5	0	0	5
EOCs	0	0	0	0
PoliceStations	1	0	0	1
FireStations	1	0	0	1

Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	1	0	0	1	1
	Bridges	4	0	0	4	4
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	199	0	0
Waste Water	120	0	0
Natural Gas	80	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	4,638	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.000 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 88.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

· Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
· Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
· Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
· Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**0**	**0**	**0**	**0**
2 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**0**	**0**	**0**	**0**
5 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**0**	**0**	**0**	**0**

Economic Loss

The total economic loss estimated for the earthquake is 0.02 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 0.02 (millions of dollars); 18 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 72 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.00	0.00	0.00	0.00	0.00
	Capital-Related	0.00	0.00	0.00	0.00	0.00	0.00
	Rental	0.00	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Capital Stock Losses							
	Structural	0.00	0.00	0.00	0.00	0.00	0.00
	Non_Structural	0.01	0.00	0.00	0.00	0.00	0.01
	Content	0.00	0.00	0.00	0.00	0.00	0.00
	Inventory	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**
	Total	**0.02**	**0.00**	**0.01**	**0.00**	**0.00**	**0.02**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 14 presents the results of the region for the given earthquake.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	157.53	$0.00	0.00
	Bridges	7.21	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Subtotal	**164.70**	**0.00**	
Railways	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	0.00	$0.00	0.00
	Runways	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
	Total	**164.70**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	4.00	$0.00	0.00
	Subtotal	**3.99**	**$0.00**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	2.40	$0.00	0.00
	Subtotal	**2.39**	**$0.00**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	1.60	$0.00	0.00
	Subtotal	**1.60**	**$0.00**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Communication	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
	Total	**7.98**	**$0.00**	

Table 14. Indirect Economic Impact with outside aid
(Employment as # of people and Income in millions of $)

LOSS		Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Second Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Third Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	0	0.00

Appendix A: County Listing for the Region

Fairfield,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	Fairfield	13,953	1,093	133	1,227
Total State		**13,953**	**1,093**	**133**	**1,227**
Total Region		**13,953**	**1,093**	**133**	**1,227**

HAZUS-MH: Earthquake Event Report

Region Name: New Fairfield

Earthquake Scenario: East Haddam 6.4

Print Date: February 07, 2011

Totals only reflect data for those census tracts/blocks included in the user's study region.

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General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Connecticut

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 25.01 square miles and contains 3 census tracts. There are over 4 thousand households in the region with a total population of 13,953 people (2002 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 5 thousand buildings in the region with a total building replacement value (excluding contents) of 1,227 (millions of dollars). Approximately 93.00 % of the buildings (and 89.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 164 and 0 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are 5 thousand buildings in the region which have an aggregate total replacement value of 1,227 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 89% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of 0 beds. There are 5 schools, 1 fire stations, 1 police stations and 0 emergency operation facilities. With respect to HPL facilities, there are 1 dams identified within the region. Of these, 0 of the dams are classified as ‘high hazard’. The inventory also includes 0 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 164.00 (millions of dollars). This inventory includes over 23 kilometers of highways, 4 bridges, 398 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	4	7.20
	Segments	1	157.50
	Tunnels	0	0.00
		Subtotal	**164.70**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	0	0.00
		Subtotal	**0.00**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	0	0.00
	Runways	0	0.00
		Subtotal	**0.00**
		Total	**164.70**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	4.00
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**4.00**
Waste Water	Distribution Lines	NA	2.40
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**2.40**
Natural Gas	Distribution Lines	NA	1.60
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**1.60**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	0	0.00
		Subtotal	**0.00**
		Total	**8.00**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	East Haddam 6.4
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.40
Latitude of Epicenter	41.50
Earthquake Magnitude	6.40
Depth (Km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	CEUS Event

Building Damage

HAZUS estimates that about 68 buildings will be at least moderately damaged. This is over 1.00 % of the total number of buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	21	0.40	2	0.71	1	1.24	0	1.68	0	1.21
Commercial	207	3.93	21	7.17	9	15.30	1	20.65	0	20.34
Education	5	0.10	0	0.17	0	0.35	0	0.42	0	0.50
Government	4	0.08	0	0.14	0	0.32	0	0.37	0	0.36
Industrial	85	1.60	8	2.80	4	6.26	1	7.64	0	6.84
Other Residential	177	3.36	14	4.75	5	8.82	1	10.51	0	11.86
Religion	10	0.18	1	0.30	0	0.64	0	0.99	0	1.20
Single Family	4,762	90.34	244	83.96	40	67.07	4	57.74	0	57.69
Total	**5,271**		**290**		**60**		**7**		**1**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	4,775	90.59	230	79.42	29	48.44	1	21.04	0	0.00
Steel	156	2.95	14	4.93	7	11.25	1	11.30	0	7.51
Concrete	26	0.49	2	0.85	1	1.95	0	1.21	0	0.71
Precast	9	0.17	1	0.32	1	1.25	0	2.54	0	0.45
RM	40	0.77	3	0.90	2	2.84	0	4.36	0	0.00
URM	255	4.83	37	12.91	20	32.46	4	58.76	1	91.05
MH	10	0.19	2	0.66	1	1.81	0	0.79	0	0.29
Total	**5,271**		**290**		**60**		**7**		**1**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 0 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**At Least Moderate Damage > 50%**	**Complete Damage > 50%**	**With Functionality > 50% on day 1**
Hospitals	0	0	0	0
Schools	5	0	0	5
EOCs	0	0	0	0
PoliceStations	1	0	0	1
FireStations	1	0	0	1

Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	1	0	0	1	1
	Bridges	4	0	0	4	4
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	199	1	0
Waste Water	120	1	0
Natural Gas	80	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	4,638	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.000 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 71.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 40 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

· Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
· Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
· Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
· Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	1	0	0	0
	Total	**1**	**0**	**0**	**0**
2 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**1**	**0**	**0**	**0**
5 PM	Commercial	1	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**1**	**0**	**0**	**0**

Economic Loss

The total economic loss estimated for the earthquake is 6.22 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 6.21 (millions of dollars); 15 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 72 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.02	0.15	0.00	0.02	0.19
	Capital-Related	0.00	0.01	0.12	0.00	0.00	0.13
	Rental	0.06	0.03	0.10	0.00	0.00	0.19
	Relocation	0.21	0.01	0.13	0.01	0.03	0.40
	Subtotal	**0.27**	**0.07**	**0.50**	**0.02**	**0.06**	**0.91**
Capital Stock Losses							
	Structural	0.57	0.02	0.17	0.03	0.04	0.83
	Non_Structural	2.62	0.09	0.40	0.09	0.09	3.29
	Content	0.84	0.02	0.20	0.05	0.05	1.16
	Inventory	0.00	0.00	0.01	0.01	0.00	0.02
	Subtotal	**4.04**	**0.13**	**0.77**	**0.18**	**0.18**	**5.30**
	Total	**4.31**	**0.20**	**1.27**	**0.20**	**0.24**	**6.21**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 14 presents the results of the region for the given earthquake.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	157.53	$0.00	0.00
	Bridges	7.21	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Subtotal	**164.70**	**0.00**	
Railways	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	0.00	$0.00	0.00
	Runways	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
	Total	**164.70**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	4.00	$0.01	0.13
	Subtotal	**3.99**	**$0.01**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	2.40	$0.00	0.11
	Subtotal	**2.39**	**$0.00**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	1.60	$0.00	0.06
	Subtotal	**1.60**	**$0.00**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Communication	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
	Total	**7.98**	**$0.01**	

Table 14. Indirect Economic Impact with outside aid
(Employment as # of people and Income in millions of $)

	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.01
Second Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.03
Third Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.04
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.04
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.04
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	0	-0.04

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Fairfield,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
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	Fairfield	13,953	1,093	133	1,227
Total State		**13,953**	**1,093**	**133**	**1,227**
Total Region		**13,953**	**1,093**	**133**	**1,227**

HAZUS-MH: Earthquake Event Report

Region Name: New Fairfield

Earthquake Scenario: Stamford 5.7

Print Date: February 07, 2011

Totals only reflect data for those census tracts/blocks included in the user's study region.

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The replacement value of the transportation and utility lifeline systems is estimated to be 164 and 0 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are 5 thousand buildings in the region which have an aggregate total replacement value of 1,227 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 89% of the building inventory. The remaining percentage is distributed between the other general building types.

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For essential facilities, there are 0 hospitals in the region with a total bed capacity of 0 beds. There are 5 schools, 1 fire stations, 1 police stations and 0 emergency operation facilities. With respect to HPL facilities, there are 1 dams identified within the region. Of these, 0 of the dams are classified as ‘high hazard’. The inventory also includes 0 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 164.00 (millions of dollars). This inventory includes over 23 kilometers of highways, 4 bridges, 398 kilometers of pipes.

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		Subtotal	**164.70**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	0	0.00
		Subtotal	**0.00**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	0	0.00
	Runways	0	0.00
		Subtotal	**0.00**
		Total	**164.70**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	4.00
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**4.00**
Waste Water	Distribution Lines	NA	2.40
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**2.40**
Natural Gas	Distribution Lines	NA	1.60
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**1.60**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	0	0.00
		Subtotal	**0.00**
		Total	**8.00**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Stamford 5.7
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-73.60
Latitude of Epicenter	41.15
Earthquake Magnitude	5.70
Depth (Km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	CEUS Event

Building Damage

HAZUS estimates that about 79 buildings will be at least moderately damaged. This is over 1.00 % of the total number of buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	21	0.41	2	0.58	1	1.00	0	1.36	0	1.11
Commercial	209	4.01	20	5.85	9	12.48	2	17.88	0	18.52
Education	5	0.10	0	0.14	0	0.30	0	0.40	0	0.48
Government	4	0.08	0	0.12	0	0.26	0	0.34	0	0.32
Industrial	86	1.64	7	2.21	3	4.86	1	6.40	0	5.63
Other Residential	176	3.37	15	4.39	6	7.93	1	9.85	0	11.89
Religion	10	0.18	1	0.27	0	0.59	0	0.93	0	1.18
Single Family	4,700	90.21	293	86.44	51	72.58	5	62.83	0	60.88
Total	**5,211**		**339**		**70**		**9**		**1**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	4,718	90.54	278	82.13	38	54.25	2	26.75	0	0.00
Steel	160	3.07	12	3.47	5	7.31	1	7.40	0	2.97
Concrete	27	0.51	2	0.63	1	1.31	0	0.77	0	0.32
Precast	9	0.17	1	0.30	1	1.20	0	2.45	0	0.48
RM	40	0.76	3	0.86	2	2.82	0	4.34	0	0.21
URM	247	4.75	41	12.11	22	31.86	5	57.85	1	95.90
MH	10	0.20	2	0.50	1	1.25	0	0.45	0	0.12
Total	**5,211**		**339**		**70**		**9**		**1**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 0 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**At Least Moderate Damage > 50%**	**Complete Damage > 50%**	**With Functionality > 50% on day 1**
Hospitals	0	0	0	0
Schools	5	0	0	5
EOCs	0	0	0	0
PoliceStations	1	0	0	1
FireStations	1	0	0	1

Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	1	0	0	1	1
	Bridges	4	0	0	4	4
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	199	1	0
Waste Water	120	0	0
Natural Gas	80	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	4,638	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.000 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 73.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 40 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 13,953) will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	1	0	0	0
	Total	**1**	**0**	**0**	**0**
2 PM	Commercial	1	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**1**	**0**	**0**	**0**
5 PM	Commercial	1	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**1**	**0**	**0**	**0**

Economic Loss

The total economic loss estimated for the earthquake is 9.83 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 9.82 (millions of dollars); 10 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 77 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.02	0.15	0.00	0.02	0.19
	Capital-Related	0.00	0.01	0.11	0.00	0.00	0.13
	Rental	0.08	0.04	0.10	0.00	0.00	0.21
	Relocation	0.27	0.01	0.13	0.01	0.03	0.46
	Subtotal	**0.34**	**0.09**	**0.48**	**0.02**	**0.06**	**0.99**
Capital Stock Losses							
	Structural	0.72	0.02	0.17	0.03	0.04	0.98
	Non_Structural	4.34	0.16	0.57	0.15	0.14	5.35
	Content	1.86	0.05	0.37	0.09	0.10	2.47
	Inventory	0.00	0.00	0.01	0.02	0.00	0.03
	Subtotal	**6.92**	**0.23**	**1.12**	**0.28**	**0.28**	**8.83**
	Total	**7.26**	**0.31**	**1.60**	**0.30**	**0.34**	**9.82**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 14 presents the results of the region for the given earthquake.

Table 12: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	157.53	$0.00	0.00
	Bridges	7.21	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Subtotal	**164.70**	**0.00**	
Railways	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	0.00	$0.00	0.00
	Runways	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
	Total	**164.70**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	4.00	$0.00	0.06
	Subtotal	**3.99**	**$0.00**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	2.40	$0.00	0.05
	Subtotal	**2.39**	**$0.00**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	1.60	$0.00	0.03
	Subtotal	**1.60**	**$0.00**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Communication	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
	Total	**7.98**	**$0.00**	

Table 14. Indirect Economic Impact with outside aid

(Employment as # of people and Income in millions of $)

	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.02
Second Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.05
Third Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.06
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.06
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	0	-0.06
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	0	-0.06

Appendix A: County Listing for the Region

Fairfield,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	Fairfield	13,953	1,093	133	1,227
Total State		**13,953**	**1,093**	**133**	**1,227**
Total Region		**13,953**	**1,093**	**133**	**1,227**

APPENDIX E
RECORD OF MUNICIPAL ADOPTION

CERTIFICATE OF ADOPTION
TOWN OF NEW FAIRFIELD BOARD OF SELECTMEN

A RESOLUTION ADOPTING THE TOWN OF NEW FAIRFIELD HAZARD MITIGATION PLAN UPDATE, 2016

WHEREAS, the Town of New Fairfield has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of those natural hazards profiled in the plan (e.g. *flooding, high wind, thunderstorms, winter storms, earthquakes, dam failure, and wildfires)*, resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the New Fairfield Board of Selectmen approved the previous version of the Plan in 2011; and

WHEREAS, the Town of New Fairfield has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update, 2016 under the requirements of 44 CFR 201.6; and

WHEREAS, committee meetings were held and public input was sought in 2015 regarding the development and review of the Hazard Mitigation Plan Update, 2016; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of New Fairfield; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of New Fairfield, with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this Plan will make the Town of New Fairfield eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of New Fairfield;
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Town Council.

Adopted this 3rd **day of** Jan **, 2017 by the Board of Selectmen of New Fairfield, Connecticut**

Susan Chapman
First Selectman

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of New Fairfield this 3rd day of January 2017.

Pamela J. Dohan
Town Clerk

Town of New Fairfield
Board of Selectmen
4 Brush Hill Road
New Fairfield, CT 06812

MINUTES
Board of Selectmen Special Meeting
Tuesday, December 27, 2016
9:00 am
Town Hall Conference Room

Members present:
Susan Chapman, First Selectman
Kim Hanson, Selectman (arrived 9:04 am)
Mike Gill, Selectman

Other Town Officials Present:
Ed Sbordone, Accounting Manager

Call To Order First Selectman Susan Chapman called the meeting to order at 9:00am

Budget Transfer
Susan Chapman made a motion to approve the following Intra-Departmental transfer in the amount of $6,000.00. Mike Gill seconded the motion. (Such document to be attached to the minutes of this meeting) **Vote: 2-0-0 (Motion approved- Kim Hanson arrived late and did not vote)**

$	Transfer To		$	Transfer From	
$1,000.00	4160-260	Unclass-P&B Workers Comp	$1,000.00	4160-290	Unclass P & B Employee Physicals (Increased Drug Screens and Physicals)
$5,000.00	4161-332-1	Prof. Services-Legal Land	$5,000.00	4161-332-3	Prof. Services-Legal Labor (Various Union Contract Negotiations)
$6,000.00			**$6,000.00**		

Personnel Report
Susan Chapman made a motion to approve the Personnel Report dated December 27, 2016 as presented. Mike Gill seconded the motion.
Vote: 2-0-0 (Motion approved-Kim Hanson arrived late and did not vote)

Discuss and vote to approve Resolution for Recycling Rewards Grant
Susan Chapman made a motion to approve the following Resolution:
Be it resolved that it is in the best interests of the Town of New Fairfield to enter into contracts with the Department of Energy and Environmental Protection.

In furtherance of this resolution, Susan Chapman, the First Selectman is duly authorized to enter into and sign said contracts on behalf of the Town of New Fairfield. Susan Chapman currently holds the First Selectman position and has held that office since May 28, 2013. The First Selectman is further authorized to provide such additional information and execute such other documents as may be required by the local, state or federal government in connection with said contracts and to execute any amendments, rescission, and revisions thereto.

Mike Gill seconded the motion. **Vote: 2-0-0 (Motion approved-Kim Hanson arrived late and did not vote)**

Vote to approve Resolution adopting the Town of New Fairfield Hazard Mitigation Plan
Susan Chapman made a motion to approve the following resolution:

WHEREAS, the Town of New Fairfield has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of those natural hazards profiled in the plan (e.g. *flooding, high wind, thunderstorms, winter storms, earthquakes, dam failure, and wildfires)*, resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the New Fairfield Board of Selectmen approved the previous version of the Plan in 2011; and

WHEREAS, the Town of New Fairfield has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update, 2016 under the requirements of 44 CFR 201.6; and

WHEREAS, committee meetings were held and public input was sought in 2015 regarding the development and review of the Hazard Mitigation Plan Update, 2016; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of New Fairfield; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of New Fairfield, with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this Plan will make the Town of New Fairfield eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of New Fairfield;
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Town Council.

Mike Gill seconded the motion. **Vote: 3-0-0 (Motion approved)**

Adjournment
Mike Gill made a motion to adjourn at 9:05 am. Susan Chapman seconded the motion.
Vote: 3-0-0 (Motion approved)

APPENDIX F
FEMA Snow Load Guidance

FEMA Snow Load Safety Guidance

FEMA

www.FEMA.gov

This flyer summarizes warning signs of overstress conditions during a snow event, key safety issues and risks a snow event poses to buildings, and what to do after a snow event.

Warning Signs of Overstress Conditions during a Snow Event

Overstressed roofs typically display some warning signs. Wood and steel structures may show noticeable signs of excessive ceiling or roof sagging before failure. The following warning signs are common in wood, metal, and steel constructed buildings:

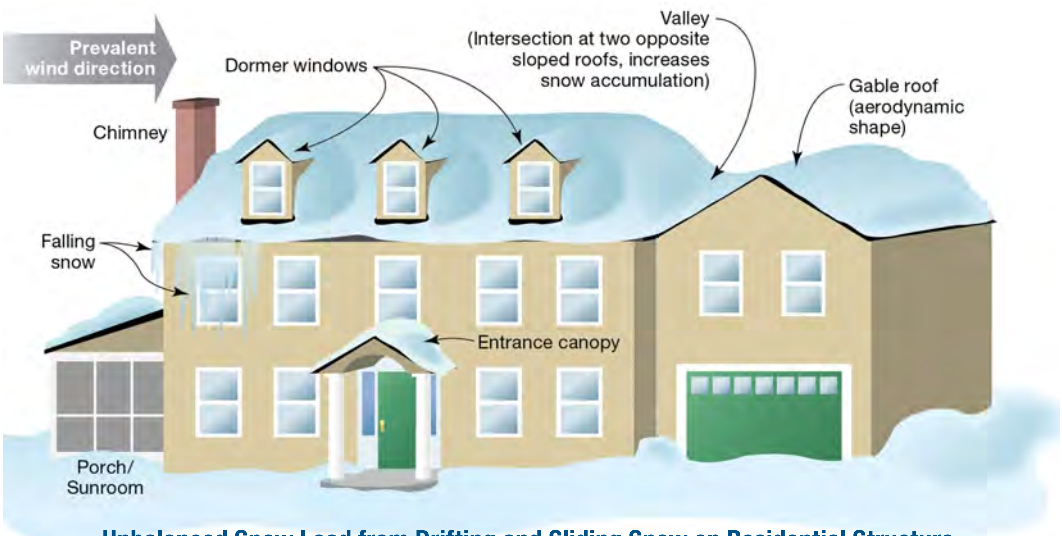
- Sagging ceiling tiles or boards, ceiling boards falling out of the ceiling grid, and/or sagging sprinkler lines and sprinkler heads
- Sprinkler heads deflecting below suspended ceilings
- Popping, cracking, and creaking noises
- Sagging roof members, including metal decking or plywood sheathing
- Bowing truss bottom chords or web members
- Doors and/or windows that can no longer be opened or closed
- Cracked or split wood members
- Cracks in walls or masonry
- Severe roof leaks
- Excessive accumulation of water at nondrainage locations on low slope roofs

Warning! If any of these warning signs are observed, the building should be promptly evacuated and a local building authority and/or a qualified design professional should be contacted to perform a detailed structural inspection.

Key Safety Issues and Risks

Snow accumulation in excess of building design conditions can result in structural failure and possible collapse. Structural failure due to roof snow loads may be linked to several possible causes, including but not limited to the following:

- **Unbalanced snow load from drifting and sliding snow.** When snow accumulates at different depths in different locations on a roof, it results in high and concentrated snow loads that can potentially overload the roof structure.
- **Rain-on-snow load.** Heavy rainfall on top of snow may cause snow to melt and become further saturated, significantly increasing the load on the roof structure.
- **Snow melt between snow events.** If the roof drainage system is blocked, improperly designed or maintained, ice dams may form, which creates a concentrated load at the eaves and reduces the ability of sloped roofs to shed snow. On flat or low slope roof systems, snow melt may accumulate in low areas on roofs, creating a concentrated load.
- **Roof geometry.** Simple roofs with steep slopes shed snow most easily. Roofs with geometric irregularities and obstructions collect snow drifts in an unbalanced pattern. These roof geometries include flat roofs with parapets, stepped roofs, saw-tooth roofs, and roofs with obstructions such as equipment or chimneys.



Unbalanced Snow Load from Drifting and Sliding Snow on Residential Structure

What to Do After a Snow Event

After a snow event, snow removal may be in order. To determine whether snow removal is necessary, one may enlist valuable resources such as a local building authority and/or a qualified design professional, who will be familiar with the snow conditions of the region and the design capacities of local buildings per the building code. If it is determined that the snow should be removed, snow removal should only be performed by qualified individuals. The qualified individual should follow necessary protocols for safe snow removal to minimize risk of personal injury and lower the potential for damaging the roof covering during the snow removal process.

Warning! Snow removal is a dangerous activity that should only be done by qualified individuals following safety protocols to minimize risks. If at any time there is concern that snow loads may cause a collapse of the roof structure, cease all removal activity and evacuate the building.

If subsequent snow events are anticipated, removing snow from the roof will minimize the risk of accumulating snow causing structural damage. One benefit of immediate snow removal is that the effort required to remove the snow from the rooftop is reduced.

Safety Measures for Snow Removal

Below are some safety measures to take during snow removal to minimize risk of personal injury.

- Any roof snow removal should be conducted following proper OSHA protocol for work on rooftops. Use roof fall arrest harnesses where applicable.
- Always have someone below the roof to keep foot traffic away from locations where falling snow or ice could cause injuries.
- Ensure someone confirms that the area below removal site is free of equipment that could be damaged by falling snow or ice.
- Whenever snow is being removed from a roof, be careful of dislodged icicles. An icicle falling from a short height can still cause damage or injury.
- When using a non-metallic snow rake, be aware that roof snow can slide at any moment. Keep a safe distance away from the eave to remain outside of the sliding range.
- Buried skylights pose a high risk to workers on a roof removing snow. Properly mark this hazard as well as other rooftop hazards.

Methods of Snow Removal

Below are some recommended methods of snow removal that allow the qualified individual to remove snow safely and minimize risk of personal injury and property damage.

- Removing snow completely from a roof surface can result in serious damage to the roof covering and possibly lead to leaks and additional damage. At least a couple of inches of snow should be left on the roof.
- Do not use mechanical snow removal equipment. The risk of damaging the roof membrane or other rooftop items outweighs the advantage of speed.
- Do not use sharp tools, such as picks, to remove snow. Use plastic rather than metal shovels.
- Remove drifted snow first at building elevation changes, parapets, and around equipment.
- Once drifted snow has been removed, start remaining snow removal from the center portion of the roof.
- Remove snow in the direction of primary structural members. This will prevent unbalanced snow loading.
- Do not stockpile snow on the roof.
- Dispose of removed snow in designated areas on the ground.
- Keep snow away from building exits, fire escapes, drain downspouts, ventilation openings, and equipment.
- If possible, remove snow starting at the ridge and moving toward the eave for gable and sloped roofs.
- In some cases a long-handled non-metallic snow rake can be used from the ground, thereby reducing the risk. Metal snow rakes can damage roofing material and pose an electrocution risk and should be avoided.
- Upon completion of snow removal, the roofing material should be inspected for any signs of damage. Additionally, a quick inspection of the structural system may be prudent after particularly large snow events.

If you have any additional questions on this topic or other mitigation topics, contact the FEMA Building Science Helpline at FEMA-Buildingsciencehelp@fema.dhs.gov or 866-927-2104.

You may also subscribe to the FEMA Building Science e-mail list serve, which is updated with publication releases and FEMA Building Science activities.

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Visit the Building Science Branch of the Risk Reduction Division at FEMA's Federal Insurance and Mitigation Administration at http://www.fema.gov/building-science.

Please scan this QR code to visit the FEMA Building Science web page.

APPENDIX G
Mitigation Project Status Worksheet

Mitigation Action Progress Report Form

Progress Report Period	From Date:	To Date:
Action/Project Title		
Responsible Agency		
Contact Name		
Contact Phone/Email		
Project Status	❏ Project completed ❏ Project canceled ❏ Project on schedule ❏ Anticipated completion date:__________ ❏ Project delayed Explain __________	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

2. What obstacles, problems, or delays did the project encounter?

3. If uncompleted, is the project still relevant? Should the project be changed or revised?

4. Other comments