Southern Windsor County Regional Planning Commission Multi-Jurisdictional All Hazard Mitigation Plan

2012

FINAL PLAN APPROVAL IS DATED FROM ADOPTION BY WINDSOR, VT ANNEX 7/24/2012.

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EXECUTIVE SUMMARY

Hazard mitigation is any sustained effort to permanently reduce or eliminate long term risk to people and property from the effects of hazards. Floods, winter storms, high winds, and hazardous material spills are some of the hazards experienced by the towns within Southern Windsor County.

The purpose of this plan is to identify specific hazards that are common to the Region along with those that are specific and unique to each town and to establish a framework to reduce the risks associated with these hazards.

The Southern Windsor County Regional Planning Commission (SWCRPC) Multi-Jurisdictional All Hazard Mitigation Plan is regional in scope and is accompanied by ten separate annexes that serve as town specific Hazard Mitigation Plans for each jurisdiction within the Region. The Regional Plan is organized into six chapters with ten annexes and three appendices:

Chapters-

1. Profile of the Southern Windsor County Region
2. Planning Process
3. Regional Hazard Analysis and Resources
4. Critical Facilities
5. Hazard Mitigation Goals
6. Adopting, Evaluating and Updating the Plan

Town Annexes

A. Andover
B. Baltimore
C. Cavendish
D. Chester
E. Ludlow
F. Reading
G. Springfield
H. Weathersfield
I. West Windsor
J. Windsor

Appendix A - Maps for this plan

- Emergency Management Facilities
- Transportation Network
- Water Resources
- Future Land Use
- Hazardous Facilities

Appendix B - Current hazard mitigation programs

Appendix C - Acronyms and Abbreviations

CHAPTER I: Profile of the Southern Windsor County Region

A. BACKGROUND OF THE REGION

The SWCRPC Region is comprised of ten towns including their downtowns, villages, hamlets, and dispersed populations. The member towns are Andover, Baltimore, Cavendish, Chester, Ludlow, Reading, Springfield, Weathersfield, West Windsor, and Windsor. The Region is located in southeastern Vermont along the Connecticut River with Windham County to the south, Rutland County and the Green Mountains to the west, and the remainder of Windsor County to the north.

The climate is generally temperate with moderately cool summers and cold winters. This creates ideal conditions for summer and winter recreation, spectacular fall foliage, and springtime sap runs. Average annual precipitation is around 42 inches and snowfall generally ranges from a low of 70 inches along the Connecticut River to as much as 200 inches in the Green Mountains. The growing season can range from 100 to 140 days depending on location, with the first frost generally occurring in early October and the last frost in late May or early June. The weather is unpredictable and large variations in temperature, precipitation, and other conditions may occur both within and between seasons.

B. PHYSIOGRAPHIC CHARACTERISTICS

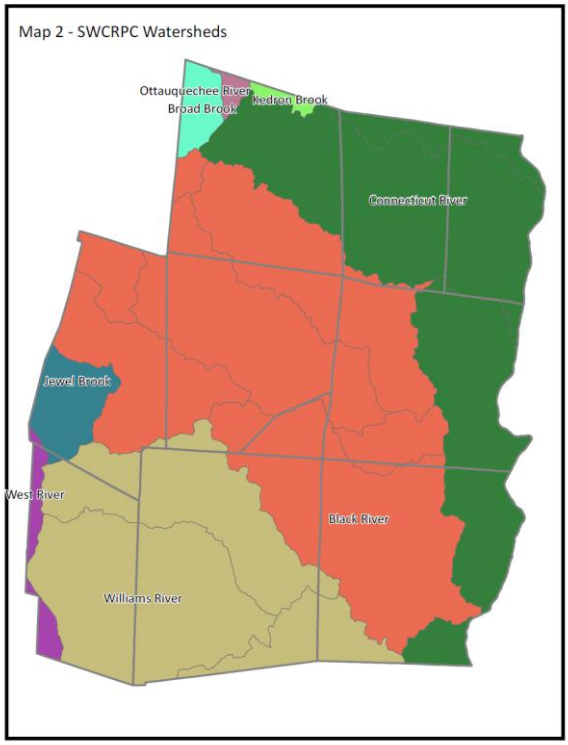
Tectonic impact and glaciation have contributed to the physiographic diversity of our Region, creating a landscape that is hilly and wooded with moderate to steep slopes. Southern Windsor County contains a broad range of landforms from the rocky acidic soils, spruce-fir forests, and beech stands of the Green Mountains to the fertile sandy soils and white pines of the Connecticut River valley, to the hill farms, orchards, woodlots, and sugar bushes in between. The shallow upland soils tend to be dominated by bedrock, with small, dispersed sites containing “enriched” organic deposits. Soils along the Connecticut River are deeper and more fertile, having been deposited by rivers of glacial melt, or by Lake Hitchcock, which covered a large part of the valley ten to twelve thousand years ago.

Much of the Region remains undeveloped or sparsely developed due to the physical constraints imposed by the terrain. Rivers and streams are interspersed throughout the Region, draining south and east to the Connecticut River. The combination of mountains, streams, valleys, and rocky land has resulted in areas with outstanding geologic features such as Cavendish Gorge and various other peaks, gorges, cascades, and waterfalls. The principal rivers are the Black River and Williams River which both feed into the Connecticut River that runs into Long Island Sound. The broad Connecticut valley holds fertile agricultural land, while the narrower and steeper Black and Williams valleys have traditionally been home to sawmills, woolen mills, gristmills, and small hydroelectric power dams. Numerous lakes, ponds, and wetlands comprise the remainder of the Region's surface water features.

Dominant physiographic land features in the Region include two mountains - Okemo Mountain (in Ludlow and Mount Holly) and Mt. Ascutney (shared by Windsor, West Windsor, and Weathersfield) - with elevations over 3,000 feet above sea level. Mt. Ascutney is an example of a monadnock, an isolated mountain of erosion-resistant rock rising above a surrounding area worn flat by water and ice. In addition, Terrible Mountain in Andover is over 2,800 feet in elevation and Hawks Mountain, shared by Cavendish, Baltimore, and Weathersfield, is nearly 2,100 feet above sea level.

The total area of the Region, as shown on Map 1, is approximately 345 square miles.

The Region is located within the Connecticut River Watershed and sits within three basins, as defined by the State of Vermont Agency of Natural Resources: the Black River (Basin 10), the Williams River (Basin 11), and the Lower Connecticut (Basin 13). The basins include a number of sub-basins, which are individual watersheds (as in the Mill Brook) or sections of watersheds (as in the Upper, Middle and Lower Black River). Map 2 illustrates watershed boundaries within the SWCRPC Region.



There are two hospitals within the Region: Springfield Hospital located in Springfield and Mount Ascutney Hospital & Health Center in Windsor. The Veterans' Administration Hospital in Hartford, Dartmouth Hitchcock Medical Center (DHMC), Alice Peck Day Memorial Hospital located in Lebanon, NH, Valley Regional Hospital in Claremont, NH, serve this region as well. Mount Ascutney, Alice Peck Day and Springfield Hospitals are affiliated with DHMC. DHMC also provides helicopter rescue ambulance service to the region through Dartmouth Hitchcock Air Response Team (DHART).

C. POPULATION GROWTH

According to U.S. Census figures (see Table 1.1); the general population in the Region was gaining during the latter part of the 20th century and grew at a faster pace during the 1970s than during the 1980s. Overall growth between 1970 and 1990 was 2.6%, from 23,902 to 24,524 residents. The Region experienced population gains during the 1970s and losses

during the 1980s, registering a net gain of 621 people over the twenty year period. The towns of Ludlow, Springfield and Windsor experienced net population losses due to the loss of major employers (especially those in the machine tool industry), reductions in the average household size and the rising cost of living.

Table 1.1 – Regional Population Trends: 1980-2010

Town	1980	1990	2000	2010	1980-2000 % Change	2000-2010 % Change
Andover	350	373	496	467	41.7	-5.8
Baltimore	181	190	250	244	38.1	-2.4
Cavendish	1,355	1,323	1,470	1,367	8.5	-7
Chester	2,791	2,832	3,044	3,154	9.1	3.6
Ludlow	2,414	2,301	2,499	1,963	3.5	-19.8
Reading	647	614	707	666	9.3	-5.8
Springfield	10,190	9,579	9,078	9,373	-10.9	3.2
Weathersfield	2,534	2,674	2,788	2,825	10	1.3
West Windsor	763	923	1,067	1,099	39.8	3
Windsor	4,084	3,714	3,756	3,553	-8	-5.4
Region	25,309	24,524	25,105	24,711	-0.8	-1.6

Source: US Census Bureau 1980-2010

U.S. Census figures for 2000 reflected continued growth in the general population of the Region in every town except Springfield, most likely due to the additional loss of major employers in that area since 1990. The growth experienced in the rest of the Region contributed to a net gain of 581 people from 1990 to 2000. Overall growth from 1970 to 2000 was 5%, from 23,903 to 25,105 residents. Continuing the downward trend in the more densely populated villages and towns, the population continues to decline due to many contributing factors including loss of job opportunities. Following losses in previous decades, the towns of Ludlow and West Windsor have experienced recent population gains due to growth at Okemo Mountain Resort in Ludlow and the combined growth in jobs and tight housing availability in the Upper Valley. Individual town growth trends can be found in each town annex.

As growth continues in more rural areas, the population becomes more dispersed, making it difficult to provide emergency services. It may also increase the potential risk to certain hazards such as wildfire or direct contact with wildlife, as more people move into more rural areas.

D. TRANSPORTATION NETWORK AND TRAFFIC

Interstate 91 runs along the eastern side of the region and intersects with Interstate 89 in Hartford, connecting New York City to St. Johnsbury and Quebec, Canada. The other interstate in Vermont, I-89, connects Boston, MA to Montreal, Canada. Other major routes in the region include state highway routes 5, 10, 11, 44, 100, 103, 106, and 131. Traffic volumes are highest along the major travel corridors, as would be expected. I-91, Route 103 and the portion of Route 11 between I-91 and downtown Springfield are the most traveled highways in the region and provide connections for residents, tourists, and commercial activities. Routes 103 and 44 serve as an important connection to area ski resorts and experience significantly higher traffic volumes in the winter. The remainder of the local and State highway network experience much lower traffic volumes, but provide important access

to commercial and residential properties. The Transportation Network Map depicts the regional highway network and shows highway of most significance for emergency-related travel.

Traffic accidents and hazardous materials spills along the heaviest traveled highways would be disruptive to the greatest number of motorists. I-91 and Route 103 are important freight routes, designated as in the National or Vermont Truck Network. Trucks hauling petroleum products or other hazardous materials pass through densely settled areas that these, and other, highways bisect. Hazardous materials spills would potentially affect more people along urban sections of state highways due to the close proximity of residential and commercial structures.

Two rail lines traverse the region: Green Mountain Railroad (GMR) (State owned right-of-way, in Chester, Cavendish, and Ludlow), and New England Central Railroad (NECR) (privately owned right-of-way, in Windsor). Amtrak "Vermonter", on the NECR rail, travels the Connecticut River and White River corridor connecting Washington, D.C., New York City, White River Junction, Burlington and St. Albans. GMR serves as a scenic tourist attraction and provides limited freight service. NECR train derailments pose a significant threat in terms of potential hazardous materials spills, potentially contaminating the Connecticut River, a public drinking water source for a number of downstream communities

There is one general aviation airport in the region: Hartness State Airport in Springfield. Lebanon Municipal Airport, in West Lebanon, NH serves commercial airlines and general aviation while the publicly owned Claremont, NH airport is general aviation only. Corporate jets frequent both Hartness and Lebanon airports. There are numerous private landing strips within the region, including two in Andover (Andover-Ludlow Rd. and above Horse Shoe Acres off Andover-Weston Rd.), two in Ludlow (East Hill and Smithville), and one in Chester (off Green Mountain Turnpike).

CHAPTER II: Planning Process

A. BACKGROUND

This plan is a Multi-Jurisdictional All Hazard Mitigation Plan for the Southern Windsor County Regional Planning Commission (SWCRPC) Region with annexes for each town within the SWCRPC. Town annexes are meant to be used in accompaniment to the Regional Hazard Mitigation Plan. The impact of natural and human-caused events can be reduced through community planning and mitigation. The goal of this plan is to provide a mitigation plan to be used by communities in the SWCRPC region to make them more disaster resistant through the planning process and mitigation actions identified within this plan.

Hazard mitigation is any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Based on the results of previous efforts, FEMA and state agencies have come to recognize that it is less expensive to prevent disasters than to repeatedly repair damage after a disaster has struck. This plan recognizes that opportunities to strengthen a community may be identified in all four phases of emergency management: preparedness, mitigation, response, and recovery. Hazards cannot be eliminated, but it is possible to determine what the hazards are, where the hazards are most severe, and to identify local actions that can be taken to avoid exposure to or otherwise reduce the severity of the hazard.

Additionally, the Disaster Mitigation Act of 2000 (DMA 2000) establishes a national program for Pre-Disaster Mitigation that includes mitigation planning and eligibility requirements for state and local governments. The Act is aimed at reducing loss of life and property, human suffering, economic disruption, and disaster costs. High priority should be given to mitigation of hazards at the local level with increased emphasis on assessment and avoidance of identified risks, implementing loss reduction measures for existing exposures and ensuring critical services and facilities survive a disaster.

Hazard mitigation strategies and measures avoid the hazard by stopping or limiting new exposures in known hazard areas, alter the hazard by eliminating or reducing the frequency of occurrence, avert the hazard by redirecting the impact by means of a structure or land treatment, or adapt to the hazard by modifying structures or standards and include projects such as:

- Flood-proofing structures
- Purchase of development rights in hazard prone areas
- Tying down propane/fuel tanks in flood-prone areas
- Elevating furnaces and water heaters
- Identifying & modifying high traffic incident locations and routes
- Ensuring adequate water supply
- Elevating structures or utilities above flood levels
- Identifying & upgrading undersized culverts
- Proactive land use planning for floodplains and other flood and erosion-prone areas
- Proper road maintenance and construction
- Ensuring critical facilities are safely located
- Buyout & relocation of structures in harm's way
- Establish & enforce appropriate building codes
- Public information

B. PLANNING PROCESS

This plan was developed utilizing process developed through FEMA and Vermont Emergency Management (VEM). The process involved the following steps:

1. Gather detailed hazard information;
2. Identify critical facilities and areas of concern;
3. Identify existing mitigation strategies;
4. Identify the gaps in existing mitigation strategies;
5. Identify potential mitigation strategies;
6. Prioritize and develop the Action Plan;
7. Develop implementation strategy; and,
8. Develop strategy for adopting and monitoring the Plan.

Hazard information was gathered from a variety of sources as noted throughout this document. Information from the following sources was extremely valuable: Vermont Center for Geographic Information, Vermont Emergency Management, Vermont Agency of Natural Resources, Northeast States Emergency Consortium, National Climatic Data Center, and the US Army Corp of Engineers. Existing plans, including the SWCRPC Regional Plan and local town plans were reviewed and incorporated to the greatest extent possible in order to maintain consistency between this plan and the others reviewed. Information from the Regional Plan and town plans formed the basis for the community background and growth trends information. In some cases town plans had hazard mitigation policies which were incorporated into each Annex, as appropriate.

During the initial plan development process, SWCRPC met with the membership of Local Emergency Planning Committee 3 (LEPC 3) in Vermont. This is a multi-jurisdictional LEPC that covers the geographic area of Southern Windsor County and one additional town, Hartland. The LEPC represents a wide cross section of the regional population, including local officials, hospitals, businesses, and others. All meetings are open to the public and all member communities, organizations, and businesses had access to the development of this plan through the Planning Committee. The LEPC 3 Planning Committee met to review a draft hazard probability analysis and to determine hazard vulnerability for the region.

For the update process, SWCRPC conducted public meetings including members of the town and planning commission members for each town within the Region along with gathering input from local first response agencies. These meetings helped to provide specific mitigation project ideas along with identifying mitigation projects that have occurred since the plan was first adopted in 2006. All meetings were open to the public and in many cases, meeting agendas were posted before each meeting for public review. Most local information was collected during these meetings based on the experience and knowledge of the town officials present. In some cases, follow up interviews were needed to gather additional information.

Complete listings of local meetings and supportive information are included in each Annex.

The plan adoption processes for the region and towns includes duly-noticed public hearings allowing for comment from all interested parties, including neighboring communities, business owners, academia and the general public.

C. ACKNOWLEDGEMENTS

The Southern Windsor County Regional Planning Commission extends special thanks to those that assisted in the development of this Plan:

LEPC 3 Planning Committee

- Barbara Thomas, West Weathersfield Fire Department
- Jackson Schonberg, American Red Cross
- Michael Thomas, West Weathersfield Fire Department
- Bruce Pollock, Green Mountain Chapter American Red Cross
- Rick Hopkins, Vermont State Police
- Becky Thomas, Vermont Department of Health

Andover

- Ken Hathaway, Emergency Management Director

Baltimore

- Kevin Gould, Selectboard
- Walter Rich, Selectboard Chair

Cavendish

- Richard Svec, Town Manager

Chester

- Rich Cloud, Police Chief
- Graham Kennedy, Road Foreman
- Julie Hance, Zoning Administrator
- David Pisha, Town Manager

Ludlow

- Ron Bixby, Emergency Management Director
- Frank Heald, Town Manager

Reading

- Gary Vittum, Emergency Management Director
- Barb Acuna, Town Clerk

Springfield

- Russ Thompson, Fire Chief
- Doug Johnston, Police Chief
- Bob Forguites, Town Manager
- Bill Kearns, Zoning Administrator

Weathersfield

- Josh Compo, Emergency Management Director
- Jim Mullen, Town Manager
- deForest Bearse, Zoning Administrator

West Windsor

- Jim Kenyon, Emergency Management Coordinator
- Ralph Johnson, Constable
- Martha Harrison, Zoning Administrator

Windsor

- Stephen Soares, Police Chief
- Mark Kirko, Fire Chief
- Paul Belaski, Zoning Administrator
- Steve Cottrell, Town Manager

Other

- Matt Moran, Environmental Analyst, VT DEC

CHAPTER III: Regional Hazard Analysis and Resources

A. Hazard Analysis

Identifying Hazards

The first step in hazard mitigation planning is to identify the natural and manmade hazards that may affect the area. Southern Windsor County is vulnerable to a number of potential hazard events, including:

- Flooding
- Flash floods
- Ice Jam
- Dam failures
- Power Shortage/Failure
- High Winds
- Hurricane/Tropical Storm
- Drought
- Wildfire/Forest Fire
- School Safety Issue
- Terrorism
- Hazardous Materials (fixed site/transport)
- Water Supply Contamination
- Radiological Incident
- Structure Fire
- Winter Storm
- Transportation Incident (air/train/auto. crash)
- Earthquake
- Chemical/Biological Incident
- Avalanche/Landslide/Mudflow/Erosion
- Civil Unrest

B. Significant Hazards

The following seven hazards were identified as significant threats to the region based on past occurrences, vulnerability, input from the LEPC 3, and input from SWCRPC member towns:

1. Fire
2. Flooding
3. Severe Winter Weather
4. Transportation Incident or Disruption
5. Hazardous Materials
6. High Winds
7. Earthquake

The following regional maps have been included in this plan and can be found in Appendix A: Hazardous Facilities, Future Land Use, Water Resources, Transportation Network and Emergency Management Facilities.

The hazard maps provided in this multi-jurisdictional plan may be applied to all town annex plans, and have been used in determining magnitude and risk of hazards in the region. Critical facilities and other structures located within hazard areas have been identified in the town annexes.

The next step in mitigation planning is to identify those hazards that are most likely to affect the area based on the cultural and physical situation of the region, and on past hazard events. The scope of impact of past hazard events, to the extent known locally, is included primarily in each town annex. As more detailed historical information becomes available or known, the plan will be updated accordingly.

The general hazards that are most applicable to the SWCRPC region include:

1. Fires
2. Flooding
3. Severe Winter Weather
4. Transportation Incident or Disruption
5. Hazardous Materials
6. High Winds
7. Earthquake

1. Fire

For the purposes of this Plan, fire events include both structural fires and wildland fires. No specific fire hazard areas are identified or mapped at this time. Areas at risk include all buildings in this region although residential structures are often at higher risk due to use and occupancy. While Vermont has adopted the International Building Code from 2006, many local towns do not have enforced building codes.

Statewide, it is required that all residential rental structures be equipped with working smoke and carbon monoxide detectors. Owner occupied homes must have working alarms at the completion of construction, sale, or transfer.

Table 1: Vermont Fire Statistics for 2010[1]

COUNTY	2010		2009		2008		2007		2006	
	#Fires	Acres	#Fires	Acres	#Fires	Acres	#Fires	Acres	#Fires	Acres
Addison	1	.5	10	9	6	10	4	4.5	2	1.20
Bennington	4	3.35	4	40.5	12	20.8	3	25.13	8	40.18
Caledonia	5	6.75	13	3	3	2.5	12	8.3	7	3.40
Chittenden	9	23.95	2	4	12	10.68	5	3.96	7	2.64
Essex	1	.75	1	3	2	5	0	0	2	1.32
Franklin	19	10.56	15	27	25	29.87	7	84.95	22	53.92
Grand Isle	0	0	0	0	0	0	0	0	0	0
Lamoille	2	.16	6	5	11	5.8	8	4.39	13	12.63
Orange	6	3.65	16	46	4	2.39	8	14.15	12	31.66
Orleans	9	6.72	4	2.5	4	.31	5	.46	6	4.35
Rutland	6	5.3	3	4	9	30.93	2	.5	8	30.15
Washington	9	3.86	7	3	10	6.12	5	3.1	4	4.6
Windham	11	15.77	8	12	14	10.45	16	11.65	23	61.65
Windsor	6	2.51	6	5	3	3.35	6	18.7	4	6.5
TOTALS	**88**	**83.83**	**95**	**164**	**115**	**138.19**	**81**	**179.79**	**118**	**254.2**

Structural Fires
Structure fires can occur in any community. A house fire or apartment fire can cause injury or death and displace a family overnight or make a family homeless with a complete loss of their possessions. Fires can affect one residential unit or spread to other homes or apartment complexes destroying large portions of a community.

Residential fires kill more people in the United States each year than all other natural disasters combined. The most significant common factor in fire fatalities in Vermont continues to be the absence of a functioning smoke detector in the sleeping area of single and multi-family dwellings.

Children and the elderly are at greatest risk of death from fire. Anyone with disabilities limiting their ability to evacuate from a building is also at risk. Low-income families who are living in poorly constructed homes with inadequate and/or poorly maintained heating systems are at high risk for fires. Many tenants do not have renters' insurance and would have difficulty financially recovering from a fire.

The peak season for house fires is during the winter months, between December and March when people are heating their homes. The most common causes of structure fires in Vermont are: heating equipment, cooking, unknown and incendiary/suspicious[1].

Fire and Acres by Cause December 17, 2008		
Cause	**# of Fires**	**# of Acres**
Lightning	3	3.52
Campfire	9	22.43
Smoking	2	0.75
Debris Burning (brush)	59	69.76
Arson	1	0.25
Equipment Use	5	3.38
Railroads	2	0.75
Children	5	4.26
Miscellaneous	31	35.2
Total	117	140.3

Source: 2008 Report of the State Fire Marshal[1]

Forest Fire
Wildland fires can spread to residential areas, thus forcing whole communities to evacuate. When fires are followed by heavy rains, the potential for mudslides and flooding is increased.

While not common, Vermont is not immune to large scale wildfires. The most active time of the year for wildland fires is the spring season when snow melts leave abundant fine fuels such as dried grass and brush. The burning of debris is the most common cause of wildland fires although most are small in acreage. For 2008, Windsor County experienced only 3 fires with a total burn area of 3.26 acres[1].

Most of southern Vermont and New Hampshire is heavily forested and given the right conditions, the potential for widespread forest fires is great. Northern New England did experience some large forest fires in the late 1940s and portions of the Vermont forest are now beyond the natural burn cycle. Areas at risk include all of the forested areas in the region, communities or residents located in or along the edges of forested areas are particularly at risk.

History of Structural Fires
In Vermont, there were 3,451 reported fire incidences in 2008 which represents a 35% increase in number of fire emergencies since 1999. Greater than 80% of these fires were residential structures; either single family, multi-family or other. Eight civilian fatalities resulted from fires in 2008 which is nearly 2 below the previous ten year average.

History of Wildland Fires
No major event is listed for Vermont. The following events occurred in New Hampshire:

- 10/00/1947 Rochester, Farmington Forest Fire
- 10/25/1948 New Hampshire Forest Fire
- 06/27/1953 Central New Hampshire Forest Fire

2. Flooding
Floods are the most common and costly hazard to affect Vermont. Several types of floods occur in Vermont including inundation/slow rising, flash flooding, ice jams and fluvial erosion hazards. They can be caused by heavy or continuous rains, spring thaw, winter ice jams or dam failure flooding. These types of events can result very quickly as is the case with flash floods, or can occur over longer periods of time in slow-rising flood waters.

In all flooding events, water supplies, both public and private, can be contaminated. All types of flooding can be life threatening.

Vermont is susceptible to flooding because of its mountainous terrain, steep valleys, seasonal weather patterns and location of villages in floodplains. Flooding can be made worse by large areas of impervious surfaces, river or stream channelization by humans, stream bank erosion, debris, dam failures, and drainage systems that do not work properly.

Tropical storms and hurricanes are normally associated with large amounts of rainfall and can result in flooding and flash floods. Many of the serious flooding events in Vermont take place in summer following severe weather events involving heavy rainfall.

At risk areas include low-lying areas or floodplains along rivers, streams and lakes, and properties near upland drainages. Structures, public utilities and transportation infrastructure located within the floodplains are most at risk. (See Map 2)

Flooding can be caused by a variety of events as listed below, and are often made more severe when more than one event is combined.

- Snow thaws
- Ice jam events
- Thunderstorms
- Heavy rainfall
- Moderate rainfall following extended periods of rain
- Hurricane related severe rain storms

Slow-Rising Floods
Floodplains are the low lying areas adjacent to rivers or streams and can be identified as higher risk areas for flooding. Early settlers built communities close to rivers where it was flat, and they had easy access to water power and transportation. Consequently, many of our towns and villages have populations located in floodplains. River flooding could potentially be widespread, affecting many communities. Structures, public utilities and transportation infrastructure located within the floodplains

are most at risk (see Water Resources map). The floodplain areas within those towns along the Connecticut River

Flash Flooding
High elevation flooding during heavy or continuous rains to properties abutting drainage areas has been frequently experienced in Vermont. Much of the damage during the 2008 summer flooding in central Vermont was caused by such flooding.

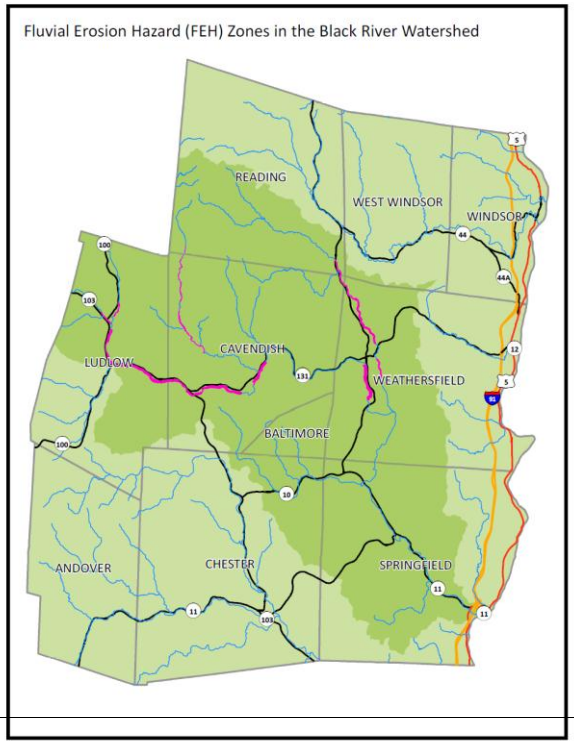
Flash flooding events are rapid onset events that "often result from stagnant or slow-moving thunderstorms as well as from the passage of a series of thunderstorms over the same geographic area. Such high-intensity and often long-duration events produce large amounts of precipitation in a short period of time. These precipitation amounts can quickly exceed bank-full stages along rivers and streams, trigger mass movements (such as landslides and mudslides), sweep away unattached structures (e.g. mobile homes), and carve new [river channels into unstable riverbanks]."[1]

Ice Jam Flooding
Historically, ice jams are common in New England. Ice jams occur during winter and spring when river ice breaks up and flows downstream. Such ice flows can build up against bridges or other obstructions and create a temporary dam impounding large volumes of water. The most devastating winter floods have been associated with a combination of heavy rainfall, warm temperatures, rapid snowmelt and resulting ice jams. Winter weather with less than average snowfall can result in greater ice buildup on streams and rivers, potentially resulting in greater ice jam damage.

Streams, seasonal brooks and drainage courses in higher elevation areas are at risk for flash flooding. Areas along the river valleys of the Black, Connecticut and Williams are most susceptible to ice jam flooding.

Fluvial Erosion Hazards
Historic land uses throughout the region have resulted in encroachments to the floodplain along with the loss of woody vegetation from stream banks. These current and historic practices have resulted in the increased loss of a rivers floodplain access and increase the chance of erosion and river avulsion.

Fluvial erosion is erosion caused by gradual or sudden changes in rivers and streams over time. The changes can be subtle or gradual bank erosion to more dramatic river shifts caused by flood events. Fluvial erosion studies were conducted in 2008/09 by the SWCRPC in coordination with qualified consultants. The assessment work was completed on the Black River along with major tributaries in the towns of Ludlow, Cavendish, Weathersfield and Springfield and Hubbard Brook in Windsor. FEH zones were created and mapped as a result of the data; the zone



[1] Lesley-Ann Dupigny-Giroux, "Climate Variability and Socioecc Historical Perspective"

represents the area needed by the rivers to maintain a stable condition over time (see Water Resources Map).

Outreach events were held in Ludlow, Cavendish and Weathersfield in 2010 and were targeted to the local Planning and Conservation Commissions. As towns complete updates to their town plans, the RPC in encouraging those communities affected by fluvial erosion to include protective measures to prevent and/or mitigate the effects.

History of Flooding Events

New England has a long history of flood events. The Vermont Flood of 1927 was the deadliest natural disaster in the state's history; eighty-four people were killed with over $28 million in property damage. The spring floods of 1936, which affected all of New England, caused $113,000,000 in damage, killed 24 people and made 77,000 people homeless.

During 1978, flooding occurred throughout New England causing millions of dollars in damage. In 1996, flooding ravaged communities in northern New England resulting in significant damage and a Presidential Declaration of Emergency.

Flooding events[2] in Vermont include:

07/1990	Flooding, Severe Storm
03/1992	Flooding, Heavy Rain, Ice Jams
05/1993	Flooding, Heavy Rain, Snowmelt
08/1995	Heavy Rain, Flooding
02/1996	Storms, Flooding
06/1996	Flooding
04/1997	Excessive Rainfall, High Winds, Flooding
07/1998	Severe Storms, Flooding
07/2000	Severe Storms, Flooding
07/2002	Severe Storms, Flooding
09/2003	Severe Storms, Flooding
09/2004	Severe Storms, Flooding
05/2007	Severe Storms, Flooding
08/2007	Severe Storms, Flooding
07/2008	Severe Storms, Flooding
08/2008	Severe Storms, Tornado, Flooding
09/2008	Severe Storms, Flooding

The following ice jam events have been recorded by US Army Corps of Engineers, Cold Regions Research and Engineering Laboratory (CRREL):

01/1990	Chester	Williams River
03/1992	West Windsor	Mill Brook
03/1992	Windsor	Mill Brook

[2] Disasters recorded by FEMA – http://www.fema.gov/news/disasters_state.fema?id=50

03/1992	Windsor	Connecticut River
01/1996	Chester	Williams River
01/1996	Cavendish	Black River
01/1996	Springfield	Black River
01/1999	Chester	Williams River
12/2000	Windsor	Connecticut River
12/2000	Chester	Williams River (2 ice jams)
01/2001	Windsor	Connecticut River
12/2003	Springfield	Connecticut River

3. Severe Winter Weather

Severe winter weather includes ice storms, Nor'easters, heavy snowfall or blizzard conditions. Nor'easters are a subtropical depression which can cause severe and widespread winter storms. Severe cold weather can also cause significant disruption to the region. All winter storms make walking and driving extremely dangerous.

Severe winter storms are a frequent occurrence in Northern New England, and include snowstorms, ice storms, and periods of extreme cold temperatures. A winter storm is considered severe when there is a possibility of:

- Six or more inches of snow fall at a given location within 48 hours,
- There is property damage, injuries or deaths, or
- An ice/glaze storm which causes property damage, injuries or death.

Blizzards

A blizzard is a snowstorm with sustained winds of 40 miles per hour (mph) or more, or gusting up to at least 50 mph with heavy falling or blowing snow, persisting for one hour or more, temperatures of ten degrees Fahrenheit or colder and potentially life-threatening traveling conditions.

Ice Storms

An ice storm involves rain, which freezes upon impact. Ice coating at least one-quarter inch in thickness is heavy enough to damage trees, overhead wires and similar objects, and can produce widespread power outages.

Nor'easters

A nor'easter is a large weather system traveling from South to North, passing along, or near the Atlantic seacoast. As the storm approaches New England and its intensity becomes increasingly apparent, the resulting counterclockwise cyclonic winds impact the coast and inland areas form a northeasterly direction. The sustained winds may meet or exceed hurricane force. The Dolan-Davis Nor'easter Classification Scale is utilized to determine the severity of Nor'easters:

CLASS	% OF STORMS	AVERAGE RETURN INTERVAL	AVERAGE PEAK WAVE IN FEET	AVERAGE DURATION IN HOURS
1 WEAK	49.7	3 DAYS	6.6	8
2 MODERATE	25.2	1 MONTH	8.2	18

3 SIGNIFICANT	22.1	9 MONTHS	10.8	34
4 SEVERE	2.4	11 YEARS	16.4	63
5 EXTREME	0.1	100 YEARS	23.0	96

The elderly, homebound and travelers are at particular at risk during severe winter weather. Town services and businesses can experience severe disruption during prolonged winter storms as heavy snow falls and ice build-up can cut off transportation routes and cause extended power and communication outages. People living in isolated areas may be without power for extended periods of time. Immediately following a severe winter storm, people may not have access to emergency services and necessary supplies. Elderly and disabled may need assistance or evacuation for medical reasons or for lack of home heating.

In this region, these weather events generally occur between December and March. Nor'easters can occur at any time of the year but are more common during winter months.

History of Severe Winter Weather
The ice storm of 1998 caused extreme and wide spread damage to trees, power and communication lines, homes and businesses. The following are winter weather events greatly affected the region:

03/1993	Blizzard
01/1998	Ice Storm (all Northern New England)
03/2001	Severe storm results in significant snowfall across Vermont
01/2003	Heavy snowfall resulting in 20 inches in Windsor County

No specific winter storm hazard areas are identified or mapped since such events are regularly occurring events during the winter and early spring and occur region-wide.

4. Transportation Incident or Disruption

An incident involving cars, trucks, trains or planes can impact a community or a region. Transportation routes or centers can be disabled, and if hazardous materials are involved, evacuations can be ordered. A single plane or train incident can cause hundreds of casualties.

Major disaster level incidents involving our highways, trains, and airways, although not frequent, could happen at any time.

Communities located close to highways, railroads, and airports are most at risk for significant transportation disruptions, however, severe disruptions to major travel corridors, such as Interstate 91, could affect many of the region's residents and businesses. A train derailment and resulting chemical spill could pollute the Connecticut River, a source of public drinking water for many downstream communities. At risk populations include commuters and tourists, as well as the communities near the event.

Transportation incidents can occur at any time of year; however, adverse weather conditions can be a catalyst for traffic accidents.

History of Transportation Events
According to NH Public Radio, a train derailment occurred on April 9, 2001 in Winchester, Vermont. According to reports, the accident caused the "engine to plunge into the Connecticut River and dump thousands of gallons of diesel fuel into the water. Some Wildlife [was] affected...but the clean-up effort began quickly."

Transportation accident data is difficult to compile. The high crash location data developed by the Vermont Agency of Transportation lists the most current accident data available. These crash data, specific for each town, are listed in each Annex. In addition, certain accident locations of local concern may be mapped in each Annex, as deemed appropriate by each local Hazard Mitigation Committee.

High Crash Data for SWCRPC Region
Summarized from Vermont Agency of Transportation (AOT) Crash Listings 01/01/2005—12/31/2009

Town	Road Name	Mile Marker Range	Number of Crashes
Weathersfield	US Rt. 5	5.14	7
Chester	VT-11	1.25	5
Springfield	VT-11	3.56	5
Springfield	VT-11	3.92	11
Springfield	VT-11	3.95	5
Springfield	VT-11	3.99	14
Springfield	VT-11	4.06	8
Springfield	VT-11	4.53	6
Springfield	VT-11	4.55	9
Springfield	VT-11	4.56	8
Springfield	VT-11	4.59	5
Springfield	VT-11	4.61	24
Springfield	VT-11	4.62	7
Springfield	VT-11	4.71	5
Springfield	VT-11	4.76	8
Springfield	VT-11	4.87	5
Springfield	VT-11	4.95	7
Springfield	VT-11	4.97	6
Springfield	VT-11	5.07	5
Springfield	VT-11	5.37	6
Springfield	VT-11	5.55	5
Springfield	VT-11	8.17	7
Springfield	VT-11	8.18	6
Windsor	VT-44	4.73	8
Springfield	I-91	45	5
Springfield	I-91	46	5
Weathersfield	I-91	48	8
Chester	VT-103	2.49	7
Cavendish	VT-103	2.82	7
Ludlow	VT-103	2.22	5
Ludlow	VT-103	4.06	14

Ludlow	VT-103	4.34	5
Springfield	VT-106	0	5
Springfield	VT-106	3.28	10
Weathersfield	VT-106	4.30	5
Weathersfield	VT-131	1.32	8
Weathersfield	VT-131	6.52	5
Weathersfield	VT-131	8.64	8

Qualification - .01 mile stretch of road with greater than or equal to 5 crashes

5. Hazardous Materials

A material is classified as hazardous if it is corrosive, explosive, toxic, ignitable, biologically irritating, radioactive or packaged in a dangerous container. Furthermore, a material that has adverse effects on people, animals, environment or property is considered as a hazardous material. Incidents with hazardous materials can occur during their transportation, storage, use, and disposal.

There are 3 nuclear power plants in Northern New England: Vermont Yankee, Seabrook, and Maine Yankee. These power plants represent a large-scale disaster risk.

Tier 2 sites consist of all facilities that store hazardous chemicals on-site. The owners of these sites are required to report to the state every year. These sites, in general, pose a potential significant threat if the hazardous materials become released into the environment. These areas are shown on Map 5 and on the maps in each Annex.

Homeowners typically have a variety of hazardous materials, including toxic cleaning solutions, petroleum products and typical garden chemicals. Household hazardous waste generally poses a small risk at the regional level, but should be considered. For instance, propane tanks located outside and within floodplains can pose a risk during a flood event if not secured.

Incidents involving hazardous materials are a growing disaster risk. A small mishap at either a fixed site or hazardous materials in transit could cause significant impacts upon a community.

Hazardous materials incidents can have a wide range of potential impacts depending upon the type of materials involved. Communities or structures located along transportation routes, industrial areas, near storage sites and nuclear power plants are particularly at risk. Evacuations for hazardous material incidents can be hurried and confusing. All groups that would have problems evacuating homes including children, the elderly, the physically disabled, and non-English speakers are at greater risk to harm during a hazardous materials incident.

A Commodity Flow Study (CFS) was completed in 2006 by LEPC #3 with funds provided by a grant from the State Emergency Response Commission (SERC). This study was an inventory of hazardous materials being transported through the LEPC region which, in 2006, was composed of the western and southern 13 towns of Windsor County, VT. The LEPC committee has long been aware that the majority of hazardous materials being transported through the region are motor vehicle fuels (diesel and unleaded gasoline) along with heating fuels (oil and gas). The study was designed to inventory rail and truck lines to verify the belief that those were indeed the hazardous materials, and to alert them to any new materials that they were previously unaware of. Those involved in the study were:

The data from the 2006 CFS established that in addition to propane, gasoline, fuel oil and kerosene, other hazardous materials are being transported through the region on a frequent basis. By identifying the placards on tankers, volunteers were able to identify carbon dioxide, toluene, methyl ethyl ketone, battery acid, oxygen, nitrogen – refrigerated liquid, sulfur dioxide and lithium aluminum hydride.

History of Hazardous Materials Incidences

The table below lists recent hazardous materials incidences in the region. This information was provided by the Vermont Department of Environmental Conservation – Waste Management Division.

Recent Hazardous Material Incidents in the Southern Windsor County region

Town	Year	Product	Quantity	Incident Type
Andover	5/5/2006	Hydraulic Oil	1 quart	Hydraulic line failure
Andover	1/9/2009	Heating Oil	300 gallons	AST rupture
Andover	8/22/2009	MODF	3 gallons	Transformer fell on lawn
Andover	9/3/2009	Hydraulic Oil	2.5 gallons	Blown hydraulic line
Andover	5/28/2010	Tetra borate	unknown	Treating telephone poles
Cavendish	2/9/2006	Oil and anti-freeze	unknown	Car accident
Cavendish	8/18/2006	Transformer oil	1 quart	Transformer leak
Cavendish	11/29/2006	Hydraulic Oil	5 gallons	Hydraulic spill
Cavendish	6/4/2007	Hydraulic Oil	10 gallons	Hydraulic hose burst
Cavendish	10/30/2007	Vehicle Fluids	3 gallons	Vehicle accident
Cavendish	5/6/2009	Non-PCB MODF	3 gallons	Transformer shot with firearm
Cavendish	6/5/2009	MODF	10 gallons	Transformer shot with firearm
Cavendish	8/15/2009	Transformer oil	1 quart	Power outage
Chester	7/28/2005	Unknown petroleum		Petroleum discovered during excavation work
Chester	7/29/2005	Hydraulic Oil	2 gallons	Blown hydraulic line
Chester	8/1/2005	Mineral Oil	unknown	Transformer leak
Chester	3/10/2006	Hydraulic Oil	1 quart	Chainsaw hydraulic oil spill
Chester	7/7/2006	Diesel	1 gallon	
Chester	10/4/2006	Diesel	2 gallons	Diesel release from vehicle
Chester	10/21/2006	Transformer oil	1 pint	Transformer leak
Chester	10/30/2006	Transformer oil	1 pint	Transformer leak
Chester	11/9/2006	Hydraulic Oil	2 gallons	Line excavator truck hydraulic leak
Chester	4/5/2007	Transformer oil	2 quarts	Transformer leak
Chester	7/26/2007	Transformer oil	5 gallons	Transformer leak
Chester	9/8/2007	Photo chemicals	unknown	
Chester	1/11/2008	Heating Oil	300 gallons	AST line failure
Chester	2/9/2009	Heating Oil	10-20 gallons	AST line failure
Chester	8/28/2009	Hydraulic Oil	3-5 gallons	Hose split from equipment and sprayed brush

Chester	9/9/2009	Heating Oil	1 gallon	AST overfill
Chester	12/1/5/2009	Hydraulic Oil	4 gallons	Hydraulic line release
Chester	1/27/2010	Hydraulic Oil	10 gallons	Hydraulic hose blew
Chester	1/27/2010	Hydraulic Oil	4-5 gallons	Hose ripped while loading equipment
Chester	2/10/2010	Heating Oil	4 ounces	UST overfill
Chester	3/24/2010	Heating Oil	4 tablespoons	AST leak
Chester	5/20/2010	Hydraulic Oil	10 gallons	Hydraulic spill
Chester	5/26/2010	MODF	3 gallons	Transformer Exploded
Chester	6/17/2010	Heating Oil	unknown	Oil in sump
Chester	7/13/2010	Hydraulic Oil	4 gallons	Hydraulic leak
Ludlow	3/28/2005	Diesel	unknown	Release from compressor
Ludlow	8/12/2005	Transformer oil	560 gallons	Car ran into transformer
Ludlow	8/20/2005	Diesel and hydraulic oil	5-10 gallons	Excavator caught fire
Ludlow	10/3/2005	Solid wastes	unknown	Illegal dumping
Ludlow	10/4/2005	Hydraulic Oil	20 gallons	Hydraulic hose break
Ludlow	11/21/2005	Heating Oil	50 gallons	AST leak
Ludlow	1/28/2006	Heating Oil	400 gallons	UST spill
Ludlow	2/6/2006	Diesel	2 gallons	Spill during delivery
Ludlow	2/22/2006	Diesel	3 gallons	Overfill of vehicle tank
Ludlow	3/10/2006	Heating Oil	10 gallons	Overfill
Ludlow	4/18/2006	Diesel and hydraulic oil	13 gallons	Dump truck roll over
Ludlow	5/12/2006	Hydraulic Oil	15 gallons	Hydraulic leak
Ludlow	7/11/2006	Hydraulic Oil	5 gallons	Hydraulic leak
Ludlow	8/3/2006	Gasoline	13 gallons	Gasoline tank punctured
Ludlow	8/23/2006	Hydraulic Oil	10 gallons	Hydraulic line failure
Ludlow	1/11/2007	Crankcase oil	3 gallons	Engine leak
Ludlow	2/12/2007	Hydraulic Oil	5 gallons	Leak from drill
Ludlow	3/30/2007	Hydraulic Oil	17 gallons	Hydraulic spill
Ludlow	5/17/2007	Hydraulic Oil	5 gallons	Burst hydraulic hose
Ludlow	5/21/2007	Hydraulic Oil	25 gallons	Hydraulic line failure
Ludlow	7/12/2007	Non-PCB dielectric fluid	2 gallons	Equipment malfunction
Ludlow	7/25/2007	Hydraulic Oil	15 gallons	Hydraulic line failure
Ludlow	10/9/2007	Kerosene	250 gallons	AST release
Ludlow	1/6/2008	Gasoline	4 gallons	UST overfill
Ludlow	1/31/2008	Hydraulic Oil	25 gallons	Hydraulic hose failure
Ludlow	3/11/2008	Hydraulic Oil	3 gallons	Hydraulic hose failure
Ludlow	3/18/2008	Brake fluid	2 gallons	Brake fluid release from machinery
Ludlow	6/2/2008	Hydraulic Oil	10 gallons	Hydraulic release

Ludlow	7/2/2008	Gasoline	8 gallons	Vehicle drove off with hose attached
Ludlow	7/23/2008	Lube oil	2 gallons	Failed seal
Ludlow	10/15/2008	Heating Oil	unknown	Leaking valve on AST
Ludlow	10/27/2010	Hydraulic Oil	10 gallons	Hydraulic release
Ludlow	11/6/2008	Hydraulic Oil	15 gallons	Hydraulic failure
Ludlow	12/15/2008	Diesel	8 gallons	Fuel line leak
Ludlow	1/12/2009	Hydraulic Oil	5 gallons	Hydraulic hose failure
Ludlow	4/22/2009	Hydraulic Oil	10 gallons	Blown hose
Ludlow	7/7/2009	Heating Oil	1 gallon	Leaking AST filter
Ludlow	7/10/2009	Heating Oil	unknown	AST filter spill
Ludlow	7/20/2009	Kerosene	unknown	AST leak
Ludlow	10/13/2009	Diesel	1 gallon	Overfill
Ludlow	10/26/2009	Heating Oil	1 quart	AST overfill
Ludlow	12/14/2009	Heating Oil	0.5 gallons	Overfill
Ludlow	1/20/2010	Heating Oil	1 gallon	Overfill
Ludlow	2/6/2010	Fuel oil	10 gallons	AST filter in line
Ludlow	3/10/2010	Hydraulic Oil	unknown	Hydraulic spill
Ludlow	4/30/2010	Heating Oil	0.5 gallons	UST overfill
Ludlow	5/3/2010	Hydraulic Oil	5 gallons	Blown line
Ludlow	6/17/2010	Heating Oil	I gallon	AST overfill
Ludlow	7/29/2010	Hydraulic Oil	5 gallons	Hydraulic hose leak
Reading	9/29/2009	Hydraulic Oil	1 quart	Blown hose on pole grabber
Springfield	1/23/2005	MODF	unknown	Transformer fell
Springfield	5/3/2005	Diesel	2 gallons	Vehicle tank line leak
Springfield	8/16/2005	Hydraulic Oil	1 quart	Hydraulic hose burst
Springfield	9/22/2005	Compressor oil	1 quart	Compressor leak
Springfield	10/9/2005	Milk	1000 gallons	Milk spill
Springfield	10/26/2005	Diesel	45 gallons	Hose ripped from dispenser
Springfield	2/6/2006	Hydraulic Oil	1 gallon	Hydraulic line leak
Springfield	2/15/2006	Heating Oil	30 gallons	AST leak
Springfield	3/28/2006	Diesel	15 gallons	Nozzle fell out of truck
Springfield	4/20/2006	Hydraulic Oil	1 gallon	Hydraulic line failure
Springfield	5/5/2006	Hydraulic Oil	1 gallon	Hydraulic leak
Springfield	6/28/2006	Diesel	10 gallons	Diesel found on ground
Springfield	6/30/2006	Diesel	3 gallons	Diesel spill
Springfield	7/3/2006	Hydraulic Oil	2 gallons	Hydraulic line break
Springfield	7/24/2006	Diesel	5 gallons	Vehicle overfill
Springfield	8/7/2006	Diesel	4 gallons	Customer spill while fueling
Springfield	8/20/2006	Gasoline	5 gallons	Petro sheens in parking lot
Springfield	9/22/2006	Hydraulic Oil	1 gallon	Hydraulic line failure

Springfield	11/21/2006	Diesel and kerosene	30 gallons	Truck lost fuel
Springfield	11/27/2006	Gasoline	1 gallon	Spill at pump
Springfield	12/13/2006	#2 Fuel Oil	219 gallons	AST failure at seam
Springfield	12/14/2006	Diesel	5 gallons	Nozzle fell out of truck
Springfield	1/26/2007	Diesel	2 gallons	Vehicle overfill
Springfield	2/3/2007	Hydraulic Oil	1 gallon	
Springfield	2/8/2007	Diesel	5 gallons	Spill
Springfield	2/26/2007	#2 Fuel Oil	170 gallons	AST leak
Springfield	3/6/2007	Gasoline	6 gallons	Spill at pump
Springfield	6/26/2007	Non-PCB transformer oil	0.5 gallons	Tree downed pole and transformer
Springfield	7/6/2007	Gasoline	5 gallons	Vehicle gas tank leak
Springfield	1/14/2008	Diesel	130 gallons	Tractor trailer accident
Springfield	1/25/2008	#2 Fuel Oil	5 gallons	AST overfill
Springfield	3/13/2008	#2 Fuel Oil	3 gallons	AST overfill
Springfield	4/24/2008	Diesel	5 gallons	Customer spill while fueling
Springfield	4/24/2008	Transformer oil	unknown	Transformer oil spill
Springfield	8/18/2008	Gasoline	2 gallons	Gasoline spill
Springfield	9/17/2008	Diesel	300 gallons	UST overfill
Springfield	9/26/2008	Mercury vapors	unknown	Broken fluorescent bulbs
Springfield	11/19/2008	#2 Fuel Oil	60 gallons	AST leak
Springfield	1/15/2009	Hydraulic Oil	1 gallon	Hydraulic leak
Springfield	3/5/2009	#2 Fuel Oil	2 gallons	Overfill
Springfield	3/5/2009	Kerosene	200 gallons	AST leak
Springfield	4/1/2009	#2 Fuel Oil	200 gallons	AST leak
Springfield	5/22/2009	Diesel	15 gallons	UST overfill
Springfield	6/12/2009	Diesel	5 gallons	Vehicle overfill
Springfield	8/20/2009	#2 Fuel Oil	2 gallons	Leaking compression fitting
Springfield	9/20/2009	#2 Fuel Oil	10 gallons	Basement flood
Springfield	9/23/2009	#2 Heating Oil	20 gallons	
Springfield	9/30/2009	#2 Fuel Oil	20 gallons	Spill
Springfield	12/23/2009	Fuel oil	unknown	Oil discharging out of ground
Springfield	12/30/2009	#2 Fuel Oil	1 gallon	Delivery spill
Springfield	1/8/2010	#2 Heating Oil	0.5 gallons	AST release
Springfield	1/21/2010	#2 Fuel Oil	2 gallons	AST
Springfield	1/29/2010	Antifreeze	1 gallon	Spill from truck
Springfield	2/19/2010	#2 Fuel Oil	60-100 gallons	AST overfill
Springfield	3/2/2010	#2 Fuel Oil	1 gallon	Customer spill while fueling
Springfield	3/16/2010	#2 Fuel Oil	0.5 gallons	Delivery spill
Springfield	4/30/2010	#2 Fuel Oil	1 gallon	Delivery spill

Springfield	5/27/2010	Hydraulic Oil	2-5 gallons	Truck blew hydraulic line
Springfield	8/9/2010	Diesel	1200 gallons	Dispenser allowed to run
Weathersfield	10/25/2005	Gasoline	10 gallons	Car accident
Weathersfield	11/22/2005	Transformer Oil	9 gallons	
Weathersfield	4/4/2006	#2 Fuel Oil	10 gallons	UST overfill
Weathersfield	5/19/2006	#2 Fuel Oil	5 gallons	UST overfill
Weathersfield	8/4/2006	Antifreeze	5 gallons	Hose failure on turbine
Weathersfield	5/24/2007	Gasoline	5 gallons	Hose fault
Weathersfield	9/13/2007	Hydraulic Oil	1 quart	blown hose
Weathersfield	6/17/2008	#2 Fuel Oil	3 gallons	AST overfill
Weathersfield	1/28/2009	Diesel	100 gallons	Vehicle accident
Weathersfield	10/27/2009	Transformer Oil	1 quart	
Weathersfield	12/8/2009	Diesel	50 gallons	Dump truck drive off, dump bed took off top
Weathersfield	12/27/2009	Hydraulic Oil	20 gallons	Truck overturned
Weathersfield	4/15/2010	Gasoline	7 gallons	Leaking auto gas tank
Weathersfield	6/16/2010	Motor oil	1 gallon	Car leak
Weathersfield	6/30/2010	Hydraulic Oil	3 gallons	Line failure
West Windsor	5/10/2006	Hydraulic Oil	1 gallon	Hydraulic leak
West Windsor	3/23/2007	#2 Fuel Oil	150 gallons	AST release to basement
Windsor	12/30/2005	#2 Fuel Oil	6 gallons	UST release
Windsor	3/7/2006	Mercury	1 pint	Mercury spill
Windsor	5/5/2006	Mineral oil with PCB	1 gallon	Transformer leak
Windsor	5/22/2006	Hydraulic Oil	3 gallons	Hydraulic hose burst
Windsor	12/2/2006	Gasoline	2.5 gallons	Customer drove off with hose attached
Windsor	5/17/2007	Phenol solid	45 gallons	Phenol spill, material had volatilized
Windsor	11/27/2007	#2 Fuel Oil	30 gallons	Leak at furnace
Windsor	11/28/2007	#2 Fuel Oil	30 gallons	AST leak
Windsor	3/27/2008	#4 Heating oil	unknown	AST release
Windsor	5/5/2008	Hydraulic Oil	10 gallons	Hydraulic leak
Windsor	6/3/2008	Aluminum and titanium powder	2 cups	Fireworks materials found
Windsor	12/15/2008	Transformer Oil	1 gallon	Power pole down
Windsor	12/24/2008	Non-PCB transformer oil	5 gallons	Transformer down
Windsor	4/3/2009	Kerosene	unknown	AST tipped over
Windsor	6/26/2009	#2 Fuel Oil	1 gallon	AST overfill
Windsor	7/13/2009	#2 Fuel Oil	20 gallons	AST leak
Windsor	9/15/2009	#2 Fuel Oil	1 gallon	Fuel oil spill
Windsor	9/25/2009	#2 Fuel Oil	1 gallon	Oil spill on lawn
Windsor	1/13/2010	#2 Fuel Oil	1 gallon	Broken AST line

Windsor	1/27/2010	Motor oil	1-2 quarts	Truck engine oil leak
Windsor	4/8/2010	MODF	unknown	Transformer fell to ground
Windsor	4/8/2010	Hydraulic Oil	4 gallons	Hose failure
Windsor	6/8/2010	MODF	1 gallon	Large ground transformer
Windsor	7/7/2010	Non-PCB transformer oil	1 gallon	Transformer spill

6. High Winds

High wind events can cause significant levels of disruption to the region. High wind events include hurricane, tropical storms, tornadoes, downbursts and wind shear. No specific high wind hazard areas are identified or mapped at this time.

Hurricanes
The coastal areas of Massachusetts, New Hampshire, and Maine are at much greater risk of damage from hurricanes than Vermont. Vermont, however, is not immune from the effects of hurricanes as was demonstrated by the devastating floods of a tropical storm in 1927, the Hurricane of 1938, flooding caused by Hurricane Belle in 1976, and more recently the flooding caused by Hurricane Floyd. Historically, for the Northern New England states of Maine, New Hampshire and Vermont, hurricanes and tropical storms have been large-scale disaster occurrences.

Wind damage from hurricanes can be severe and can occur miles inland. Trees downed by high winds can block roads, and down power and communications lines. Mobile home parks and houses on ridge lines are at greater risk from wind damage. Blown out windows can cause water damage to homes, sometimes destroying bedding, clothing, and other basic needs of the residents. On average, nine tornadoes are created per hurricane

Tropical Storms
Tropical storms, like hurricanes, tend to generate two types of hazards in Vermont: damage from wind and river flooding. Flooding is discussed in an earlier section. Wind damage from a tropical storm is similar to that generated by a hurricane, although typically not as severe.

People and communities subject to wind damage usually reside on ridge tops or in river valleys. There are several factors that contribute to an increase in the risk for residents of Vermont from tropical storms. They include: greater apathy among Vermont residents due to the lack of recent storm history and a large tourist population coinciding with peak hurricane season (fall foliage). Technology and the facade of a large public infrastructure, including roads, telephone communications, and emergency services, can have people believing that they are immune to the effects of severe weather. In Vermont, this false sense of security has been reinforced by a lack of major hurricanes in recent history.
It is clear from the data that most large coastal storms that track through Northern New England occur in late summer and early fall. Fifty-three percent of all the hurricanes occurred in September.

History of Hurricanes and Tropical Storms[3]
Hurricanes and tropical storms in New England include:

09/1985	Hurricane Gloria	>70 mph winds
08/1991	Hurricane Bob	>60 mph winds

Downburst
"A downburst is a severe localized wind blasting down from a thunderstorm. These 'straight line' winds are distinguishable from tornado activity by the pattern of destruction and debris. Depending on the size and location of these events, the destruction to property may be devastating. Downbursts fall into two categories. Microbursts cover an area less than 2.5 miles in diameter, and macrobursts cover an area at least 2.5 miles in diameter."[4]

Wind shear
Wind shear is caused by sudden changes in pressure causing a sudden shift in wind direction. There are no records of any wind shear related damage in the region.

Severe Thunderstorms
"A severe thunderstorm that produces a tornado, winds of at least 58 mps (50 knots), and/or hail at least 3/4" in diameter. Structural damage may imply the occurrence of a severe thunderstorm. A thunderstorm wind equal to or greater than 40 mps (35 knots) and/or hail of at least ½" is defined as approaching severe."[5]

Recent History of Severe Thunderstorm Events[6]

6/2003	Wind damage
6/2004	Wind damage and hail
7/2007	Flooding/washouts in northern Windsor County
8/2007	Reports of wind damage
5/2009	Reports of wind and hail damage

Tornados
A tornado is a storm of short duration composed of winds rotating around a central core at high velocity (up to 300 mph) with a high potential for inflicting damage in concentrated areas.

It is not generally known that tornadoes do occur in the New England states. For years, it was believed that tornadoes only happened in the mid-western states. Tornadoes occurring in New England were referred to as "high winds." People's attitudes changed after the tragic tornado that occurred in Worcester County, Massachusetts in June 1953 which killed 90 people and did $53 million in damage. There is minimal risk of tornadoes through all of Northern New England.

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[3] UVLSRPC
[4] Ibid
[5] Glossary. NOAA National Weather Service. Retrieved April 8, 2010 (http://www.weather.gov/glossary/index.php?letter=s).
[6] "Summaries and Photos of Recent Weather Events in the Burlington Forecast Area." National Weather Service Forecast Office, Burlington, VT. Retrieved April 8, 2010. (http://www.erh.noaa.gov/btv/events/recentwx.shtml).

Tornadoes are indiscriminate in their destruction. There is generally little warning time, therefore no time for evacuation. Mobile home parks are particularly vulnerable.

The peak season for tornadoes for Northern New England is from June to August, but they can occur at any time of the year

History of Tornados
In June 2003 in Cavendish and Ludlow a microburst/tornado took down trees, blocked roads, damaged house and caused widespread electrical outages in a swath approximately 6 miles long and 0.5 miles wide.

To date, 32 tornadoes have been recorded in Vermont.

Tornado Events in Windsor County include:[7]

10/24/1955	Event #2	F1 Scale
07/09/1962	Event #4	F1 Scale
07/09/1962	Event #5	F1 Scale
08/11/1966	Event #1	F1 Scale

To date 72 tornadoes have been recorded in New Hampshire. The following events occurred in New Hampshire:

06/23/1982	Claremont & Croydon Tornado
09/09/1821	Cornish, Croydon, Lake Sunapee, New London Sutton, Salisbury, Mt Kearsarge, Warner & Boscawen Tornado
07/01/1877	Gilsum, Sullivan & Nelson Tornado

7. Earthquake
An earthquake is a sudden rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and often cause landslides, flash floods, fires, avalanches, and tsunamis. The magnitude and intensity of an earthquake is determined by the use of scales like the Richter Scale and the Mercalli Scale.

New England states are located on the North American Tectonic Plate and are subject to internal plate earthquakes, as opposed to plate boundary earthquakes that are prevalent in California. New England earthquakes are not as correlated with known fault lines and affect a wider geographic area than the western quakes when they occur.

The odds that a damaging earthquake, a magnitude of 5 or more, will occur somewhere in New England in any given year are 1 in 20 or 90% probability in within the next 50 years. The odds for a magnitude 6 earthquake are 1 in 300 or about 30% in 50 years.

[7] Tornado Project, www.tornadoproject.com

The National Oceanic and Atmospheric Administration has designated the earthquake risk in Northern New England as moderate with the coastline of Maine and New Hampshire as major.

At-risk populations include people working or residing in old or unsound structures. It should be noted that buildings in Vermont are not designed for earthquake safety and un-reinforced brick buildings are at particular risk for damage.

Earthquakes can occur at any time.

History of Earthquakes
Between 1843 and 1989 there were 69 earthquakes reported in Vermont. Recent earthquakes include:

01/19/1982	West of Laconia, NH
04/20/2002	Centered in upstate NY State

Between 1728 and 1989 there were 270 earthquakes reported in New Hampshire**.**

The Vermont Geological Survey of the Agency of Natural Resources completed a HAZUS analyses for the SWCRPC Region. The summary for these analyses is on page 51. The full report is available for inspection at the SWCRPC office. Maps provided by the Vermont Geological Survey are presented in Appendix B.

Recent Declared Disasters in Vermont[8]
The following is a listing of recent major disaster declarations in Vermont, provided by FEMA Region 1.

07/27/2000	Severe Storms and Flooding	1336
01/18/2001	Severe Winter Storm	1358
07/12/2002	Severe Storms and Flooding	1428
09/12/2003	Severe Storms and Flooding	1488
09/23/2004	Severe Storms and Flooding	1559
05/04/2007	Severe Storms and Flooding	1698
08/03/2007	Severe Storms and Flooding	1715
07/15/2008	Severe Storms and Flooding	1778
08/15/2008	Severe Storms, Tornado and Flooding	1784
09/12/2008	Severe Storms and Flooding	1790
01/14/2009	Severe Winter Storm	1816

On 04/10/2001 an Emergency Declaration was made for a Snowstorm, disaster number 3167.

C. HAZARD PROBABILITY AND VULNERABILITY ANALYSIS

The next steps involve identifying which hazards pose the greatest risk and which critical facilities are the most vulnerable to hazard events, as well as to estimate the potential losses. The first step in this process is to identify those hazards that pose the greatest risk. This step completed for the regional plan is summarized below.

In the Town Annexes the following steps will be addressed:

[8] FEMA Region 1 website

- To locate the facilities most likely to be damaged in a hazard event.
- Identify vulnerable facilities by comparing their locations to possible hazard events.

1. Methodology[9]

A vulnerability analysis for each community begins with an inventory of possible hazards and an assessment of the risk that they pose. These are the questions to be answered.

- What hazards can affect your community?
- How bad can it get?
- How likely are they to occur?
- What will be affected by these hazards?
- How will these hazards affect you?

The process to do this in the regional all-hazards plan differs somewhat to the methodology used in the Town Annexes.

The process involved in the regional portion of this plan is the same used in the development of the Regional Emergency Operations Plan for the Local Emergency Planning Committee #3, which encompasses the entire Southern Windsor County region and the town of Hartland. This process involved extensive involvement of the LEPC #3 Planning Committee in the assessment of vulnerability.

For this section, the rating system for the Hazard Risk Assessment is based on combining the probability of the disaster of occurring (largely based on history) and the vulnerability rating is based on the potential number of people beyond the capability of an individual Town to manage and respond to that may require response from other Towns of LEPC #3 and beyond for emergency services during a disaster, e.g. mass care and emergency assistance. The rating system is as follows:

Probability Rating:		
Score	**Category**	**Description**
4	Annual	The disaster occurs on an annual basis in Vermont
3	High	The disaster has occurred within the last 15 years or current conditions indicate that the disaster is likely to occur at least 2 times in the next 20 years in Vermont.
2	Medium	The disaster has occurred 4 or more times in the last 100 years or current conditions indicate that the disaster is likely to occur more than 2 times in the next 50 years.
1	Low	The disaster has occurred 1 to 3 times in the last 100 years or current conditions indicate that the disaster is likely to occur at least once in the next 50 years.
0	Unlikely	There has not been an occurrence in the last 100 years and conditions have not changed, or there is no past history and probability is unsure.

Vulnerability

[9] Source: Addison County Region Wide All Hazards Mitigation Plan

Score	Category	Description
4	Extensive	Disaster could impact over 9,000 people in the chapter service area [over 3,000 families]
3	Major	Disaster could impact 1,501 - 9,000 people [500 - 3,000 families]
2	Substantial	Disaster could impact 301 - 1,500 people [100-500 families]
1	Moderate	Disaster could impact 30 - 300 people [10 - 100 families]

2. Probability and Vulnerability Analysis

The following table presents the results of the regional risk assessment considering wide number of potential hazards, listed in the order of probability:

Type of Disaster	Probability	Vulnerability	Score
Residential Fire	4	1	5
Flash Floods/Ice Jams	4	2	6
Blizzard or Severe Winter Storms	3	4	7
Power Outages	3	4	7
Slow-rising Floods	3	3	6
Hazardous Materials Release	3	3	6
Hurricanes/Severe Storms/Tornado	3	3	6
Transportation: Rail, Highway, Airplane	3	2	5
Major Fires/Industrial Explosion	3	2	5
Dam Break	1	4	5
Wildfire	4	1	5
Avalanche, Landslides & Mudslides	1	1	2
Serious Earthquake	1	4	5
Nuclear Power Incident	1	4	5
Civil Disturbance	1	2	3
Epidemic	1	3	4
Terrorism: Explosives & Biologicals	1	4	5
Nuclear Attack	0	4	4
Meteorite Fall	0	4	4
Drought	1	1	2

In addition, many disasters will act as 'triggers' for secondary events or disasters that are caused by the primary or triggering disaster event. This triggering of one or more secondary events, some unintended or unanticipated, by a primary disaster is referred to as a "Cascade Effect." The following table presents a list of primary events and the possible secondary events that could be triggered by the primary event and would have major consequence to the affected community.

CASCADE EFFECT - Secondary Events

	Secondary events that can be triggered by a disaster											
	Cascade Effect - Secondary Events	Power Failure	Hazardous Materials	Fire	Radiological Incident	Water Supply Failure	Transportation Incident	Levee/Dam Failure	Flash Flood	Landslide	Slow-rising Flood	Blast	Fallout
Primary Disaster (triggering)	Residential Fire	x	x	x			x					x	
	Flash Floods/Ice Jams	x	x	x		x	x	x	x	x	x		
	Blizzard or Severe Winter Storms	x					x	x	x	x	x		
	Power Outages		x	x	x	x	x	x				x	
	Slow-rising Floods	x	x	x	x	x	x	x		x			
	Hazardous Materials Release			x		x	x					x	
	Hurricanes/Severe Storms/Tornado	x	x	x	x	x	x	x	x	x	x		
	Transportation: Rail/Highway/Airplane	x	x	x	x	x	x	x					
	Major Fires/Industrial Explosion	x	x	x	x	x	x					x	
	Dam Break	x	x	x	x	x	x		x	x	x		
	Wildfire	x	x	x			x						
	Avalanche/Landslide/Mudslide	x	x	x			x	x	x		x		
	Serious Earthquake	x	x	x	x	x	x	x		x		x	
	Nuclear Power Incident		x		x		x						x
	Civil Disturbance			x		x	x					x	
	Epidemic						x						
	Terrorism: Explosive/Biologicals	x	x	x	x	x	x	x				x	
	Nuclear Attack	x	x	x	x	x	x	x				x	x
	Meteroite Fall	x	x	x	x	x	x	x				x	
	Drought			x		x							

These guidelines were used to assess the risk for the state Hazard Inventory/Risk Assessment, and to assess the risk for each SWCRPC community. See Town Annexes for community hazard vulnerability ratings.

3. Summary of Vulnerability Analysis by Hazard

The following summarizes the results of this vulnerability analysis for each hazard type.

Fires

Fires were identified as one of the top risks for the region.

Residential fires:	ANNUAL probability	LOW vulnerability
Major fires:	HIGH probability	SUBSTANTIAL vulnerability
Wildland Fires:	ANNUAL probability	MODERATE vulnerability

Vermont building codes address appropriate fire prevention methods, but pre-existing older structures are vulnerable.

Flooding

Flooding was identified as one of the top risks for the region.

Flash floods:	ANNUAL probability	SUBSTANTIAL vulnerability
Ice jams:	ANNUAL probability	SUBSTANTIAL vulnerability
Slow-rising floods:	HIGH probability	MAJOR vulnerability
Dam break:	LOW probability	EXTENSIVE vulnerability

Maps in the town annex illustrate those critical facilities that are located within the 100-year floodplain, as well as in areas vulnerable to flash flood events. A significant number of structures, infrastructure, residents and critical facilities are located within the 100-Year floodplain. Damage estimates will be included in each Town Annex. Zoning bylaws can address development within flood zones in order to minimize flood damage and preserve natural flood retention areas.

Severe Winter Weather
Severe winter weather was also identified as one of the top risks for the region.

Blizzard or severe winter storm:	HIGH probability	EXTENSIVE vulnerability

Damage estimates will be included in each Town Annex. Building codes could establish structural standards for buildings in order to withstand significant heavy snow loads on building roofs.

Transportation Incident or Disruption
Transportation related events are a likely disaster for this region.

Trans.: rail/highway/air:	HIGH probability	SUBSTANTIAL vulnerability

Damage estimates will be included in each Town Annex. Access management provisions exist for all state highways and for local roads in many of the towns. Driveway permits that are effectively implemented can have a big effect in reducing a community's vulnerability to traffic accidents. Traffic speed enforcement may effectively reduce the severity of potential accidents.

Hazardous Materials
Hazardous material releases are likely in this region.

HazMat:	HIGH probability	MAJOR vulnerability

Damage estimates will be included in each Town Annex. Traffic speed enforcement can have some effect on reducing a community's vulnerability to a hazardous materials incident.

High Wind Events
High wind events, including winds associated with hurricanes and tropical storms, are a significant risk for this region.

Hurricanes/severe storms/tornado	HIGH probability	MAJOR vulnerability

Damage estimates will be included in each Town Annex. Building codes could establish structural standards for buildings, such as structural reinforcements to prevent wind damage.

Earthquake
Major earthquakes were determined to have a low probability but the chance for extensive damage to the region if one should occur.

Serious earthquake:	LOW probability	EXTENSIVE vulnerability

The Vermont Geological Survey of the Agency of Natural Resources completed a HAZUS analyses for the SWCRPC Region. A summary for these analyses is listed below. The full report is available for review at the SWCRPC office.

D. Summary of HAZUS

Based on a request from the SWCRPC, the Vermont Geological Survey (VGS) conducted HAZUS earthquake analyses to be incorporated into the Regional All-Hazard Mitigation Plan. These analyses on earthquake loss estimations for the Southern Windsor County region are summarized below. The land area used in this analysis is expanded slightly beyond the regional planning commission jurisdiction, based on existing census tract geography and LEPC #3 boundaries.

HAZUS is a computer model developed by FEMA and the National Institute of Building Sciences to enable earthquake loss estimations at a regional level using US Census data as a basis for existing conditions. The estimations developed in these analyses conducted by VGS can be used by "local, regional and state officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery." These analyses summarized below are based on hypothetical once-in-500-year earthquakes in Tamworth, NH; Goodnow, NY; and Middlebury, VT.10

The geographical size of the region studied, is 612.58 square miles, with a population of 44,404 people and over 18 thousand households (2000 Census). The region includes an estimated 17 thousand buildings, approximately 99 percent of which are residential structures. The total building replacement value is $3,250 million, 84 percent of which (or $2,730 million) accounts for residential structures. The replacement value for the transportation network is $3,755 million, and $517 million for utility lifeline systems.

Based on the HAZUS analysis, earthquakes in all epicenter locations (Tamworth, Goodnow and Middlebury) will not exceed critical thresholds for severity (i.e. threshold values of peak ground acceleration). However, some building damage is predicted.

Tamworth Scenario:

- A once-in-500-year earthquake in Tamworth of 6.2 magnitude could cause no damage to essential facilities, 6 total Level 1 casualties (requiring medical attention but no hospitalization), $8.58 million in building-related economic losses, $700,000 in transportation system losses,

[10] HAZUS, Vermont Geologic Survey, Department of Environmental Conservation, Agency of Natural Resources, September 2003.

$2.82 million in utility system losses, and have an indirect economic impact of $3.96 million in lost income. (See Appendix B)

Goodnow Scenario:

- A once-in-500-year earthquake in Goodnow of 6.6 magnitude could cause no damage to essential facilities, 6 total Level 1 casualties (requiring medical attention but no hospitalization), $5.85 million in building-related economic losses, $500,000 in transportation system losses, $1.01 million in utility system losses, and have an indirect economic impact of $3.95 million in lost income. (See Appendix B)

Middlebury Scenario:

- A once-in-500-year earthquake in Middlebury of 5.7 magnitude could cause no damage to essential facilities, 3 total Level 1 casualties (requiring medical attention but no hospitalization), $3.53 million in building-related economic losses, $400,000 in transportation system losses, $1.15 million in utility system losses, and have an indirect economic impact of $3.94 million in lost income. (See Appendix B)

HAZUS maps are included in Appendix B. The complete HAZUS report is available at the SWCRPC and is not contained in this Plan.

CHAPTER IV: CRITICAL FACILITIES

Identifying and then prioritizing the facilities and areas of concern is vitally important to mitigation planning. Critical facilities include all human-made structures or other improvements which because of their function, size, service area or uniqueness have the potential to cause serious bodily harm, extensive property damage or disruption of vital socioeconomic activities if they are destroyed, damaged, or if their services are repeatedly interrupted. All vital structures necessary for community health, safety and prosperity and must remain normally open are considered critical facilities.

This section's primary focus is facilities and areas of concern at the regional level and with the purpose to protect the integrity of the regional infrastructure. Locally important resources are discussed in the Town Annexes. The categories for these facilities were taken from the Addison County Regional Plan. The following list below was adapted by SWCRPC from lists generated during regional planning agency GIS meetings held in 2003 and from the Upper Valley All-Hazards Mitigation Plan.

The Vermont Pre-Disaster Mitigation Planning Critical Facilities list includes the following facilities and resources:

Emergency Response Services

- Police Stations (local, state and County Sheriff)
- Fire Stations and Substations
- Emergency Operation Center(s)
- Town's designated emergency shelters
- Health care offices, hospitals, medical clinics
- Emergency Fueling Stations
- Evacuation Routes
- Secondary Evacuation Routes
- National Guard Armory
- Highway garages and equipment sheds (town and state)

Non-Emergency Response Facilities and Structures

- Town offices
- Wastewater treatment facilities
- Water supply pump station
- Water storage facility
- Publicly maintained culverts and bridges
- Power generation site
- Power substation
- Communications tower, transmission lines
- Airports (public and private)
- Media sites: VIT, newspaper, TV stations
- Phone switching stations
- Utility offices
- Railroad stations/facilities
- Government offices, including courthouses
- Border crossing areas
- Marinas and commercial docks
- Bus transit stations
- Dams

Facilities/Populations to Protect

- Institutional care (group quarters, nursing, elderly)
- Schools (that are not shelters)
- Higher educational institutions
- Animal/veterinary shelters
- Daycare facilities
- Cultural/Historic sites
- Mobile home parks
- Public places for large events, public gathering locations
- Prisons/corrections facilities
- Public records/antiquities

Potential Resources

- Suppliers of food and potable water
- Suppliers of fuel for motor vehicles and home heating
- Medical supplies
- Large equipment
- Potential back-up shelters
- Snow removal
- Contractors to provide additional labor in disaster recovery efforts

Regional Critical Facilities and Areas of Concern

This section details those critical facilities and areas of concern of significant size and scope that they have the potential to affect a significantly large percentage of the region's population in the event of a major disaster. Map 3 shows critical facilities in the Region.

Transportation Infrastructure
Map 1 shows the major highway in the region. Interstate 91, state highways and Class 2 Town Highways are the primary means of mobility for residents and travelers alike. It is a high priority to maintain these highways in passable condition to the greatest extent possible in order to maintain basic access to, from and through this region in a disaster event. Most local Rapid Response Plans rely on these same roads to evacuate residents during a disaster.

Vermont Yankee Nuclear Power Plant
Vermont Yankee nuclear power plant in Vernon, Vermont, is not within the Southern Windsor County region; however, has the potential to affect large numbers of residents of this region. This power plant began operations in 1972 and the current license expires in 2012. As of 2005, Vermont Yankee was providing 33.9% of the energy for the state of Vermont. According to the Entergy website, Vermont Yankee generates a maximum dependable capacity of 535 MW. Damage to the nuclear reactor or waste storage facility could result in radioactive waste entering the environment. Depending upon the direction of the prevailing wind, a nuclear plume could cause significant health risk to populations of this region.

Currently nuclear waste is stored onsite. Eventual transporting of nuclear waste to the Yucca Mountain national storage facility in Nevada would not likely affect this region directly.

Emergency Telecommunications Systems
Multiple statewide communications systems currently exist for the varied emergency response agencies in the State of Vermont. Many agencies – including conservation officers, fire personnel, EMS, and local, county and state law enforcement – utilize the different available systems for voice communication essential for emergency situations. Better interoperable communications between these varied groups is essential during major disasters.

A system of communication is being implemented throughout Vermont by the Department of Public Safety. The VCOMM system establishes a system in which individual towns maintain their own operable radio network with access to other town emergency services through an interoperable network of channels devised by the state. This alleviates two problems that occur during an emergency: the need for emergency personnel to remember the radio frequency of nearby town emergency services and the system will increase the mobile coverage of radio networks throughout the state.

Other Issues of Regional Concern

- **Residential Fires –** Fires in residential structures likely pose the greatest potential risk for loss of life and property in this region. In this region, many old and new structures alike do not have adequate fire protection devices, such as smoke detectors and fire extinguishers. Winters are long and cold in Vermont, and many households rely on fuel wood for winter heat, which increases the risk for structural fires.

- **Large-Scale Flooding** – A major flooding event is the most likely hazard event to cause the greatest displacement of families in this region. See Map 2 that shows 100-Year floodplains in this region. Areas adjacent to the Connecticut River are particularly at risk.

- **Hazardous Material Spills** – Most towns place hazardous material spills at the top of their list for community vulnerability. Interstate 91 and VT Route 103 are designated Vermont truck routes and are highly likely to be locations of hazardous materials spills. The New England Central Railroad, which runs along the Connecticut River, also poses this same risk.

At-Risk Populations and Animals

The following populations have the potential to be heavily or frequently impacted by disaster. They may require special planning and resources to ensure that their needs can be met as quickly and as effectively as those of the general population.

- **Senior Citizens** - may have mobility, nutritional, physical or mental health needs that will require additional resources to meet their needs. Special effort to identify and locate affected senior citizens must be made by Towns.

- **Nursing Home Residents & Assisted Living Residents** - These facilities have to be identified in the disaster planning stage and the number of residents and levels of care determined. Staff contacts need to be identified and the Town should have an understanding of the institution's responsibilities toward its residents during a major event.

- **Hospitals** - There are a variety of Hospitals to be found in the region, from small community based facilities to major teaching hospitals and Veterans Administration.

- **Low-income Families** - For a variety of socioeconomic factors (i.e. housing stock, residence location, infrastructure condition, and heating methods) low-income families bear a disproportionate share of disaster events and consequences. Low-income families also tend to have fewer resources to fall back on for effective and efficient disaster response and recovery.

- **Residents Living in Flood Zones** - By definition, families residing in flood zones are more prone to suffer loss in a flooding event. NFIP 100-Year Flood Map - Flood Hazard Zones and areas known to flood first, should be well known and identified in each Town. Higher altitude drainage areas that are prone to flooding should be noted and identified.

- **Mobile Home Park Residents** - Mobile home parks are often located in marginal residential areas more prone to disaster damage. Coupled with the greater exposure to disaster events, the nature of mobile home construction means that the degree of damage suffered from a disaster will usually be at a greater loss level. Also, mobile home residents tend to have fewer resources to fall back on in responding to disaster loss and recovery.

- **Children** - Children are particularly vulnerable to hazards. Special effort to identify and locate children must be made by Towns.

- **Persons Physically, Mentally Challenged or with Behavior Disorders** – Local emergency response responders should locate and be familiar with these persons in their Town, as

responders will generally be required to provide a higher level of service and resources for these individuals. This population also usually demands a higher degree of understanding and sensitivity from disaster workers.

- **Animals** – Families seeking shelter in American Red Cross facilities are not allowed to keep their pets with them. These pets must be separately sheltered. Agricultural birds and animals may have to be transported, sheltered, watered and fed. In addition, cows need to be milked, and even when cows may be sheltered in place, milking large numbers of cows will require electrical power

B. Local Critical Facilities and Areas of Concern

The Town Annexes detail critical facilities and areas of concern determined at the local levels in each town of this region. While these are presented as only resources of local interest, all identified critical facilities and areas of concern are important at the regional level as well.

Maps in the Town Annexes illustrate the locations of major local critical facilities and areas of concern in the region. Incorporating these maps with local land use regulations may help to inform the local land use decision making process and mitigation efforts.

CHAPTER V: Local, Regional and State Hazard Mitigation Goals

A. Local – see town specific annex

B. Regional

Southern Windsor County Regional Planning Commission (SWCRPC)

SWCRPC serves 10 member towns in southeastern Vermont, in a region that is approximately 25 miles long by 20 miles wide. Our planning staff includes transportation, environmental, land use, and community planners, as well as Geographic Information Systems (GIS) mapping technicians and a solid waste coordinator. Our Board of Commissioners represents each of our 10 member towns. We have provided professional planning assistance to municipal boards since 1966.

SWCRPC Goals, Policies and Recommendations that Support Hazard Mitigation

The 2009 Regional Plan includes the following overall goals that support hazard mitigation:

- To achieve a reasonable balance between protection of natural resources and growth in a way that maximizes the potential for both.
- To assist all member communities in developing effective town plans and implementation documents.
- To identify housing needs throughout the Region and to encourage the development and rehabilitation of housing that will meet the needs of all regional residents regardless of social characteristics or income.
- To create and maintain efficient public facilities and services adequate to meet existing and foreseeable future needs.
- To develop a transportation system that balances the needs of safety, convenience, cost, energy efficiency, environmental protection, economic growth, and recreation.
- Regionally significant natural, cultural and archeological features, and historic sites and buildings should be protected and preserved.
- All appropriate agencies should cooperate in the development and maintenance of a safe and efficient regional transportation system that meets the vehicular and pedestrian needs of all residents with minimum impact to the Region's environmental and aesthetic qualities.
- The protection of significant agricultural and forested land, through incentives and measures which discourage the subdivision or fragmentation of large parcels of such lands is discouraged.
- Efficient infrastructure adequate to support economic or other growth should be created prior to development.

Land Use goals, polices and recommendations that support hazard mitigation:

- To direct growth and development toward areas of the Region where it will be most effective and efficient to provide the necessary public infrastructure and services.
- Towns are encouraged to adjust zoning and subdivision regulations to allow for densities that protect or enhance the existing settlement patterns and resources.

- Priority for the use of public funding for the maintenance or improvement of infrastructure shall be for those that support concentrated development in Regional, Town and Village Centers.
- Use of public funds for the conservation of natural resources is encouraged.
- Local efforts to encourage compatible development adjacent to significant natural resources (waterways, large forested areas, wildlife habitat, etc.) by requiring buffer strips, visual screening and other mitigation devices should be supported.
- The RPC should assist towns to eliminate or mitigate the effects of development on natural resources that extend beyond town borders or are considered regionally significant as determined by the affected towns and the region.
- Help towns to evaluate proposed development projects for possible adverse effects to important natural resources, both within and beyond town borders.
- Assist communities with developing effective bylaws, including zoning and subdivision regulations, that are consistent with the purpose and intent of their town plans and that consider the needs of adjacent towns and the Regional Plan.
- Support town, public and private conservation organizations in protecting significant cultural resources, farmland, forestland, shorelines, and significant plant and animal species and their habitat.
- Encourage state and federal agencies to contact local planning commissions and the RPC when considering the location or relocation of government buildings.

Community Utilities and Facilities goals, policies and recommendations that support hazard mitigation:

- Location and expansion of utilities and facilities should occur in areas best able to serve the public interest with the fewest negative side effects.
- Extensions of service infrastructure should take place in areas proposed for development by town plans and local bylaws.
- Town efforts to maintain, upgrade and expand water/sewer distribution lines and sewage treatment facilities so that they meet or exceed federal, state and local standards should be supported.
- The quality of municipal and public drinking water supplies should be protected.
- Assist towns that wish to upgrade wastewater treatment facilities and adopt other techniques that will decrease the concentrations of phosphorus and other chemicals detrimental to surface waters.
- To ensure that adequate services and facilities exist in the Region to promote a safe and healthy social environment.
- To maintain Enhanced 911 service as designed and provided by the Vermont Enhanced 911 Board.
- Participation in the Vermont Enhanced 911 program by all towns in the Region is encouraged.
- Expansion or creation of health and safety facilities is encourages, as necessary, to meet the current and future demand.

- Town, inter-governmental, regional, state and federal cooperation is encouraged in the development of service areas and standards for health and safety facilities and services.
- Assist towns in obtaining administrative and financial assistance from the Vermont Enhanced 911 Board for ongoing system maintenance.
- Promote town and regional assessments of the impact of existing and potential development on public health and safety facilities and services prior to new development.
- Communications facilities, whether at new or existing sites, must demonstrate that the facility complies with the applicable FCC emissions standards in order to protect public health and safety.
- Promote the necessary infrastructure enabling interoperable communications to support emergency services.
- All wireless communication facilities within the Region should be inventoried, located and mapped by the RPC.

Emergency Planning and Management goals, policies and recommendations that support hazard mitigation:

- To build disaster-resistant communities in the region through sound emergency and land use planning.
- To maintain Enhanced 911 service as designed and provided by the Vermont Enhanced 911 Board.
- Encourage towns to undertake and periodically review an all-hazards risk assessment in their community to identify potential hazards and the life and property at risk, including cultural, historical and natural resource assets.
- Encourage towns in emergency planning to develop and implement regulations to make communities more disaster resistant.
- Encourage towns to review, update and adopt a Basic Emergency Operations Plan for newly identified risks.
- Encourage towns to adopt minimum standards for public roads, bridges and culverts using the Vermont Local Roads Program and FEMA standards.
- Encourage towns, in the adoption of minimum road standards, to include the requirement that all private roads and driveways be properly constructed to prevent damage from storm water runoff.
- Explore efforts to develop a regional emergency response plan that includes surrounding areas in Vermont and New Hampshire.

Natural Resource goals, policies and recommendations that support hazard mitigation:

- Achieve and maintain an appropriate balance between forestland uses and other land uses, in the best interests of the environment and regional residents

- To protect, and improve where necessary, the quality and quantity of the Region's surface waters and the land surrounding them so that they support a variety of uses and functions including contact recreation, habitat for native flora and fauna, and flood control.
- To protect and preserve wetlands so that they may serve the functions defined in the

Vermont Wetlands Rules.

- Development in flood hazard areas shall be in compliance with the municipal flood hazard regulations.
- Destruction of wetlands and construction in wetlands should be avoided.
- The storage or use of chemicals that could contaminate groundwater within Source Protection Areas is discouraged.
- To ensure that all towns in the Region have drinking water supplies that are safe and sufficient to meet the needs of future growth.
- Avoid developments on soils susceptible to flooding, erosion hazards and the failure of foundations and septic systems.
- Ensure that any extraction or recovery of mineral resources located below or adjacent to the surface of water bodies or impoundments is in accordance with appropriate state guidelines and any other applicable regulations.
- Ensure that effective site reclamation and revegetation plans are provided and implemented.
- To maintain a consistently high level of air quality for the health and enjoyment of the Region's residents and visitors.

Transportation goals, policies and recommendations that support hazard mitigation:

- Encourage VTrans to reduce speed limits on the Region's State Highways that pass directly through village centers where towns have no jurisdiction.
- Any proposed development adjacent to an interchange should be clustered within existing development to limit the number of direct access points on to arterial roads. Any proposed project that would significantly alter traffic flow or volume should be discouraged and/or mitigated to the greatest extent possible.
- State and Town Highway projects should use the existing road alignments. Maintenance or rehabilitation will be given priority over increasing speed or capacity.

Energy goals, policies and recommendations that support hazard mitigation:

- Now new dams or major improvements to existing dams should be encouraged, or permitted, without full considerations of its social, economic and environmental impacts, and are in conformance with local and regional plans.
    a) run-of-the-river projects are preferred over project which require impoundments with low or minimum flows;
    b) recreation and fisheries are high priorities for river uses and should not be significantly diminished by hydropower development; and,
    c) water quality and minimum flows to sustain aquatic life must be maintained.

STATE GOALS (State of Vermont Hazard Mitigation Plan)
Goal 1. Avoidance of Hazards
Policy Objective 1

Integrate hazard avoidance strategies for at-risk property and infrastructures into state, local and regional development plans, land use plans, regulations and projects.
Recommended Mitigation Actions & Activities

- To the extent possible, create grant and loan priority incentives to ensure that all new construction takes place outside of designated flood plain, fluvial erosion hazard, and repetitive loss areas.

- Recommend increased State funding for communities which adopt mitigation measures as outlined in the newly revised 2007 Emergency Relief & Assistance Fund (ERAF) incentives list.

- Ensure that proposed environmental and development legislation initiatives are in accordance with the State Mitigation Plan.

Goal 2: Prioritize Public Safety

Recommended Mitigation Actions & Activities

- Conduct technical assessments guided by the data outputs of the fluvial geomorphic and landslides assessment and mapping process.
- Fund local or regional flood hazard mitigation planning activities, adoption of riparian corridor protection mechanisms and/or management strategies through state grant programs.
- Utilize Regional Planning Commissions and the VT Department of Agriculture to assist in coordinating flood hazard mitigation efforts and adoption of riparian corridor protection mechanisms.
- Use risk and vulnerability data as the basis for developing action plans (utilizing avoidance strategies whenever possible) and establishment of funding priorities. Incorporate these into project selection criteria and use weighted ranking for PDM and HMGP applications.
- Enact new legislation and/or strengthen existing regulations to ensure that all future development is consistent with the most recent fluvial and mapping assessments.
- Accelerate current mapping and risk assessment initiatives utilizing the latest technologies, e.g. fluvial hazard risk assessment, HAZUS MH.

Goal 3: Fully Utilize Federal Funding Streams to Support Hazard Mitigation Initiatives

Recommended Mitigation Actions & Activities

- Require that each HMGP and PDM project be in conformance with the State Mitigation Plan and Local Mitigation Plan approved under 44 CFR part 201.
- Require that each HMGP and PDM project focus on priority mitigation strategies as identified in this State Plan, e.g. risk avoidance, repetitive loss areas, riparian corridor protection, areas impacted by fluvial erosion, chronic flooding, et al.
- Require that each HMGP and PDM project have a beneficial impact upon the designated disaster area, whether or not located in the designated area.

- Require that each HMGP and PDM project be in conformance with 44 CFR part 9, Floodplain Management and Protection of Wetlands, and 44 CFR part 10, Environmental Considerations.

- Require that each HMGP and PDM project solve a problem independently or constitute a functional portion of a solution where there is assurance that the project as a whole will be completed. Projects that merely identify or analyze hazards are not eligible.

- Require that each HMGP and PDM project be cost-effective and substantially reduce the risk of future damage, hardship, loss, or suffering resulting from a major natural or man-made disaster.

- Require that each HMGP and PDM project address a problem that has been repetitive, or a problem that poses a significant risk to public health and safety if left unresolved.

- Require that each HMGP and PDM project will not cost more than the anticipated value of the reduction in both direct damages and subsequent negative impacts to the area if future disasters were to occur. Both costs and benefits will be computed on a present-value basis, following FEMA BCA guidelines.

- Require that each HMGP and PDM project be the most practical, effective, and environmentally sound alternative after consideration of a wide range of options.

- Require that each HMGP and PDM project contribute to a practical long-term solution to the problem it is intended to address.

- Require that each HMGP and PDM project consider the long-term changes to the areas it protects, to include manageable future maintenance and modification requirements.

- Disallow project proposals which attempt to address issues solely related to deferred maintenance or neglect of existing infrastructure facilities.

- Allow the state's HMGP and PDM-C grant funds be used to develop State, tribal and/or local mitigation plans to meet the planning criteria outlined in 44 CFR Part 201. Enhanced plan approval would allow HMGP funds to rise to the 20% level for hazard mitigation projects/planning after a federally declared disaster. Attainment of an Enhanced plan remains a long-range goal for Vermont Emergency Management; however, this is partially contingent upon increased staffing levels and resource allocations at the state level.

- Allow projects to be of any nature that will result in protection to public or private property. Eligible projects include, but are not limited to:

    - Structural hazard control or protection projects
    - Transportation infrastructure facilities: roads, bridges, culverts
    - Construction activities that will result in protection from hazards
    - Repetitive loss properties
    - Retrofitting of facilities
    - Property acquisition or relocation, as defined in Section 206.434 (e)

- Development of State or local mitigation standards
- Development of comprehensive mitigation programs with implementation as an essential component
- Development or improvement of warning systems
- Assessment of land use compatible with natural processes and identified natural hazards

- Incorporate this objective into project selection criteria and use weighted ranking to evaluate and prioritize PDM and HMGP applications which demonstrate clear relationships to other state, local and regional planning efforts.

- Bolster State ability to support development of nationally competitive PDM-C applications

- As part of a collaborative process involving VTrans and ANR, integrate fluvial geomorphic considerations into transportation infrastructure planning, design, construction and maintenance activities.

- Include fluvial erosion hazard risk assessment and mapping as an integral element of FEMA Map Modernization activities.

- When feasible, encourage project participation by the Army Corps of Engineers, USDA's Natural Resource Conservation Service, and others

Goal 4: Seek to Accomplish Multiple or Combined Hazard Mitigation Objectives

Policy Objective 4.1

Encourage Projects Which Utilize An Environmentally Sustainable, Ecological Process:

In acknowledgment of existing state and federal resource protection goals, as well as natural resource functions and values, the following will receive priority: project designs which consider, support and enhance benefits to fish/wildlife, habitat, wetlands, open space protection, support for rural resource economies, storm water runoff remediation, and pollution protection for state streams, rivers, lakes and ground source drinking water.

Recommended Mitigation Actions & Activities

- Incorporate this objective into project selection criteria and use weighted ranking to evaluate and prioritize PDM and HMGP applications.

Policy Objective 4.2

- Identify and Incorporate Projects Which Utilize Multiple Funding Sources, and/or Involve Multiple Jurisdictions

Projects with multiple funding sources, multiple jurisdictions and/or combined government, community/private backing have a broader base of support and thus would tend to increase the likelihood that a given project would be constructed and maintained. Also, pooled funding streams often

provide opportunities to leverage matching funds. Given that there are multiple sources of funds from specific state and federal programs, it is wise to encourage the application of these various funding sources to address projects that match the purpose of these funds.

Recommended Mitigation Actions & Activities

- Prioritize HMGP and PDM applications based upon the involvement of multiple political jurisdictions (watersheds, regions or multi-town collaborations), multiple funding sources, and multi-agency sponsorship or partnerships.

- Incorporate these considerations into project selection criteria and use weighted ranking for PDM and HMGP applications.

Policy Objective 4.3

Utilize Implementation Mechanisms/Technical Support from Multiple Sources

Recommended Mitigation Actions & Activities:

- Prioritize HM and PDM Project funding based upon evidence of supporting scientific/engineering documentation and support from a broad base of peer reviewers (e.g. federal, state, regional, local) so as to ensure the technical validity of a proposed project solution.

- Incorporate this objective into project selection criteria and use weighted ranking for PDM and HMGP applications.

Goal 5: Reduce Expenditures for Property and Infrastructure Protection

Goal 6: Build Support and Capacity to Further Reduce Natural and Man-Made Vulnerabilities at the state and local levels

Recommended Mitigation Actions & Activities

- The Agency of Natural Resources may send a questionnaire to each town requesting the location of any private or public dam not included on the National and State dam inventory list.

- Development of HAZMAT in-transit tracking systems for vehicles and trains carrying extremely hazardous substances. It is proposed that operators give advance notice to the State of hazardous cargo and routes to the final destination. This proposal may be incorporated into VEM's Vermont Emergency Management Planning & Response Database (VEPARDS) system.

- Develop more effective mechanisms for coordination and cooperation between state, municipal, non-profit and private emergency service providers. This would remedy any existing deficiencies in coordinating disaster response and recovery efforts. The goal is to achieve full operational functionality at the state, regional, and local levels to effectively deal with unforeseen events such as mass evacuations, ice storms, hazmat spills, power outages, etc. VEM would act as a central focal point and lead agency in coordinating all emergency response and mitigation efforts state-wide.

Policy Objective 6.1: Provide Funding and Technical Assistance for the Development of Local Mitigation Plans

Recommended Mitigation Actions & Activities

- Create a state process and timeframe by which the local plans will be reviewed, coordinated, and linked to the State Mitigation Plan.

- Create criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include a section on the coordination of local mitigation planning that includes the following: consideration for communities with the highest risks, repetitive loss properties, most intense development pressures, and strongest commitment to address these hazards expressed in their respective regional and local mitigation plans. Furthermore, for non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs.

Policy Objective 6.2: Enhance the Capacity for Vermont Emergency Management to Deliver Grant Funds to Local Entities Efficiently and Effectively

Recommended Mitigation Actions & Activities:

- VEM will continue its development of a comprehensive strategic plan with significant public input from its partners and customers, in order to improve levels of service and organizational efficiency in support of its many programs. This also applies to its partner agencies on the Hazard Mitigation Committee. VEM will endeavor to improve working relations among and between state, regional, and local partners.

  VEM will sponsor PDM-C workshops with FEMA to enable towns to submit more competitive grant applications.

Goal 7: Bolster State Ability to Support Development of PDM-C Applications

Recommended Actions & Activities:

- Schedule practical workshop sessions to assist applicants in preparing competitive grant applications, including sessions on benefit cost analysis, engineering design, environmental permits, etc.

CHAPTER VI: Adopting, Evaluating and Updating the Plan[11]

Plan Adoption Process

On July 21, 2006 FEMA officially adopted the Southern Windsor Vermont Multi-Jurisdictional All Hazard Mitigation Plan. Following the FEMA approval, all ten towns in the Region adopted the plan and their own respective Annex (See Appendix C for sample approval letter).

In addition to the public process involved in the development of the initial draft of this document, other agencies will had the opportunity to review and comment on this plan before it is formally adopted. The Local Emergency Planning Committee 3, local Hazard Mitigation Committees, businesses, academia and the general public all were given the opportunity to review drafts of this document for review. The State Hazard Mitigation Officer also reviewed and commented on a draft before submitting a recommendation for forwarding the document on to FEMA Region 1.

Duly-noticed public hearings were held to give members of the public, surrounding communities and academic institutions an opportunity to comment on the draft plan. Hearings were announced in local community papers and press releases are shown in Appendix X. Copies of the final plan were announced and made available to members of the public. All interested parties shall be notified of the adoption process through U.S. mail and given the opportunity to review the draft document. The adoption of the plan by the local governing bodies demonstrates agreement with the Southern Windsor County All-Hazard Mitigation Plan and the appropriate accompanying local hazard mitigation Annex.

The adopted plan, and subsequent revisions, will be incorporated into the Regional Plan and Town Plans, which are updated every five years. Elements of this Plan can be incorporated directly into town plans during their 5-year update schedule, or this Plan could be adopted as a part of the town plan. Elements of this Plan will be incorporated into regional and local emergency operations plans.

Plan Maintenance and Evaluation Criteria

This plan is dynamic and will be updated regularly. Although the requirement is to update the Plan every five years, it will be important to review the associated project list on an annual basis, or after each major hazard event.

A regular plan maintenance process will involve the following steps, at least every five years:

1. Southern Windsor County Regional Planning Commission (SWCRPC) will convene a meeting of a plan review/update committee.
2. The committee will review the process and determine if the evaluation criteria are appropriate, and modify each criterion as needed. Data needs will be reviewed, data/funding sources identified and data collection responsibilities assigned.
3. SWCRPC will request a report from each community detailing changes in local regulations pertinent to hazard mitigation as well as project implementation progress since adoption.
4. A revised draft report will be prepared based on the following criteria:

[11] Adapted from Upper Valley Pre-Disaster Mitigation Plan (Feb. 2004) and Addison County, Vermont Region Wide All Hazards Mitigation Plan (2002)

- Changes in state and local regulations and processes that are hazard-related since the last plan adoption.
- Progress in implementation of initiatives and projects.
- Effectiveness of previously implemented initiatives and projects.
- Review and discussion of the effectiveness of public and private sector coordination and cooperation.

5. SWCRPC will convene a second meeting of the committee to review the draft report and reach consensus on proposed changes to the plan.
6. SWCRPC incorporates the changes.
7. SWCRPC schedules a duly-warned public meeting of the communities, businesses, institutions and the general public to review the changes. All individuals participating in the initial plan adoption process will be contacted for each subsequent plan maintenance process.
8. Communities, businesses, institutions and the general public review changes and provide comments on draft report.
9. SWCRPC incorporates comments into draft report.
10. SWCRPC finalizes report and distributes to communities and other interested parties.
11. Local Emergency Management Directors present the report to local governing bodies and other interested parties at duly-noticed public hearing.
12. Local governing bodies consider revised report for adoption.

After each major hazard event, a special review of the plan and of appropriate initiatives should take place based on the following criteria:

1. Within six months of a declared emergency event, Vermont Emergency Management will initiate a post disaster review and assessment. Members of the State Hazard Mitigation Committee will be notified that the assessment process has begun.
2. This post disaster review and assessment will document the facts of the event and assess whether existing Hazard Mitigation Plans effectively address the hazard.
3. A draft After Action Report of the review and assessment will be provided to the review/update committee.
4. SWCRPC will convene a meeting of the review/update committee to make a determination if the plan should be amended based on the post-disaster review. If the committee determines that no modifications to the plan are needed, then the After Action Report will be distributed to affected communities.
5. If the committee determines that modification of the plan is needed, then SWCRPC drafts and amended plan based on recommendations of the committee.
6. Follow steps seven through twelve from the plan maintenance process listed above.

Review of Hazard Mitigation Initiatives and Projects

In addition to the plan review process, each project or initiative should be reviewed for effectiveness annually. The SWCRPC should convene the review/update committee for this evaluation as well. Annually, the SWCRPC should request a progress report from each town detailing each previously approved hazard mitigation project or initiative as well as any desired new initiatives. The committee will meet to review project status and to evaluate each based on the following criteria:

Community Benefit

- Will the project mitigate a hazard impact that the community is particularly vulnerable to?
- What is the benefit/cost ratio of the project? (FEMA, Vermont Emergency Management and/or the regional planning commission can provide technical assistance for this kind of analysis.)
- Does the project help achieve other community objectives?
- Could it be quickly implemented?

Community Commitment

- Is the project consistent with existing municipal plan?
- Is there demonstrated public support for this project or recognition of the problem?
- Can the project be implemented (at least in part) through other existing municipal programs or funding sources?

Project Implementation

- Is there a funding source currently available for this project?
- Are matching funds or in kind services available for this project?
- How long will it take for the proposed mitigation project to accomplish its stated goals?

Appendix A: Regional and Town Maps: Attached Documents

Appendix B: Existing Hazard Mitigation Programs

The next step involves identifying existing mitigation strategies for the hazards likely to affect the region and evaluating their effectiveness. Below are some of the existing local hazard mitigation related programs and activities ongoing or underway in the SWCRPC region. More detailed lists can be found in Appendices A, B, and C. Also outlined in this chapter are regional, state and federal programs or resources that can offer technical assistance or funding for hazard mitigation related initiatives.

A. LOCAL MITIGATION INITIATIVES

Town Plans

Town plans involve a significant public process to assist local planning commissions develop a vision for future town development. Nine communities have up-to-date town plans, which describe and analyze current development trends and town programs, and which set a vision for the community's future development. Adoption of the recently updated West Windsor Town Plan was not completed within the required five-year time period. The Town is currently working to adopt the Plan.

Subdivision Regulations

Subdivision regulations regulate how land is divided, and generally assures proper fire protection and emergency vehicle access.

Zoning Ordinances

Zoning ordinances regulate land uses and can be used to protect sensitive areas from development and to require development to adequately address hazards, such as flood-proofing building structures. Nine communities have zoning ordinances. Cavendish is the only town to have not adopted zoning regulations.

Site Plan Review Regulations

Site plan review regulations regulate certain features of a site design, often including landscaping, drainage and impervious surface requirements.

Local Emergency Operations Plans

Primarily the larger communities in the region have adopted local emergency operations plans. These plans should be reviewed and updated annually.

Basic Emergency Operations Plans (BEOPs)

The following table summarizes the status of local Rapid Response Plans (RRPs). Like local emergency operations plans, RRPs should be reviewed and updated annually. The state requires updates every 18 months.

Town:	BEOP Last Updated:
Andover	2010
Baltimore	2010
Cavendish	

Chester	2010
Ludlow	2010
Reading	2010
Springfield	2010
Weathersfield	2010
Windsor	2010
West Windsor	2010

National Flood Insurance Program
All communities, except Baltimore, belong to the National Flood Insurance Program (NFIP). The NFIP was instituted in 1968 to make flood insurance available in those communities agreeing to regulate future floodplain development. As a participant in the NFIP, a community must adopt regulations that, at a minimum: 1) require any new residential construction within the 100-year floodplain to have the lowest floor (including the basement) elevated above the 100-year flood elevation; 2) allow non-residential structures to be elevated or dry flood proofed; 3) require anchoring of manufactured homes in flood prone areas.

Local Emergency Planning Committee 3
All ten communities are active members of the 11 town (including Hartland) Local Emergency Planning Committee 3. The group recently developed an All Hazard Emergency Resource Guide that will be distributed to all participating towns that outlines available resources, town, state and private, that can be accessed during an emergency.

Multi-Jurisdictional All-Hazard Plan
Local Emergency Planning Committee (LEPC) 3 has developed an All Hazard Emergency Resource Guide which encompasses those hazards most likely to affect the region. The guide provides historical background information on each hazard as well as a list of potential resources at the local, state and federal levels.

Mutual Aid
All ten towns have at least informal emergency services mutual aid agreements with other communities. Efforts are being made by the LEPC #3 to encourage formalized mutual aid agreements to adequately address liability issues between agencies. LEPC #3 is also encouraging public works mutual aid compacts.

Townwide Culvert and Bridge Inventories
Southern Windsor County Regional Planning Commission is working with the ten towns to develop and regularly update inventories of all town-maintained bridges and culverts. The Commission anticipates that all ten towns to have completed culvert and bridge inventories by the end of 2005.

Town Highway and Bridge Standards
Six towns have adopted the Vermont Local Road Standards, including Cavendish, Chester, Ludlow, Springfield, Weathersfield, West Windsor and Windsor. These standards are suggested to upgrade infrastructure to a minimum level to withstand 25-year flood events.
Downtown Village Planning

Vermont's Downtown Program, developed in 1998, prioritizes funding for projects in designated downtowns. This program has encouraged communities to prioritize development and revitalization of higher density downtowns before considering public investment outside of these areas. Springfield and Windsor both have designated downtowns under the Vermont Downtown Program of the Vermont Division for Historic Preservation. No other communities have designated downtown or village districts at this time.

Connecticut River Joint Commissions (CRJC)

The New Hampshire legislature created the Connecticut River Valley Resource Commission in 1987 to preserve and protect the resources of the valley, to guide growth and development within it, and to initiate cooperation with Vermont for the benefit of the valley. The Vermont legislature established the Connecticut River Watershed Advisory Commission in the following year. The two commissions banded together as the bistate Connecticut River Joint Commissions in 1989. Their role is advisory, not regulatory.

The New Hampshire and Vermont Commissions developed a River Corridor Management Plan that set recommendations for planning and protecting the watershed, and this Plan will be undergoing revision in the next few years.

Watershed Planning Efforts

The State of Vermont Agency of Natural Resources has been implementing a river basin planning effort throughout the state, and working to involve town residents and officials in watershed planning efforts. Some of the potential projects that could be implemented are flood mitigation, stream bank stabilization, water quality sampling, and other related efforts. The SWCRPC region falls in three river basins, the Black River, Williams River and Lower Connecticut River, which are a focus of state basin planning activities. Active watershed groups in the region include: the Mill Brook Watershed Association, Connecticut River Watershed Association and the Mount Ascutney Region River Subcommittee (Connecticut River Joint Commissions).

The Agency of Natural Resources has also begun the process of identifying fluvial erosion hazards around the state. This work is primarily handled by the RPC's with product being sent to ANR for quality assurance. Results of the FEH study will indicate what stream reaches present the greatest threat to human development based on the natural history of a stream. In the past, towns and engineers have tried mechanical ways to prevent stream flooding and erosion. Today we are recognizing that often times these engineered designs may be causing greater harm to streams. The goal of the FEH studies are to show the natural course of streams and indicate where human development can occur based on this data. It will also tell towns what structures are in the greatest threat to flood damage currently. Towns will then be able to interpret the data and devise a strategy for removal of structures or flood proofing.

Local Emergency Planning Committee #3

The LEPC #3 district includes thirteen towns in southern and eastern Windsor County, Vermont, including towns in this region as well as Hartford, Hartland, and Norwich. LEPC #3 is active in encouraging regional cooperation in emergency planning and has acquired grant monies to put on two table-top exercises of the current draft LEPC All-Hazards EOP and to complete a Commodity Flow Study completed in 2006.

C. STATE AND FEDERAL

The following listing and descriptions show existing hazard mitigation programs at various agencies from different levels of government. This is not meant to be a comprehensive list.

STATE

Agency of Transportation

- Town Highway Grants Program. State aid grants for highways are made annually to the governing body based on the number of Class 1,2 or 3 miles in the Municipality. The General Assembly appropriates a lump sum annually for this purpose (19 V.S.A. Section 306(a)). Distribution is made quarterly, with no application required. There is no requirement that State funds be matched with local funds, other than a requirement that municipalities expend no less than $300 per mile of local tax revenues of their highways (19 V.S.A. Section 307).
- Town Highway Bridge Program. State assistance for major rehabilitation or reconstruction of bridges with a span of six feet or more on class 1, 2 or 3 town highways is made available by the Secretary of Transportation from annual appropriations for that purpose (19 V.S.A. Section 306(b)). State assistance amounts are not limited for any one project. The State assistance requires 10 percent participation or match of total project cost with town funds for replacement projects and 5% for rehabilitation projects. The local match is capped at the amount raised by a municipal tax rate of $0.50 on the Grand List (19 V.S.A. Section 309(a)).
- Town Highway Structures Program. State grants for bridges, culverts and retaining walls that are part of the municipalities' highway (Class 1, 2 or 3) infrastructure are made by the Secretary of Transportation from annual appropriations for the purpose. State grant amounts are limited to $150,000 for any one project. State funds are required to be matched, as follows:
    - By at least 20% of the total project cost, or
    - By at least 10% of the total project cost providing that town has adopted Town Highway codes and standards and the town has conducted a highway infrastructure study (not less than three years old), which identifies all town culverts, bridges and identified road problems.
- Town Highway Class 2 Roadway Program. State grants to provide for the preservation of any Class 2 highways by providing grants for resurfacing or reconstruction are made by the Secretary of Transportation or his/her designee from annual appropriations for that purpose. State grants are limited to $150,000 for any one project and there are match requirements for the town similar to the Town Highway Structures Program.
- Town Road & Bridge Standards, Infrastructure Study. As a result of legislative action relating to the Town Aid programs an incentive program was created providing additional funding to towns meeting two requirements:
    - Adopted codes and standards.
    - Conducted a network infrastructure study.

Department of Public Safety, Division of Emergency Management

- Hazard Mitigation Grant Program. Described below under Federal Programs.
- Pre-Disaster Mitigation Program. Described under Federal Programs.

- Local Emergency Management Director Program. A continuing program of training for local emergency management directors to provide a consistent base of knowledge to understand their roles and responsibilities in Emergency Management.

Vermont Agency of Natural Resources (VT ANR)

- Fluvial Erosion Hazard Risk Assessment Methodology. VT ANR has developed the technical protocols and tools for conducting a fluvial geomorphic assessment, and can provide guidance to regional planning commissions and towns in carrying this out.
- VT Geological Survey. Has developed protocols for conducting a landslide hazard assessment, and can provide guidance to regional planning commissions and towns in carrying this out.
- Basin Planning. The Department of Environmental Conservation is providing technical assistance to develop river basin plans throughout the state. In this region, a basin plan is now underway for both the Black River Watershed.

FEDERAL

FEMA

FEMA currently has three mitigation grant programs: the Hazards Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation program (PDM), and the Flood Mitigation Assistance (FMA) program.[12]

Hazards Mitigation Grant Program (HMGP)

Authorized under Section 404 of the Stafford Act, the Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the program 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 declaration.

Hazard Mitigation Grant Program funding is only available in States following a Presidential disaster declaration. Eligible applicants are:

- State and local governments
- Indian tribes or other tribal organizations
- Certain private non-profit organizations

Individual homeowners and businesses may not apply directly to the program; however a community may apply on their behalf. HMGP funds may be used to fund projects that will reduce or eliminate the losses from future disasters. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the flood. In addition, a project's potential savings must be more than the cost of implementing the project. Funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage.

Flood Mitigation Assistance (FMA) Program

FMA provides funding to assist States and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program (NFIP). There are three types of grants available under FMA: Planning, Project, and Technical Assistance Grants. FMA Planning Grants are available to

[12] Source: FEMA Region 1 website

States and communities to prepare Flood Mitigation Plans. NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA Project Grants. FMA Project Grants are available to States and NFIP participating communities to implement measures to reduce flood losses. Ten percent of the Project Grant is made available to States as a Technical Assistance Grant. These funds may be used by the State to help administer the program. Communities receiving FMA Planning and Project Grants must be participating in the NFIP. A few examples of eligible FMA projects include: the elevation, acquisition, and relocation of NFIP-insured structures.

Funding for the program is provided through the National Flood Insurance Fund, and FMA is funded at $20 million nationally.

States are encouraged to prioritize FMA project grant applications that include repetitive loss properties. The FY 2001 FMA emphasis encourages States and communities to address target repetitive loss properties identified in the Agency's Repetitive Loss Strategy. These include structures with four or more losses, and structures with 2 or more losses where cumulative payments have exceeded the property value. State and communities are also encouraged to develop Plans that address the mitigation of these target repetitive loss properties.

Pre-Disaster Mitigation Program

The Pre-Disaster Mitigation (PDM) program provides technical and financial assistance to States and local governments for cost-effective pre-disaster hazard mitigation activities that complement a comprehensive mitigation program, and reduce injuries, loss of life, and damage and destruction of property. FEMA provides grants to States and Federally recognized Indian tribal governments that, in turn, provide sub-grants to local governments (to include Indian Tribal governments) for mitigation activities such as planning and the implementation of projects identified through the evaluation of natural hazards.

D. OTHER PROGRAMS[13]

Hazard Mitigation Technical Assistance Program Contract

HMTAP was established to provide FEMA with response capability for various post-disaster mitigation opportunities. The contractor has the capability to: (1) evaluate construction science techniques and practices, including build codes; (2) prepare environmental assessments or impact statements and historic preservation reviews and assessments; (3) conduct biological assessments and surveys, (4) conduct surveys, assessments, and reviews of other areas of impact such as water quality and wetland delineation; (5) conduct benefit/cost, social science, and public administration assessments; (6) conduct post-event assessments to identify mitigation opportunities; (7) Provide post-disaster land surveying, mapping services and cost estimates using GIS, GPS, and remote sensing; (8) Perform floodplain analyses; (9) conduct hazard identification and risk assessment to confirm accuracy and specific actions or methodologies needed for disaster areas; (10) document estimated flood elevations to guide reconstruction and to compute flood frequency; and (11) provide training for benefit/cost analysis, retrofit options, the Hazard Mitigation Grant Program, and National Environmental Policy Act.

National Flood Insurance Program (NFIP)

[13] Source: Addison County Region Wide All-Hazards Mitigation Plan

The National Flood Insurance Program (NFIP) makes federally subsidized flood insurance available to property owners in locations agreeing to participate in the NFIP. If communities enter the NFIP, they are required to adopt floodplain ordinances meeting criteria established by FEMA. These criteria include: requiring permits for development within designated floodplains; review development plans and subdivision proposals to determine whether proposed sites will be reasonably safe from flooding; require protection of water supply and sewage systems to minimize infiltration of floodwater; obtain, review, and utilize all base flood elevation data; and assure the maintenance of flood carrying capacities within all watercourses.

The Community Rating System
An element of the NFIP, this program is designed to promote the availability of flood insurance, reduce future flood damages, and ensure the accurate rating of flood insurance policies. Participating communities may receive credit for proven mitigation measures, thus reducing the cost of flood insurance within their jurisdictions.

The Individual Assistance Loss Prevention Program
Available to provide eligible owner- occupants, who sustained damage and received Disaster Housing Minimal Repair Funds, the opportunity to participate in a voluntary program where additional 100% federal funds are made available to break the damage-rebuild-damage cycle and help homeowners reduce or eliminate losses from future weather-related damage.

The Individual and Family Grant (IFG) Minimization Program
Available to provide IFG-eligible owner- occupants the opportunity to participate in a voluntary program where additional state and federal funds are made available to break the damage-rebuild-damage cycle, and help reduce or eliminate losses from future weather-related damage. In addition, FEMA's 800 series provides funding for low cost mitigation measures.

The Infrastructure Program (Section 406 of the Stafford Act)
Authorizes funding for the repair, restoration, or replacement of damaged facilities belonging to public and private non-profit entities, and for other associated expenses, including emergency protective measures and debris removal. The Infrastructure Program also authorizes funding for appropriate cost-effective hazard mitigation related to damaged public facilities.

The National Inventory of Dams (US Army Corps of Engineers project)
Identifies high-hazard dams and encourages the development of warning systems and emergency plans for many of these facilities.

Hazardous Materials Program
FEMA's mission under this program is to provide technical and financial assistance to States and local jurisdictions and to coordinate with public and private sector entities to develop, implement, and evaluate HAZMAT emergency preparedness programs. FEMA supports State and local agencies in the design, implementation, and evaluation of HAZMAT- related training and planning exercises, and cooperates with the U.S. Department of Transportation in the maintenance of electronic bulletin boards to provide the latest information on HAZMAT planning, training, exercises, and conferences.

US Fire Administration (USFA)
Through the USIA, FEMA administers a nationwide program to enhance fire prevention and control activities and to reduce significantly the loss of life and property caused by fires. Programs are carried

out by: National Fire Academy; Office of Fire Prevention and Arson Control; Office of Firefighter Health and Safety; Office of Fire Data and Analysis; Office of Federal Fire Policy and Coordination; Office of National Emergency Training Center Operations and Support, and Office of Educational Technology.

The Emergency Planning and Community Right-to-Know Act of 1986
The Emergency Planning and Community Right-to-Know Act of 1986 imposed upon state and local governments planning and preparedness requirements for emergencies involving the release of hazardous materials. The role of the federal government in response to an emergency involving the release of hazardous materials is to support local and state emergency operations. Activation of the federal Regional Response Team (RRT) provides access to federal resources not available at the state and local levels. An on scene coordinator is designated to manage federal resources and support. The national warning and communications center for emergencies involving the release of hazardous materials is manned 24 hours a day, and is located at the U.S. Coast Guard headquarters in Washington, D.C.

The National Weather Service
The National Weather Service provides meteorological and hydrologic services that include weather and hydrologic warnings, forecasts, and related information. The primary mission of the NWS is to save lives and reduce property damage through timely issuances of tornado and flood warnings and river stage forecasts. To cope with dangerous weather, the NWS interacts with emergency services personnel throughout the state by: issuance of tornado and flash flood watches or warnings for those areas in which a threat is posed; issuance of flood watches and warnings for major streams and rivers within the state. Addison County is within the coverage area of the NWS office in Burlington but also may receive information from the Albany, NY office.

The U.S. Army Corps of Engineers
The U.S. Army Corps of Engineers undertake a broad range of civil works projects to develop, manage, and conserve the nation's water resources. No work may be undertaken without authorization and funding from Congress, either from specific legislation or continuing authorities. Projects are planned to serve as many purposes as are feasible and to protect or improve the environment as much as possible. The Corps is involved in developing and implementing plans for flood control, navigation, hydropower, recreation, and water supply. The Corps has authority for emergency operations, bank protection, permit administration, and technical assistance. Corps of Engineers assistance includes:

- Studies and Projects
- Discretionary Authority to implement certain types of water resources projects without specific Congressional approval. These projects are typically limited in cost and duration, and include:
    - Section 14 - Emergency Stream bank Protection of Public Facilities, limitation of $500,000 per project.
    - Section 107 - Small Navigation Projects, usually for port facilities and navigation channels. Work on channels usually improves stream flow and aids flood control efforts.
    - Section 205 - Small Flood Control Projects, not to exceed $5 million. Funds may be used for projects such as upgrading flood protection structures and channelization of streams.
    - Floodplain Technical Assistance, to include:
        - Conducting floodplain mapping surveys to provide either first-time mapping of an area or to correct older floodplain maps;

        - Conducting flood studies in cooperation with FEMA to determine actual flood levels for settlement of flood insurance claims;
        - Providing technical advice regarding proposed floodplain ordinances and building codes.
    - Emergency operations to respond to flood emergencies, to include flood fighting, constructing advance temporary measures in anticipation of imminent flood, and the repair of damaged flood control works after the flood event.
    - Permit authority, the Corps has the authority to issue Permits to cover construction excavation and other related work in or over navigable waterways; and Permits covering the discharge of fill material in all waters of the United States and adjacent wetlands.

Department of Housing and Urban Development

- Community Development Block Grant Program. Funds are provided as grants to units of local government. Local governments can use the funds to construct flood and drainage facilities, finance rehabilitation projects that include flood proofing, elevation, purchase of flood insurance, and finance the acquisition and relocation of homes to remove them from the floodplains.
- Rental Rehabilitation Program. Funds to rehabilitate rental properties can be used for flood proofing and repair to flood damage.
- Section 312 Loan Program. Provides funds to rehabilitate both residential and non-residential properties, including flood repair and flood proofing.

Department of Agriculture Natural Resource Conservation Service (NRCS)

The NRCS can provide technical assistance in the conservation, development, and productive use of water resources. In addition, the NRCS monitors use of prime farmland.

- Watershed Protection and Flood Prevention. Technical and financial assistance to local entities to plan and install works of improvement for watershed protection, flood prevention, agricultural water management, and other approved purposes.
- Resource Conservation and Development. Technical and financial assistance to local entities to plan and install works of improvement for watershed protection, flood prevention, agricultural water management, and other approved purposes.
- Emergency Watershed Protection. Provides assistance to reduce hazards to life and property in watersheds damaged by severe natural events. NRCS can provide 100% of the cost of exigency situations, and 80% of the cost for non-exigency situations, if funds are available.
- Conservation Technical Assistance. Provided to land users to control erosion, sediment, and to reduce upstream flooding.
- River Basin Surveys and Investigations. Includes Conservation River Basin Studies to assist in solving existing problems or meeting existing or projected needs, and Floodplain Management Studies to provide information and assistance for reducing future flood damages. Sponsors provide financial assistance.

U.S. Geological Survey (USGS)

The USGS provides certain hazard studies and recommendations. A portion of the mission of the USGS is to collect and analyze data on the quantity of surface water through a network of gauging stations. The data is used in preparing flood frequency reports to evaluate the severity of floods. This data is useful in flood hazard mitigation studies, establishing flood prone areas, and potential flood heights near hydraulic structures.

Economic Development Administration
The Economic Development Administration was established to generate new jobs, to help protect existing jobs, and to stimulate commercial and industrial growth in economically distressed areas of the United States.

Small Business Administration (SBA)
The SBA Disaster Assistance Programs provide loans to businesses and individuals affected by presidential and SBA disaster declarations. The program provides direct loans to businesses to repair or replace uninsured disaster damage to property owned by the business, including real estate, machinery, and equipment, inventory and supplies. Businesses of any size are eligible. Non-profit organizations are also eligible. Assistance to individuals comes in the form of low-interest loans for repair or replacing damaged real and personal property. The SBA administers the Disaster Assistance Programs.

E. MITIGATION ACTIVITIES

Building Performance Assessment Team (BPAT)
This increased damage resistance is achieved through improvements in construction codes and standards, designs, methods, and materials used for both new construction and post-disaster repair and recovery. The Building Performance Assessment Team (BPAT) Program is an integral part of this process.

Sustainability/Sustainable Re-development
A new initiative and integral part of the mitigation function is the concept of Sustainability/Sustainable re-development. The concept of sustainability brings a relatively new approach to environmental, economic, and social thought, and has the potential to enhance the achievement of mitigation goals in the post-disaster (as well as pre-disaster) environment. Sustainability is development that maintains or enhances economic opportunity and community wellbeing while respecting, protecting and restoring the natural environment upon which people and economies depend. Sustainable re-development is simply the application of the concepts and practices of sustainable development to the disaster recovery process.

Mitigation Assistance Program
The Mitigation Assistance Program (MAP) provides financial assistance to States for the purpose of the development and maintenance of a comprehensive statewide hazard mitigation capability for the purpose of implementing pre- and post-disaster mitigation.

Mitigation Assistance combines three categories of assistance: State Hazard Mitigation Program assistance (SHMP), for which all States and Territories are eligible; Hurricane Program (HP) hazard assistance, for which States and Territories subject to tropical storm hazards are eligible; and Earthquake Program (EP) hazard assistance for which States and Territories subject to seismic hazards are eligible.

Community Assistance Program - State Support Services Element
The Community Assistance Program (CAP) is a product-oriented financial assistance program directly related to the flood loss reduction objectives of the National Flood Insurance Program (NFIP). States and communities that are participating in the NFIP are eligible for this assistance. The CAP is intended to identify, prevent, and resolve floodplain management issues in participating communities before they develop into problems requiring enforcement action.

Potential Mitigation Strategies[14]

The Action Plans for each community were developed by analyzing the existing hazard mitigation programs, and proposed improvements and changes to these programs. Additional programs were also identified as potential mitigation strategies. The action programs for each community can be found in the Annexes. For each community, we organized potential strategies into the following categories:

- Programs and Policies
- Structural
- Public Education and Information
- Training
- Engineering Projects
- Equipment Purchase

Below are some recommended strategies that communities can implement to help mitigate hazard impacts. A more complete list of potential mitigation strategies is located in Appendix D.

Programs and Policies such as planning, subdivision, zoning, site plan review, open space preservation, and floodplain development regulations. Some recommended hazard mitigation programs and policies include:

- Regulate development in areas vulnerable to hazard events; for instance, designating a floodplain overlay district that allows development in floodplains only if suitably built to withstand a major flood event. Alternatively, no new development would be allowed in this district.
- Identify sensitive lands, such as important flood storage areas, for preservation and take steps to acquire these lands, such as working with landowners or purchasing outright.
- Adopt floodplain management regulations that are more stringent than those set forth by FEMA.
- Land use regulations to avoid development on steep slope areas or on soils subject to liquefaction.

Structural measures including:

- Low-impact landscape designs, such as vegetated swales, for maximum storm water infiltration.
- Implementing erosion and sedimentation control best management practices.
- Culvert replacement and drainage modification to better carry storm water and protect roadways during major flood events.
- Revegetating riparian buffers to bind soil, prevent erosion and mitigate flood damage.

Public Education and Information including:

- Creating or displaying GIS maps that illustrate floodplains and other hazard areas to raise awareness in the community.
- Presentations at meetings of neighborhood groups.
- Mailings or website postings about what to do in the event of a hazard emergency.

Training activities, including:

- Hazardous material response training for emergency personnel.

[14] Adapted from Upper Valley Pre-Disaster Mitigation Plan (Feb. 2004)

- Training sessions for planning commissions and conservation commissions on wetland and water quality protection.
- Prepare and implement a fire safety education and training program for residents.

Engineering Projects, including:

- Conducting an engineering study on snow/ice load capabilities of critical facilities in town.
- Conduct an engineering study of structure vulnerability to flooding.
- Work with the regional planning commission, under the guidance of Vermont Agency of Natural Resources, to complete a fluvial geomorphic assessment of local streams and a landslide hazard assessment.
- Work with the same entities, above, to develop a fluvial erosion and landslide hazards map.

Equipment Purchase, such as:

- Portable generators for emergency shelters or other critical facilities.
- More up-to-date radio communications systems.

Appendix C: List of Acronyms

SWCRPC – Southern Windsor County Regional Planning Commission
DHART – Dartmouth Hitchcock Air Rescue Team
NECR – New England Central Railroad
DMA 2000 – Disaster Mitigation Act, 2000
LEPC – Local Emergency Planning Committee
FEMA – Federal Emergency Management Agency
VEM – Vermont Emergency Management

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