Town of Stowe, Vermont

Hazard Mitigation Plan 2015 – 2020

Technical Assistance Provided by: Lamoille County Planning Commission
FEMA Approval Pending Adoption
FEMA Formal Approval
Selectboard Adopted
Plan expires
Town of Stowe Plan Adoption Resolution
Approving the Stowe Local Hazard Mitigation Plan

The Selectboard of the Town of Stowe find that:

A) The adoption of a multi-hazard plan is required as a condition for communities to remain eligible for future Federal Emergency Management Agency (FEMA) mitigation grant funds.

B) The Town of Stowe has prepared the *Town of Stowe, VT Local Hazard Mitigation Plan*.

C) The Selectboard has reviewed and considered the *Stowe Local Hazard Mitigation Plan*.

D) The mitigation strategies and actions identified in the plan have been prioritized as outlined in the *Stowe Local Hazard Mitigation Plan*. Adoption of this Plan demonstrates Stowe’s commitment to implementing mitigation actions to reduce damage from identified hazards.

NOW THEREFORE, BE IT RESOLVED BY THE SELECTBOARD OF THE TOWN OF STOWE, A MUNICIPALITY OF THE STATE OF VERMONT, AS FOLLOWS:

Section 1. Based on the above findings, which are hereby adopted, the *Stowe Local Hazard Mitigation Plan* is approved as the official multi-hazard mitigation plan for the Town of Stowe.

Section 2. This resolution shall become effective immediately upon adoption.

The foregoing Resolution is hereby adopted this ___th day of ________________, 201X

Selectboard Chair

Selectboard Member

Selectboard Member

Selectboard Member

Selectboard Member

Town Clerk received
# Town of Stowe
## Local Hazard Mitigation Plan 2015 – 2020

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1. Introduction

This planning document is designed to serve as a single jurisdiction comprehensive Local Hazard Mitigation Plan for the Town of Stowe, Vermont to provide guidance in addressing the impacts of local hazards. The plan has been reviewed, amended and updated in its entirety to reflect changes in development, progress in local mitigation efforts, and changes in priorities since the adoption of the original plan in 2006.

The impact of expected, but unpredictable, natural and human-caused events can be reduced through community planning. The goal of this plan is to provide all-hazards local mitigation strategies that make Stowe more disaster resistant.

Hazard mitigation is defined as any sustained action that reduces or eliminates long-term risk to lives and property, resulting from the effects of natural and human-caused hazards. Based on the results of previous FEMA Project Impact efforts, FEMA, state, regional and local 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 communities have opportunities to identify mitigation strategies and measures during each phase of Emergency Management—Preparedness, Response, Recovery and Mitigation. Hazards cannot be eliminated, but it is possible to identify existing local hazards, where they are most severe, and what local actions can be taken to reduce the severity of incidents.

Hazard mitigation strategies and measures 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, adapt to the hazard by modifying structures or standards, or avoid the hazard by prohibiting or limiting development and could include projects such as:

- Flood-proofing structures;
- Tying down propane/fuel tanks in flood-prone areas;
- Elevating furnaces and water heaters;
- Identifying and modifying high traffic incident locations and routes;
- Ensuring adequate water supply;
- Elevating structures or utilities above flood levels;
- Identifying and upgrading undersized culverts;
- Proactive land use planning for floodplains and other flood-prone or erosion-prone areas;
- Proper road maintenance and construction;
- Ensuring critical facilities are safely located;
- Buyout and relocation of structures in harm’s way;
- Establishing and enforcing appropriate building codes;
- Dissemination of public information.

1.1 Purpose

The purpose of this Local Hazard Mitigation Plan (LHMP) is to assist the Town of Stowe to identify all hazards facing the community and develop strategies to begin reducing risks from these identified
1.2 Planning Process

Stowe’s LHMP was originally developed as an annex to the Lamoille County Regional All-Hazards Mitigation Plan in 2005. Since the adoption of this plan in 2006, staff from the Lamoille County Planning Commission (LCPC) and the town remained involved in the plan maintenance process through communication and support in the regular Local Emergency Planning Committee 11 (LEPC) meetings, participation in emergency response trainings and exercises, and actual hazard/disaster response and post event evaluation(s).

In 2009, LCPC conducted a formal review of the Stowe LHMP and coordinated with the Stowe Emergency Management Director (EMD) to discuss the plan, assess changes in development trends, update progress in local mitigation efforts, and adjust mitigation priorities accordingly. Pre-Disaster Mitigation meetings were focused on gathering community information and generating an inventory of the Town’s vulnerability to hazards and its current and future hazard mitigation programs, projects and activities.

In 2010, Stowe’s EMD and Town Manager worked with LCPC to update the plan, including: the addition of mitigation goals and strategies from the updated Town Plan; evaluating progress made on goals and strategies in the previous local hazard mitigation plan; as well as updates to the town’s recent hazard history. In the wake of unprecedented flooding that impacted Vermont in the spring and late-summer of 2011, Stowe again reviewed and updated its hazard mitigation plan, while working closely with the State Hazard Mitigation Officer and FEMA Region 1. The Annex was revised and updated in 2012 with FEMA approval received in 2014.

During 2013, LCPC staff assisted the Town of Stowe in transitioning their current plan to a stand-alone Local Hazard Mitigation Plan. Significant data updates took place at this time. Since fall 2011, revised drafts of the Stowe LHMP have remained posted on the LCPC website to invite public comment. Copies of the LHMP were made available to interested residents at LCPC’s offices in Morrisville and in the Stowe Town Clerk’s offices.

On October 16th, 2014 Stowe Town officials, including the Director of Planning, Public Works Director, and Emergency Management Director, met with LCPC staff to review recent updates to the plan, address how mitigation priorities have changed since the last plan update, and revise mitigation strategies to include a more comprehensive priority list of mitigation action items. To allow for additional opportunities for public comments, the meeting agenda was posted in the Stowe Town Clerk’s office, on the municipal website, and in LCPC’s office in Morrisville. Additional public comment opportunities were provided during and proceeding the November 24, 2014 Stowe Selectboard Meeting.

Feedback received from the general public, local officials, businesses, and emergency management officers was incorporated into the plan at all stages. Gathering oral histories, prioritizing hazards and mitigation strategies, and discussing where the public’s needs are most relevant was used to form this plan. Without that input and support the plan would be lacking a crucial element and motivation for mitigation.
Additional opportunities for public comment from both Stowe residents and neighboring community members will be provided at Stowe Selectboard Meetings, and reviewing the revised plan on LCPC’s website (www.lcpcvt.org) or in hard copy format at the Stowe Town Clerk’s Office.

In addition to public input, information was utilized from the following sources:
- State of Vermont Hazard Mitigation Plan, 2013
- Lamoille County Multi-Jurisdictional All Hazard Mitigation Plan (2011), and Stowe Annex (2014)
- Stowe Town Plan, 2009
- Stowe Mountain Resort Emergency Plan, 2014
- Lake Mansfield Dam Emergency Action Plan, 2014
- Stowe-Morristown Mutual Aid Agreement
- Stowe Local Emergency Operations Plan, 2014
- Emergency Response Guidebook
- National Flood Insurance Program
- Stowe Flood Insurance Rate Maps
- American Community Survey 2005-2010
- U.S. Census, 2010
- Emergency Action Plan: Upper Golf Course Reservoir Dam, 2014

1.3 Neighboring Communities

An initial Hazard Mitigation Plan kick-off meeting was held to gather public input into this hazard mitigation plan. The initial kick-off meeting was held on December 10, 2013 at the Hyde Park Municipal Office to explain the planning process and collect stories on the history of hazards in the community. Meeting notices were mailed to Selectboard members, Village Trustee members, Planning Commission, Town Administrators, Road Foremen, School District officials, Emergency Management Directors, town clerks, etc. An email notice was also provided to the Local Emergency Planning Commission (LEPC) and other individuals who had expressed interest or have a vested interest in the project.

The meeting was well attended by town officials across the County including Planning Commission members, Selectboard members, Emergency Management Directors, School Board representatives, VT Agency of Natural Resources representatives, and local emergency responders. Guest speaker Kate Hammond, the Vermont Division of Emergency Management and Homeland Security (DEMHS) Hazard Mitigation Planner, presented on the importance of adopting and maintaining a local Hazard Mitigation Plan and discussed key elements to consider when drafting or revising Mitigation Plans. This meeting provided an opportunity for communities to gain a greater understanding of the benefits of having a local Hazard Mitigation Plan and discuss natural and man-made hazards communities within the County are currently facing.

Additional opportunities for neighboring public comments as mentioned above have been provided throughout the plan update process including announcements in local newspapers, posting draft updates on LCPC’s website and announcing requests for public comments in Town Clerk Offices throughout Lamoille County. Additionally, regularly scheduled LEPC #11 meetings and regional workshops co-hosted by LCPC and the Vermont Division of Emergency Management and Homeland Security remain an avenue for public regional comments and discussions concerning local hazard
mitigation planning efforts.

1.4 Plan Maintenance Process

a) Monitoring, Evaluating, and Updating the Plan
The Town of Stowe LHMP should be evaluated and updated regularly by the Emergency Management Director, Stowe Department of Planning and Stowe Selectboard. LCPC is available to provide technical assistance. Any significant disaster event will prompt a review of this plan between Stowe town officials, emergency services providers, and LCPC. At the very minimum, the plan will be amended as required within five years from the date of FEMA approval.

In 2012 and 2014, this plan was revised to incorporate changes in demographics, land use, and mitigation priorities. Municipal officials identified mitigation actions and strategies targeting the most frequent, extensive, and costly hazards.

The LEPC may also perform a mid-cycle review of local hazard mitigation plans for Lamoille County municipalities within three years of adoption. This review will determine the effectiveness of the regional and municipal programs and reflect changes in land development, completed goals, or programs that may affect mitigation priorities. Ultimately, the long-term success of this and other LHMPs is dependent on the availability of funding to implement mitigation priorities.

b) Incorporation into Existing Planning Mechanisms
During the update and re-adoption processes for the Town Plan, bylaws, and/or regulations, the Town and LCPC will provide guidance and recommendations to the Stowe Planning Commission and Stowe Selectboard for the incorporation and integration of state, regional and local hazard mitigation goals and strategies into the specific programs and practices described in these other planning mechanisms.

Opportunities for Stowe to incorporate this Plan’s hazard mitigation strategies into their own planning mechanisms may include the following:
• Stowe Town Plan
• Stowe’s Capital budget
• Stowe Police, Fire Department, and EMS budgets and annual work programs
• Town of Stowe Zoning, Subdivision, and Flood Hazard regulations
• Transportation improvement programs
• Local and regional mutual aid agreements
• Stowe Land Trust easements and acquisitions

To effectively incorporate mitigation strategies into these existing planning mechanisms, it is important to demonstrate how these approaches maximize benefit to the entire community. This can be achieved through the utilization of a cost-benefit analysis, which quantifies the benefits of mitigation against

Stowe Land Trust works closely with the Stowe Planning Commission to prioritize land for conservation and open space, including easements for floodplains.
anticipated losses. Such an analysis is an integral part of prioritizing potential mitigation strategies and actions, and is also a requirement for submitting future FEMA mitigation grant applications.

c) Continued Public Involvement
There are three principal avenues for broad public comment that include:
- Community involvement through the local and regional planning process relating to updating existing planning mechanisms
- Participation at the regular LEPC meetings (LEPC meetings are typically attended by a variety of parties: first responders, municipal officials, non-profit health care agencies, disaster assistance groups, communications industry officials and Tier II HAZMAT operators)
- Public posting of the Plan, including Stowe’s website, the LCPC website, at the Town Office, and through social media, such as Front Porch Forum, an online community message system.

The general public will be notified of review and update efforts over the next five years through press releases to local newspapers, Selectboard meetings, announcements by local radio stations, updates to the LCPC website. Additionally, LCPC will reach out to other regional stakeholders, including the Lamoille Mutual Aid Association and Lamoille County Sheriff’s Department, to ensure mitigation planning efforts align with the county’s public safety interests.

2. Community Background

Stowe is the southern-most town in Lamoille County covering 72.8 Square miles— the largest land area of any town in Vermont. Stowe abuts the towns of Waterbury and Bolton to the south, and Worcester to the southeast. The Lamoille County towns of Morristown and Cambridge lie to the north and the Chittenden County town of Underhill borders the west part of town. It is located 35 miles from Burlington and 24 miles from Montpelier.

The two state highways in town are VT Route 100 and Route 108. VT Route 100 is the region’s primary north-south travel corridor, carrying anywhere from 9,400 vehicles between Stowe and Waterbury to 15,600 vehicles in some areas of Route 100 near the interstate. In Stowe village, daily traffic loads average about 10,700 vehicles. Heading northwest out of Stowe village towards Smugglers’ Notch is VT Route 108. In the winter it is closed to through traffic due to steep grades and sharp corners in the Notch.

Stowe is predominantly a rural, residential community, but has significantly more commercial development than other comparably sized towns, due to the high volume of tourists and seasonal homeowners the town attracts. The main town center is located around the intersection of Routes 100 and 108; development is primarily concentrated along these two state highways. According to the 2010 Census, Stowe’s population was 4,314, a slight decrease from 4,339 in 2000. The number of housing units in town is 3,526, with 1,388 total units identified as vacant seasonal, recreational, or occasional use homes. The majority of housing units in the town are single unit detached (65%). Mobile homes account for approximately 3% of household units.

During the plan update process, it was also noted that no substantial changes in development patterns have occurred in Stowe that would affect vulnerability or mitigation measures. Accordingly, the mitigation strategy approach remains appropriate and focused on the issues of greatest concern to the
town. Anecdotally, the economic recession of the late-2000s and ongoing volatility of the national housing market have depressed new construction for much of the last five years— which may, in part, explain the unanticipated population decrease recorded between the 2000 and 2010 Censuses.

There are three utilities that provide service to the town: Stowe Electric Department, Morrisville Water and Light, and Vermont Electric Cooperative. Stowe Electric Department maintains 10.1 miles of transmission lines, 120 miles of overhead distribution lines and four substations, including three primary metering points. It receives power through a new 115 KV transmission line originating in Duxbury. The only power generated at a commercial level in Stowe is one small hydroelectric facility in the village of Moscow.

Most Stowe residents and businesses obtain potable water from ground water sources. Presently 59 separate public water systems operate in the Town of Stowe, including the municipal water system. A public water supply system is defined as 10 or more service connections operating at least 60 days a year. The largest concentration of these systems is in the vicinity of Stowe Village and up Mountain Road. Other residences are served by on-site wells or springs. The municipal system is supplied by two sources, the Edson Hill well #2 and the Village Green well.

Stowe’s emergency response capabilities are unrivaled in Vermont. Locally, fire coverage is provided by the Town’s 40 member Volunteer Fire Department, located on Rte 100 south of Stowe Village (the Village is the Town’s core commercial and residential area; it is not an incorporated municipality). The Fire Department is a participant in the Lamoille County Mutual Aid Network, which functions as a mutual aid response network among all eight Lamoille County fire departments. The Stowe Fire Department also participates in the Capital Fire Mutual Aid Systems, providing back-up coverage to the Montpelier and Barre region. Additionally, in July of 2012 the Town of Stowe adopted a Public Works Mutual Aid Agreement with the Town of Morristown. This agreement allows each municipality to request equipment and personnel from one another to respond to emergency situations that threaten public infrastructure or public safety within their community.

The Stowe Police Department patrols 24 hours-a-day, providing service to the town as well as back up to neighboring communities. It is co-located with the Fire Department in a state-of-the-art public safety building, completed in 2010. There are 14 full time officers including a Chief, Sergeant and Detective and one full-time administrative assistant. The Stowe Rescue Squad and Mountain Rescue Team provide ambulance and emergency rescue services and are equipped for back-country and high-angle search and rescue operations. Stowe also maintains a swiftwater emergency team and equipment that is utilized across Vermont. Stowe’s emergency responders provide assistance to the Lamoille County Sheriff’s Department and the Vermont State Police (VSP). The LCSD and VSP also provide law enforcement coverage for Stowe.

The town most recently adopted an updated Local Emergency Operations Plan in July 2014, in accordance with 2014 DEMHS requirements. The plan is updated annually by the EMD and approved by the Stowe Selectboard. Stowe Elementary School, Stowe Middle and High School, and elderly housing at Copley Woodlands and the West Branch Apartments are identified as high risk population areas. The high school is the Town’s primary emergency shelter. The school supplies a 50kw back-up generator capable of running the oil boiler, kitchen oven, walk-in freezers and emergency lighting. The Stowe Elementary School serves as a secondary emergency shelter. The Stowe Public Safety Building is the town’s primary Emergency Operations Center (EOC).
2.1 Previous natural disasters

Since 1990, Stowe has received public assistance funding from FEMA for the following natural disasters:

<table>
<thead>
<tr>
<th>Date</th>
<th>Funding Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 1990</td>
<td>DR 875 $440,603</td>
</tr>
<tr>
<td>August 1995</td>
<td>DR 1063 $79,852</td>
</tr>
<tr>
<td>April 2007</td>
<td>DR 1698 $6,308 (Stowe Electric) May 2011 DR-1995 $298,541.79</td>
</tr>
<tr>
<td>August 2011</td>
<td>DR-4022 $291,039.62</td>
</tr>
</tbody>
</table>

Stowe received funding from the Federal Highway Administration for the following:

<table>
<thead>
<tr>
<th>Date</th>
<th>Funding Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 2011</td>
<td>DR-1995 $44,817.05</td>
</tr>
<tr>
<td>August 2011</td>
<td>DR-4022 $170,894.67</td>
</tr>
</tbody>
</table>

More recent notable disasters affecting Lamoille County and the Stowe area include those listed below. The following cost estimates reflect actual property damage, not Public Assistance received. Please recognize that the events listed below were more localized in nature and not associated with a Statewide Disaster Declaration.

<table>
<thead>
<tr>
<th>Date</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 12, 2004</td>
<td>$314,000 (Stowe damage)</td>
</tr>
<tr>
<td>February 24, 2012</td>
<td>$20,000 (County-wide property damage)</td>
</tr>
<tr>
<td>July 19, 2013</td>
<td>$50,000 (Stowe area property damage)</td>
</tr>
<tr>
<td>December 21, 2013</td>
<td>$750,000 (County-wide property damage)</td>
</tr>
<tr>
<td>March 12, 2014</td>
<td>$20,000 (County-wide property damage)</td>
</tr>
</tbody>
</table>

Detailed information on previous disasters

**June 1990:** Flash Floods affected six Vermont counties. Up to six inches of rain fell that closed roads and caused a train wreck.

**August 1995:** Record setting heavy rains caused flooding in six north-central counties (FEMA 1063-DR-VT). This was the first time since 1927 that a flood not only affected public infrastructure, but also personally impacted the residents of Vermont. Preliminary damage assessments indicated individual losses greater than damages to public infrastructure. Flood levels exceeded that of a 500-year event in several areas along the Lamoille River.

**July 12, 2004:** Stowe suffered serious flash flooding from a localized storm that dropped approximately four inches of rain within one hour. The flooding caused erosion and undercutting of existing paved roadways and ditches on Trapp Hill Road, Luce Hill Road, Moscow Road, Nebraska Valley Road and Barrows Road. The town received $314,000 in funding from the Vermont Town Highway Emergency Fund (EM-008) for repairs. An additional $53,000 was received from the Federal Aid Secondary Road Fund from the Federal Highway Administration for repairs on Barrows Road (FHWA Disaster #04-01).

**April 15 to April 21, 2007:** Stowe was hit with an ice storm and heavy rains (FEMA-1698-VT-DR) which caused extensive damage and debris. A Federal disaster was declared on May 4, 2007. Stowe Electric was provided $6,308 in public assistance funding.

**April 23 - May 9, 2011:** Excessive rain and severe floods sweep across northern Vermont and the Champlain Valley, with a federal disaster (DR-1995) declared for Addison, Chittenden, Essex, Franklin,
Grand Isle, Lamoille and Orleans counties on June 15, 2011. This declaration extended both Public Assistance and Individual Assistance funds to Lamoille County communities.

**August 30-31, 2011:** High wind and flooding associated with Tropical Storm Irene devastate southern Vermont, causing localized damage to structures and property in northern parts of the state. While the impact was far less severe in Lamoille County than elsewhere in the state, Stowe specifically experienced extensive road, bridge and culvert damage from flooding and erosion.

**February 24, 2012:** A winter storm advisory took effect in northern Vermont and in Lamoille County the afternoon of February 24, 2012. While some of the heaviest snowfall took place in Lamoille County, the Town of Stowe accumulated up to 18 inches over a 24-hour period.

**July 19, 2013:** During the evening hours on July 19, 2013 a strong thunderstorm moved its way across northern, Vermont. Wind speeds were recorded up to 65 knots. Widespread wind damage took place across northern, Vermont, leaving 15,000 customers without power. Stowe in particular also experienced notable structural damage from down trees and power lines including damage to vehicles, buildings and public infrastructure. The Stowe Recreation Path experience notable damage from this event as a result of down trees.

**December 21, 2013:** The evening of December 20 freezing rain and ice started to accumulate in northwestern, Vermont close to the Canadian border. Leading into the morning of December 21, a second round of freezing rain/hail began to fall across northern, Vermont. Ice accumulated in Lamoille County up to one inch. The winter ice storm caused numerous vehicle accidents as well as damage to trees and utility lines.

**March 12, 2014:** Blizzard conditions took place across Vermont the morning of March 12, 2014. Heavy snowfall continued through the morning of March 13. Wind gusts up to 40 mph intensified snowdrifts on roads throughout Lamoille County. During this event the Town of Stowe received 15 inches of snow.

### 3. Stowe Hazard Inventory / Risk Assessment

The following assessment is based on the revised, 2013 Vermont HI/RA (Hazard Inventory and Risk Assessment) and was reviewed in 2014 as part of this plan’s update. The first column is a list of possible hazards that could affect the community. The hazards were evaluated to have a *Rare, Unlikely, Unusual, Likely, or Frequent* frequency of being a threat to the community.

The **FREQUENCY** of occurrence is classified as shown below:

- **Rare**: < 1% probability in the next 100 years; may never have occurred in Vermont.
- **Unlikely**: 1% to 4% probability in the next year, this type of event has occurred in Vermont.
- **Unusual**: 4% to 10% probability in the next year, or at least one chance in the next 100 years.
- **Likely**: 10% to 50% probability in the next year, or at least one chance in the next 10 years.
- **Frequent**: Greater than 50% probability in the next year; an event that occurs often but degree varies.

The **SEVERITY** (percentage of the community affected) of the hazard can be classed as follows:
- Minor: < 10% of properties damaged/Minimal disruption to quality of life.
- Serious: 10% to < 25% of properties damaged/Loss of essential facilities/services for up to 7 days/Few (< 1% of population) injuries possible.
- Extensive: 25% to 50% of properties damaged/Loss of essential facilities/services for > 7 days < 14 days/Major (< 10% of population) injuries/few deaths possible.
- Catastrophic: > 50% of properties damaged/loss of essential facilities/services for > 14 days/Severe (> 10% of population) injuries/multiple deaths possible.

The combination of the impact of the hazard (severity) and the frequency was used to determine the COMMUNITY VULNERABILITY/RISK as High, Moderate or Low.

The WORST THREATS to the community are designated with an asterisk *. The worst threats are those hazards with threats that have (a) frequent possibility of occurrence, and/or (b) catastrophic or extensive impact to your community.

### 3.1 Stowe HI/RA Matrix

Table I. Stowe HI/RA

<table>
<thead>
<tr>
<th>Possible Hazard</th>
<th>Frequency</th>
<th>Severity</th>
<th>Community Vulnerability/Risk</th>
<th>Most vulnerable areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flooding and flash floods</td>
<td>Frequent</td>
<td>Extensive</td>
<td>High</td>
<td>Damage to roads, culverts, bridges, Recreation Path, residences, and commercial structures; potential water source contamination</td>
</tr>
<tr>
<td>Major highway and railroad accidents</td>
<td>Likely</td>
<td>Serious</td>
<td>Moderate</td>
<td>Intersection of VT Route 100 and 108</td>
</tr>
<tr>
<td>Winter Storm/Ice Storm</td>
<td>Frequent</td>
<td>Extensive</td>
<td>High</td>
<td>Property damage, road closures, loss of electricity from fallen trees</td>
</tr>
<tr>
<td>Structure Fire</td>
<td>Likely</td>
<td>Serious</td>
<td>Moderate</td>
<td>Spread of fire through major population centers, elderly housing complexes</td>
</tr>
<tr>
<td>Windstorms, incl. hurricanes and tropical storms</td>
<td>Likely</td>
<td>Serious</td>
<td>Moderate</td>
<td>Road closures and loss of electricity from fallen trees; other vulnerabilities associated with flooding</td>
</tr>
<tr>
<td>Major wildfire/forest fire</td>
<td>Unusual</td>
<td>Extensive</td>
<td>Low</td>
<td>Widespread damage to structures, infrastructure</td>
</tr>
<tr>
<td>Dam Failures</td>
<td>Unusual</td>
<td>Extensive</td>
<td>Moderate</td>
<td>Major damage to structures within mapped inundation zones; other vulnerabilities associated with flooding.</td>
</tr>
<tr>
<td>Hazardous materials spill</td>
<td>Unusual</td>
<td>Extensive</td>
<td>Moderate</td>
<td>Exposure to residences and general population; environmental contamination</td>
</tr>
<tr>
<td>Landslide</td>
<td>Unusual</td>
<td>Minor</td>
<td>Moderate</td>
<td>Damage to roads and structures</td>
</tr>
</tbody>
</table>
### 3.2 Community Vulnerability Analysis by Hazard

Based on the results of interviews with local residents, meetings with local Town officials, a Hazard Questionnaire conducted during the 2005 planning development process, the history of disasters in town, and the Stowe HI/RA, the following hazards were identified as significant threats to the town. Table 3.1 has been broken down into the following categories: Significant Hazards, Moderate Hazards, and “Other Hazards”. The significant hazards are based on the likelihood and frequency of occurring and include:

- **Flood Inundation and Flash Flooding**
- **Windstorms**
- **Winter Storm/Ice Storm**
- **Potential Dam Failure**

Each of these threats has the potential to cause power outages, which displace lives and property damage, especially during winter months. A section is devoted to power outages at the end of the Significant Hazards section.

Moderate hazards have potential for extensive severity and moderate risk, which includes HAZMAT incidents and Transportation hazards. Other hazards pose a risk to the community but are not as likely or severe. Thus, they are briefly discussed but not in great detail.

### 3.3 Significant Hazards (Flood Inundation and Flash Flooding, Winter Storms, Windstorms/ High Winds, and Dam Failure)

**Flooding and Flash Flooding**

The community vulnerability to a Flood is HIGH based on the Frequent possibility (Near 100% probability in the next year) of an incident with the potential for Catastrophic (>50% of the community) impact.

Based on the results of utilizing GIS to overlay the digital FIRM flood maps with the location of structures in Stowe, which were GPS located for the development of the Enhanced 911 Emergency services telephone dispatch system, sixty-three (44) vulnerable locations were identified to have the potential of flooding based on the 100-year flood zone. The estimated loss for damage to these properties was calculated by using the median housing value estimated by the 2013 American Community Survey and the 2014 Grand List of properties in town.
The Floodplain, Transportation Concerns, and Areas of Local Concern maps in Appendix C identify the areas of town that are within the 100-year floodplain. The Local Areas of Concern map identifies other areas of potential loss to infrastructure due to erosion and road flooding.

High priority culverts for replacement would have large spalls, heavy scaling, wide cracks, holes, integral wing walls nearly severed from culvert, severe scour or erosion, extreme distortion/defection and extensive corrosion. Stowe historically has recorded numerous floods. Annual flood events are common in some form with the amount of damage sustained ranging from low to severe. For example, a rare localized flash flooding event occurred during the summer of 2004 and caused erosion and undercutting of existing paved roadways and ditches on Trapp Hill Road, Luce Hill Road, Moscow Road, Nebraska Valley Road and Barrows Road. This damage is attributed to a storm that dropped approximately 4 inches of rain in one hour.

Floodplains are vital to the quality of Stowe’s surface waters and the health and safety of the community. By retaining runoff during periods of heavy rain and spring thaw, floodplains reduce the velocity of rivers and streams. They also present severe limitations for development due to potential hazards resulting from periodic flooding; harmful effects on channel capacity and downstream properties resulting from filling; and improper functioning of sewage disposal systems caused by typically high water tables.

FEMA has identified 1,140 acres of 100 year floodplain in Stowe, and an additional 165 acres of 500 year floodplain. The largest concentration of floodplain stretches along the Little River north of Stowe Village and the lower stretches of the West Branch. Significant areas of floodplain may also be found along the Little River south of Stowe Village and adjacent to Miller Brook.

**Extent:** The West Branch of the Little River, which follows the Mountain Road and the Stowe Recreation Path for much of its length, is Stowe’s most scenic and degraded waterway. Since the 1960’s development has resulted in stream channel and water quality degradation. The conversion of farm fields and forests within the West Branch watershed has resulted in increased surface runoff and flooding, flood plain encroachment, stream bank erosion and channel alteration. As a result, water quality has diminished, flooding has become more frequent, and hundreds of thousands of dollars have been spent to protect public and private investments along the river.

Severe washouts can cause damage to roads and bridges, making them impassible. The major consequences of such damage are the potential for accidents and injuries, as vehicles attempt to travel over unsafe and unstable roadways and in isolated areas with no vehicular access. Emphasis should be on anticipating where this may occur so that roadways can be closed. Due to the fact that the town highway garage is located in an area that may become isolated during a flood, relocation of the equipment should be considered before this becomes a problem. Empty sandbags are also stored at the town garage, so moving them is a consideration. Alternate transportation routes for emergency vehicles should also be pre-planned. The LEPC is actively involved in developing and exercising plans to address such issues.

In some circumstances, persons may become trapped in high water, requiring rescue. Stowe Mountain
Rescue has water rescue equipment and training and is one of three teams that have a Memorandum of Understanding with the State to respond statewide to flood and swiftwater emergencies.

Health hazards caused by flood waters include damage to water supplies and sewer lines. Underground storage tanks and hazardous materials can also leak into floodwaters and impact the quality of the local water supply. The Town Health Officer should be involved in evaluating these hazards along with the Fire Department and Vermont Division of Emergency Management and Homeland Security (DEMHS). Future LHMP updates should include historical data measuring flood magnitude, flow rate, and duration of flood events.

**National Flood Insurance Program (NFIP)**

Stowe currently administers flood hazard regulations as part of the town’s zoning regulations. These ensure that all landowners—both in and out of the mapped flood hazard area—are eligible for insurance from the NFIP. The Town of Stowe participates in the NFIP and currently has 37 policies in force.

From 1978 to 2012, there has been $115,971.66 of claims in the town and $2,495.56 from the unincorporated village. Two structures have had repetitive loss claims—one structure is mapped outside of the Special Flood Hazard Area and one structure is mapped inside the Special Flood Hazard Area.

Stowe is one of two towns in the county which has a digital flood insurance rate map (DFIRM), updated August 4, 2005. The town will continue to regulate and enforce NFIP requirements through its flood hazard regulations, including new and substantially improved construction in Special Flood Hazard Areas and providing floodplain identification and mapping determinations.

**Winter Storm/Ice Storm**

The community vulnerability to a Winter Storm/Ice Storm is HIGH based on the Frequent (Near 100% probability in the next year) occurrence and the potential for Extensive (25% to 50% of the community) impact.

A winter storm is a storm that generates sufficient quantities of snow, ice, or sleet to result in hazardous conditions and/or property damage. Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is similar to hail only smaller and can be easily identified as frozen rain drops (ice pellets) that bounce when hitting the ground or other objects. Sleet does not stick to wires or trees, but in sufficient depth, can cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surfaces, coating the ground, trees, buildings, overhead wires, and other exposed objects with ice, sometimes causing extensive damage. Periods of extreme cold tend to occur with these events.

Winter storms with snow, ice, and freezing temperatures in various combinations are fairly commonplace in Stowe, which includes the base of Vermont’s highest peak. The town is poised to handle most winter emergencies. A potential for emergencies exists when such storms also result in the loss of electricity, leaving people without adequate heating capability. Heavy wet snows of early fall and late spring cause most power failures, however, ice storms can also cause power outages. Damage has resulted in structural damage to residences and businesses in the past. Normally, damage is result of heavy snow causing roof failures. Ice events and heavy wet snows have caused numerous power outages due to power line damage.
The physical impacts of winter storms are town wide due to the expansive nature of winter storms. Based on past occurrences, the worst anticipated winter weather Stowe could experience would be 2-3’ in 24 hrs. of snow with more at higher elevations and several days of power outages. The ice storm of December 2013 demonstrated that sustained power outages are not fatal but advance preparation and planning should be taken by municipal officials and residents. Using the wind chill scale and historical information, the estimate for extreme cold is – 60 degrees Fahrenheit.

Scales to measure the extent of winter storms are:

**Heavy snowfall** – Stowe is significantly affected when they experience an accumulation of 24 inches or more in a 24-hour period.

**Blizzard** – Stowe is significantly affected when they experience sustained wind speeds in excess of 40 mph accompanied by heavy snowfall or large amounts of blowing or drifting snow.

**Ice storm** – Stowe is significantly affected when they experience ice accumulations of 1” or greater over a 48 – 72 hour time period.

**Wind Chill Extent Scale**

Due to the region’s mountainous terrain, it is not uncommon for precipitation to range from rain in the valley area to ice in the middle elevations, with heavy snows in the higher terrain. This poses a major challenge to highway maintenance personnel. Stowe maintains snow removal equipment for all town highways and Vermont Agency of Transportation maintains equipment for state highways. Snowfalls that are within normal snowfall limits are handled effectively; however, during heavy snowfall for extended periods of time, removal of snow becomes problematic. Historically, these events are not frequent and are short in duration. During such events, radio communications is maintained between highway crews and town emergency responders, and coordinated by the EOC. In the event of a winter emergency, the Highway Department will assist fire and ambulance crews by making private roads passable. In 2013, there was a national shortage of road salt so Stowe should be prepared for an extended ice storm that may require more salt than normal. Local construction equipment in the community has been used in the past to augment community resources. Stowe’s first responder equipment includes ATVs and snowmobiles. Most residences are accessible during severe weather conditions, although access may be delayed.

By observing winter storm watches and warnings, adequate preparations can usually be made to lessen the impact of snow, ice, and sleet, and below freezing temperature conditions on the Town. Providing
for the mass care and sheltering of residents left without heat or electricity for an extended time and mobilizing sufficient resources to clear broken tree limbs from roads are the primary challenges facing community officials. The Town encourages residents who are in remote locations to be equipped with generators and backup fuel supplies in the event of prolonged power outages and travel restrictions. The Fire Department can continue to provide outreach and education of the impacts of winter storms to these populations.

Hazardous materials pose a severe threat to a large percentage of Stowe’s population as elderly persons may be limited in their ability to shovel roofs and clear around vent pipes. Major snow storms resulting in deep snow drifts can block heating vent pipes causing carbon monoxide poisoning. During snow storms, the Fire Department may experience difficulty reaching customers as the roads due to cleared roads as the town road crew may be busy with snow removal in other areas of town.

Despite frequent occurrences of significant storms, a majority of residents are adequately prepared to face these types of events.

*Extent*: The worst winter storm that can be anticipated in Stowe would be comparable to the December 2008 ice storm where much of the region was impacted by 3-4” of ice accumulation, causing widespread, multi-day power outages and obstructing roads with downed trees and power lines. Alternatively, the worst snow storm that can be expected is snowfall of up to 30”, which has occurred multiple times. While large snowfalls often disrupt business for one or more days, Vermont communities are well prepared for snow and such storms are generally less of a hazard than the aforementioned ice storms. Roads, bridges, power lines, and the elderly are most vulnerable during winter storm events. The likelihood of a storm occurring is high based on documented and anecdotal evidence. The impact of damage from a winter storm increases as power outages increase or as drivers attempt vehicular travel.

**Windstorms/High Winds**

Powerful windstorms represent a four-season hazard in Vermont. Impacts may vary from highly localized events to storms causing widespread damage. These storms frequently damage structures, trees, and powerlines. In December 2010, a damaging windstorm in central and northwest Vermont led to a federal disaster declaration for Chittenden, Franklin, and Lamoille counties. Windstorms pose risk to the entire community.

Damaging winds and flooding may also be caused by hurricanes and tropical storms, which travel up the Atlantic coastline. While the risk to Vermont is not on par with the South Atlantic and Gulf Coast states, the associated rain and flooding caused by these storms has had devastating impacts locally. In 1938, a hurricane swept across New England, causing what was once cited as the worst flooding event in the state’s history. In some regions, the 1938 hurricane was only recently eclipsed by the impact of Tropical Storm Irene, which devastated southern and central Vermont in August 2011.

The impacts associated with hurricanes and severe storms are mainly associated with flooding impacts and the potential for damage from debris and fallen trees that could cause power outages. Damages from TS Irene and the April 2011 storm events are outlined in the Flood/Flash Flood section. Wind speeds during the April 2011 storm averaged 67 knots, with Cambridge reporting wind speeds up to 77 miles per hour; this translates to a Beaufort number 12 using that wind speed measurement.

*Extent*: An estimate of the worst anticipated wind extent in Stowe based on past occurrences would be
Category 1 force hurricane winds and H4 hail according to the Hail/Torro scale. At a Beaufort number of 8-9 and hail sized H4 on the Torro/Hailstorm scale, Stowe may start to experience high wind impacts and damages. In the future, Stowe could consider installing a monitoring station to better gather data for wind events. Wind events can be recorded using the Beaufort or Saffir-Simpson scales. Hail events can be recorded using the Torro/Hailstorm Scale (below). The extent of flooding associated with these storms can be found in the section above on Flooding/Flash Flooding. Heavy winds have the potential to impact residential, commercial, and civic structures (damaging roofs or blowing debris into windows or siding); damaging infrastructure; causing riverbank erosion; or causing power outages due to downed lines. The probability is high that a wind storm will occur in the next year. Damage could range from $0 to $500,000 depending on the building or infrastructure impacted.

**Hail/ Torro Scale (source: [www.torro.org.uk](http://www.torro.org.uk))**

<table>
<thead>
<tr>
<th>Intensity Category</th>
<th>Typical hail diameter (mm)</th>
<th>Typical Damage Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard Hail</td>
<td>0-20</td>
<td>No damage</td>
</tr>
<tr>
<td>Potentially Damaging</td>
<td>&gt;20</td>
<td>Slight general damage to plants, crops</td>
</tr>
<tr>
<td>Significant</td>
<td>&gt;100</td>
<td>Significant damage to fruit, crops, vegetation</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt;300</td>
<td>Severe damage to fruit and crops, glass and plastic structures, and paint and wood scored</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt;500</td>
<td>Widespread glass damage, vehicle bodywork damage</td>
</tr>
<tr>
<td>Destructive</td>
<td>&gt;800</td>
<td>Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries</td>
</tr>
<tr>
<td>Destructive</td>
<td></td>
<td>Bodywork of grounded aircraft dented, brick walls pitted</td>
</tr>
<tr>
<td>Destructive</td>
<td></td>
<td>Severe roof damage, risk of serious injuries</td>
</tr>
<tr>
<td>Destructive</td>
<td></td>
<td>Severe damage to aircraft bodywork</td>
</tr>
<tr>
<td>Super Hailstorms</td>
<td></td>
<td>Extensive structural damage. Risk of severe or even fatal injuries to people</td>
</tr>
</tbody>
</table>

**Dam Failure**

There are currently three dams located in Stowe that pose a potential threat of significant damage to life and/or property, if they were to fail. These include the Moscow Dam, Lake Mansfield Trout Club Dam and the Stowe Mountain Resort Dam. Each dam is owned by private land owners, limiting the direct involvement the Town of Stowe can have in implementing dam upgrades or requesting removal. Both the Stowe Mountain Resort and Lake Mansfield Trout Club dams serve as key recreational resources to these organizations. While the Trout Club Dam provides a quiet, peaceful small lake for water reaction activities, the dam at Stowe Mountain Resort is utilized primarily for snow making. Currently, private land owners monitor the structural integrity of these dams as well as periodic dam inspections are performed by VT DEC staff. While recognizing the impact of flooding if these dams were to be structurally deficient and fail during a storm event, the Town of Stowe is encouraged to stay up to speed on the current condition of the dams and work with private land owners and ANR to implement necessary upgrades, drainage or removal projects. Additional basic information about historic and active dams within the Town and neighboring communities can be obtained from the Vermont Dam Inventory, viewed as a map layer on the Vermont Natural Resources Atlas at [http://anrmaps.vermont.gov/](http://anrmaps.vermont.gov/).
inventory is managed by the Vermont Department of Environmental Conservation’s Streamflow Protection Program. It contains information about dams based on a potential hazard ranking system that considers the impact to downstream areas if a dam were to fail.

The potential impact of dam failure varies by location in terms of flooding inundation extend and properties likely to be effected and damaged. During the summer of 2014, the Town of Stowe EMD solicited assistance from the Vermont Department of Environmental Conservation’s Dam Safety Section and Weston and Sampson Engineers to develop an Emergency Action Plan for the potential sudden breach of the Mansfield Lake Dam. A flood inundation analysis conducted as part of this effort demonstrated the extend of flooding caused by the dam breaching would inundate approximately 30 homes/buildings structures along Miller Brook and Nebraska Valley Road. An additional 11 structures/homes would be at risk of flooding or isolation due to their vicinity to the predicted flood inundation area. Additional roads and areas that would be at risk in this scenario include the Town-owned gravel pit, Sugar Bush lane, Moscow Road, Cottonbrook Road, and areas around the Waterbury Reservoir due to an increase in dam water level. See Appendix D for flood inundation maps and a list of at risk buildings. For additional information regarding this analysis please contact Weston and Sampson, the Stowe Emergency Management Director, or LCPC for a copy of the full report.

The Stowe Mountain Resort Upper Golf Course Reservoir Dam is situated on the eastern side of Vermont Route 108, just south of the upper Golf Course and Main Lodge. Stowe Mountain Resort currently employs a Reservoir Manager that is responsible for monitoring the condition of the dam and initiating the updated resort Emergency Action Plan in the event of a reservoir emergency such as a leak, overflow or breach in the structure. The dam’s proximity to Route 108 and a moderately dense resort area of town possess a potential flooding threat to those staying in nearby accommodations and homes as well as local commercial businesses downstream along Route 108. In 2004, a Revised Dam Breach and Inundation Analysis was conducted by CEA (Civil Engineering Associates) for the Reservoir Dam. In 2014, updated flood analysis maps were created by GeoDesign Inc. Results from this analysis demonstrated that if a dam breach were to occur during a 100-year flood event a substantial number of buildings located within the dam over-bank area would become inundated. The over-bank area begins at Stowe Fork and extends to the covered bridge on Bridge Road. Further analysis identified similar results for dam breach occurring on a sunny day. For maps depicting the location of the Stowe Mountain Resort Upper Golf Course Reservoir Dam and the 2004 Flood Inundation Analysis please see Appendix D. For additional information regarding the dam please contact the Reservoir Manager at Stowe Mountain Resort or consult the 2014 Emergency Action Plan for the Upper Golf Course Reservoir Dam. Please contact the Stowe Emergency Management Director to view a hard copy of this plan.

The Moscow Dam is located in the historic village of Moscow, now part of the southwestern corner of Stowe. The dam is situated on the Little River near Moscow Mills just south of Moscow Road and north of Adams Mills Rd. The structure is a concrete dam that backs up to the river slowing the flow of water; no artificial ponds are present at this structure. If the Moscow Dam were to suddenly breach the most likely directly impacted areas would include development along Adams Mill Road and the southern portion of Moscow Road. These areas would likely be inundated by flooding in the event of a dam breach. For a map depicting the location of the Moscow Dam please see Appendix D.

*Beaver Dams*

Stowe emergency and town officials currently have not identified beaver dams that would or are causing significant flooding damage, resulting in the loss of property or life. While there are notable beaver dams developed within wetland areas and along Miller Brook, they are situated in low density
residential or natural conserved areas of town such as the wetlands along the Nebraska Valley Notch trail downstream from the Lake Mansfield Dam. However, coupled with a dam failure (Lake Mansfield) or major flooding event these beaver dams could cause significant debris to be sent downstream, potentially damaging structures and roads within predicted flood areas.

Extent: The extent of damage caused by a potential breach ranges from minimal to catastrophic, causing a significant amount of property and infrastructure damage as well as potential losses to life as outlined in the paragraphs above.

**Impact of Power Shortage/Failure**

One of the most common impacts of major natural disasters can be the prolonged loss of electricity, whether from localized damage to distribution systems or from remote impacts to generation and transmission facilities. Based on the rural character of the town and its concerns with transportation infrastructure in inclement weather, protracted loss of power could significantly endanger health and safety, have substantial economic consequences, or cause stress and severe inconvenience to the town’s residents and businesses. The shortage of energy, food supplies, and the lack of ability to pump municipal water supply to residents could threaten the welfare of the citizens of Stowe. The dependency upon out of state sources can become a problem when normal deliveries are interrupted. The VT Department of Health and the Lamoille County Sheriff’s Department maintain a list of vulnerable populations who may require additional assistance during long term outages. The Stowe Electric Department should work closely with the EMD to prepare for a sustained power outage.

3.4 Moderate Hazards (HAZMAT Incidents, Transportation Hazards)

**HAZMAT Incidents**

Hazardous materials (HAZMAT) releases are of concern to Stowe given the location of major state highways through the center of town. Some automobile accidents include releases of flammable liquids. The likelihood of a spill or release is low. Data from the inventory maintained by LEPC 11 identifies 23 Tier II sites in the Town of Stowe. A Tier II site is defined by federal law under the Emergency Planning & Community Right to Know Act and is generally any facility which uses or possesses reportable quantities of chemicals requiring material safety data sheets by VOSHA, known human carcinogens, extremely hazardous substances, explosives which require licensing or certain threshold quantities of petroleum products. According to the 2012 Tier II statewide database, eight of those 23 critical facilities located in Stowe were listed as Extremely Hazardous Sites (EHS). An EHS is a Tier II location that contains at or above the Vermont hazardous substance threshold of 100 pounds. Please see Appendix C for maps depicting the location of critical facilities and Extremely Hazardous Sites in Stowe.

According to the State’s Waste Management Interactive database, between 2005 and 2012, 55 incidents were reported involving hazardous material spills. The spills generally involved heating oil or other petroleum-based products. As of November 2012, the following table lists the active spill sites in Stowe. In 1991, the Hazardous Sites database and the Petroleum Sites database were consolidated. This list includes petroleum as well as non-petroleum sites. Prior to database consolidation, different site numbering systems were used. In order to minimize confusion, the petroleum site numbering system was adopted. This system consists of a two or four digit prefix (year site was identified) and a four digit (site specific) number. All sites identified since January 1, 1991 have been consecutively numbered beginning with 91-1000. Sites identified prior to January 1, 1991, have retained their previously assigned site identification numbers. Due to database requirements for a six digit site number, the non-
petroleum sites identified prior to January 1, 1991 have a 77 prefix added to their previously assigned site identification numbers.

Table III. Hazardous Waste Sites: November 2014

<table>
<thead>
<tr>
<th>Site#</th>
<th>Site Name</th>
<th>Site Address</th>
<th>Site Town</th>
<th>Priority</th>
<th>Discovery Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>20124258</td>
<td>Bull Estate</td>
<td>136 Cape Cod Road</td>
<td>Stowe</td>
<td>LOW</td>
<td>2/16/2012</td>
</tr>
<tr>
<td>931403</td>
<td>Dave's Mobil</td>
<td>Main St</td>
<td>Stowe</td>
<td>MED</td>
<td>5/27/1993</td>
</tr>
<tr>
<td>20033088</td>
<td>Foster's Place</td>
<td>4968 Mountain Road</td>
<td>Stowe</td>
<td>MED</td>
<td>11/1/2002</td>
</tr>
<tr>
<td>20104108</td>
<td>Kayan Residence</td>
<td>3296 Weeks Hill Road</td>
<td>Stowe</td>
<td>LOW</td>
<td>10/26/2010</td>
</tr>
<tr>
<td>20124307</td>
<td>Libby Residence</td>
<td>158 White Gates Lane</td>
<td>Stowe</td>
<td>MED</td>
<td>6/13/2012</td>
</tr>
<tr>
<td>900630</td>
<td>Mt Mansfield Garage</td>
<td>Rt 100 &amp; 108</td>
<td>Stowe</td>
<td>LOW</td>
<td>11/1/1990</td>
</tr>
<tr>
<td>20012867</td>
<td>Stonybrook Condominiums</td>
<td>251 Luce Hill Road</td>
<td>Stowe</td>
<td>MED</td>
<td>8/16/2001</td>
</tr>
<tr>
<td>961957</td>
<td>Stowe Auto</td>
<td>Mountain Rd</td>
<td>Stowe</td>
<td>LOW</td>
<td>3/1/1996</td>
</tr>
<tr>
<td>20002776</td>
<td>Stowe Car Wash</td>
<td>Route 100</td>
<td>Stowe</td>
<td>LOW</td>
<td>5/22/2000</td>
</tr>
<tr>
<td>972128</td>
<td>Sweet And Burt Bulk Facility</td>
<td>Route 100</td>
<td>Stowe</td>
<td>LOW</td>
<td></td>
</tr>
<tr>
<td>20053320</td>
<td>Tom Lot Soil Treatment</td>
<td>5781 Mountain Rd</td>
<td>Stowe</td>
<td>LOW</td>
<td>7/20/2005</td>
</tr>
<tr>
<td>20083831</td>
<td>Village Substation</td>
<td>Behind municipal building</td>
<td>Stowe</td>
<td>MED</td>
<td>7/21/2008</td>
</tr>
</tbody>
</table>

The State's database also lists 24 hazardous waste generators and 29 active underground storage tank facility locations in the Town. The potential for severe pollution impacts to water quality and ecosystems exists from hazardous waste sites and/or from facilities which use hazardous materials. A release of hazardous materials from fixed site locations is a likely occurrence.

The accompanying Areas of Local Concern Map 3 in Appendix C outlines the potential impact of a HAZMAT incident in terms of structures affected within a community from a fixed site and in terms of structures affected along a HAZMAT transportation corridor or route where an accident might occur.

When assessing community vulnerability, the impact of both fixed site and transportation were considered. Using the 2000 Emergency Response Guidebook, a 1000 foot buffer was selected. For fixed site facilities, a 1000 foot radius circle was drawn around that site to determine the area of potential impact. For potential transportation incidents, a 500 foot buffer on each side of Class I and II roads was used to determine potential impact. Of the 2,719 structures within the town, 303 structures are within 1000 feet of a Tier II site. Structures include all residential, commercial, and public buildings in a town. Structures are only counted once. This means that if a house is within 1000 feet of three Tier II sites, it is only counted once, not three times. Based on the median housing value for Stowe, provided by the 2011-2013 American Community Survey, the estimated potential loss for all properties within 1000 feet of a Tier II site is $5,336,914. The estimated potential loss for all properties within 500 feet of a major roadway is $12,771,360. See Tables III and IV below.

Table IV. Stowe Potential Tier II Hazard Loss (fixed)

<table>
<thead>
<tr>
<th>Town</th>
<th>Median Housing Value</th>
<th>Structures within 1000' of Tier II site (% of total)</th>
<th>Potential Tier II Hazard Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stowe</td>
<td>$289,600</td>
<td>387 (13%)</td>
<td>$5,336,914</td>
</tr>
</tbody>
</table>
Table V. Stowe Potential Tier II Hazard Loss (transportation)

<table>
<thead>
<tr>
<th>Town</th>
<th>Median Housing Value</th>
<th>Structures within 500’ of a major road (% of total)</th>
<th>Potential Tier II Hazard Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stowe</td>
<td>$289,600</td>
<td>882 (29%)</td>
<td>$12,771,360</td>
</tr>
</tbody>
</table>

A number of HAZMAT sites are located within one mile of the center of Stowe Village. This location houses many critical facilities, including the town offices, elderly housing, the EOC and the local elementary school.

It is also important to note that many hazardous materials potentially pass through the two identified High Accident Locations in the town, which are also within 1 mile of the school, EOC, and town offices. Additionally, there are 22 critical facilities in the town (see Appendix C) with 21 of them being within 1,000 feet of a Tier II site. Seven of the critical facilities are impacted by one known hazard and 7 critical facilities that are impacted by 2 known hazards. Known hazards are defined as being within the 100-year floodplain, being within 500 feet of a major road, and being within 1,000 feet of a Tier II site (See Appendix C, Map 3).

Transportation Hazards

Stowe is crossed by two major State highways: VT Routes 100 and 108. Route 100 through Stowe is a particularly busy stretch of highway, frequented by residents, tourists and large trucks. While Route 108 serves as less of a throughway, there is concern that a fuel shipment to the mountain could be derailed on a steep, icy part of the road. This represents a potentially challenging HAZMAT response, as access from the north would be cut-off by the seasonal closure of Smugglers’ Notch. In total, three intersections have been identified as having a history of accidents, including hazardous materials. Mass casualty incidents (more than 4 injured people) are also of particular concern involving motor vehicle accidents (particularly tour or school busses). Blocked roadways and infrastructure damage are of utmost concern on the Cambridge side of the Notch.

Currently, there are twenty one High Crash Locations identified by the Vermont Agency of Transportation (VTrans) along State routes and Major Collectors in Stowe (Transportation Concerns Map 2, Appendix C). These locations include sections of state roads and intersections as well as portions of Major Collectors. The sites located along Vermont Routes 100 and 108 and ranged from six to sixty one crashes from 2008-2012. Many of these sites are located in Stowe Village, where the majority of development is located along VT Routes 100 and 108. One of the highest crash locations is where Route 108 meets Route 100, shown in the Areas of Local Concerns map. There are seven road segments on Route 100 and ten segments of Route 108 that have been identified as High Crash Locations by VTrans in the 2008-2012 High Crash Location Report: Sections and Intersections. Additional High Crash locations located along a Major Collector include portions of Stagecoach Road from the Morristown-Stowe town line to where Stagecoach meets Route 100. Accidents recorded along Stagecoach Road in Stowe from 2008-2012 ranged from six to seven crashes.

During 2006, a culvert study was conducted based on the Vermont Center for Geographic Information Bridge & Culvert Exchange Standards; this information is readily available at the Stowe town office. It is important for Stowe to maintain current information on the status of culverts and bridges because this
infrastructure impacts the ability of water to flow during flooding. Failure to maintain adequate sized culverts or the presence of a damaged culvert can cause blockage of water passage along rivers and streams; it is common for small streams to turn into rivers due to insufficient culverts. Managing culverts is both a mitigation action and a maintenance action. Blocked or undersized culverts can lead to road washouts, bridge failures, and overtopping of stream and riverine banks, which increases erosion or floods property and infrastructure.

To plan for culvert maintenance and replacement, the town conducts an annual program and schedule. LCPC will be working with the town to update their culvert inventory during this planning cycle. Critical bridges located in town are identified on the Transportation Concerns Map 2 in Appendix C. This map demonstrates bridges with a federal sufficiency rating of less than 50 (out of 100) and areas with high erosion concerns. Ten of the Bridges in Stowe have a federal sufficiency rating of less than 50. In 2010, VTrans identified 5 scour critical bridges which require closure in the event of high water or if settlement or movement of the structure is observed. These include: Bridge 36 at Nebraska Valley Road; Bridge 39 at Moss Glen Falls Rd.; Bridge 52 at Weeks Hill Road; Bridge 64 at Ranch Brook Road; Bridge 71 at Cemetery Road; and the Luce Hill Bridge. Three bridges in town are scheduled for replacement by VTrans in 2015, Bridge 208, Gold Brook Bridge (Rte. 100); Bridge 2, Bridge St. Bridge (Rte. 108); and Bridge 3 “Gables” Bridge (Rte.108).

Railroad accidents are not likely to directly affect Stowe (as there are no active lines through town), but response agencies could be taxed in the event of a railroad accident in the neighboring town of Waterbury.

3.5 Other Hazards

Structure Fire: According to data from 2010 Census, there are 3,526 housing units in Stowe. Historically, structure fires have been isolated incidences. The risk of large scale structure fires is relatively high in Stowe but the proximity of the Fire Department, capacity of the Fire Department, and preparedness of the Fire Department lessen the risk in the Village where buildings are fairly close together. The most significant risk involves commercial lodging facilities, particularly at the major resorts. A fire in 1980 at a major cross-country ski resort caused a mass evacuation of guests and led to the rebuilding of the entire resort.

Hail Storm: With Vermont’s variable weather patterns, hail is a four-season threat to both public and private property. While the likelihood of a severe hail storm is low, smaller storms may damage homes and automobiles. Hailstorms pose risk to the entire community.

Wild/Forest Fire: Across much of Vermont, small wildland and brush fires are common, but the probability of a major forest fire is very low. Peak wild fire season is in April, just after spring “green-up.” A second window of wildfire vulnerability typically occurs in early fall. Every town in Vermont has a designated Forest Fire Warden, who receives daily updates from the Division of Forestry during periods of elevated risk. The Division of Forestry also hosts annual Forest Fire Warden trainings at locations throughout the state. The risk of wildfires is most severe in outlying areas of development—away from the town’s major highways—where structures are surrounded by ignitable hard and softwood forests.

Drought: Droughts represent a hazard in late summer, when local spring and well levels are reduced to minimal flows. The local water table reached an all-time low during the nationwide drought of 1988;
however, recovery was fairly rapid. The town has no public water reservoirs if private wells go dry. Drought poses risk to the entire community.

**Earthquakes:** According to the U.S. Geological Survey (USGS), the risk of earthquakes in Vermont and much of northern New England is rated moderate, compared with the high risk attributed to much of the West Coast and lower-Midwest. Lamoille County has not experienced any property damage or loss of life attributed to an earthquake in its history.

**Landslides:** The risk of a landslide is most often associated with flooding, erosion, and other impacts of heavy rainfall. In recent years, the nearby communities of Cambridge and Johnson experienced property damage associated with streambank landslides. While landslides are a potential risk in Stowe, due to the scale of development in mountainous terrain, historically there have been no significant landslide events.

### 4. Mitigation Goals

#### 4.1 Town of Stowe Hazard Mitigation Goals

The following goals were evaluated and re-affirmed in 2014 by the local community as valid and effective:

- Provide the technical support for, and aid in the development of, implementation mechanisms at the local level that will serve to avoid land use investments that would be, over time, endangered by, incompatible or in conflict with fluvial adjustment and erosion processes and landslides.
- Encourage hazard mitigation planning as a part of the local planning process
- Endorse and support the implementation of the Lamoille County hazard mitigation goals

#### 4.2 Planning and Development Guidelines Supporting Hazard Mitigation

The current Stowe Town Plan was adopted on October 26, 2009. The town integrates hazard mitigation planning efforts through its Town Plan goals and policies. Stowe also has adopted zoning regulations, which incorporate flood hazard regulations designed to protect life and property from flood inundation. In addition, Stowe was the first town in the state of Vermont to adopt a permanent fluvial erosion hazard overlay district into its zoning regulations, limiting development not only within the mapped 100 year floodplain, but also within lands subject to bank erosion (based upon fluvial erosion hazard assessments by the Vermont Agency of Natural Resources). It is the only municipality in Lamoille County to adopt fluvial erosion hazard regulations.

Primary Town Plan goals that support hazard mitigation are:

- To ensure the public’s safety by providing a high level of police, fire and rescue services in an efficient and cost effective manner
- Continue to replace undersized water mains when possible to improve firefighting capabilities
- Reviewing existing emergency service and emergency response standards included in local land use and development regulations (e.g. subdivision regulations) and make revisions as appropriate to ensure that adequate fire protection facilities (hydrants, water supplies) and provision for emergency vehicle access are required for new development
• Work with the Lamoille County Planning commission (LCPC) to coordinate emergency planning with neighboring communities.
• Provide an efficient, cost effective, multi-modal transportation network that provides for the needs of Stowe’s residents and visitors
• Provide and maintain a high quality public water supply to areas of concentrated development, and the protection of public and private groundwater quality throughout the town
• Requiring that runoff and erosion are adequately controlled during all stages of development through the town’s zoning and subdivision regulations
• Restricting development in the Flood Hazard and Fluvial Erosion Hazard districts primarily to recreation and agricultural land uses, with the exception of those activities related to the maintenance and continued use of existing structures
• Continued administration of the Town’s flood hazard regulations, to be updated as needed to maintain eligibility in the National Flood Insurance Program
• Continued administration of the town’s Fluvial Erosion Hazard Overlay District to limit development in erosion-prone areas.

5. Mitigation Strategies
5.1 Changes in Mitigation Strategies and Completion of Past Mitigation Actions

Since the last Hazard Mitigation Plan update, the Town of Stowe has taken several actions and implemented numerous mitigation projects to reduce the impact of future storm and flooding damage. These projects include but are not limited to: adopting Fluvial Erosion and Flood Hazard regulations; adopting the 2011 VTrans Code and Bridge Standards; replacing/up sizing culverts on Stagecoach Rd, North Hollow Rd and Cemetery Rd; addressing exposed sewer mains near the Quiet Path; installing rip rap along banks of the Little River near the Stowe Recreation Path; obtained river corridor property easements along the Little River; and made structural repairs to the foundation of five bridges (Stowe Hollow Rd, Weeks Hill, Ranch Brook Rd, Luce Hill, Nebraska Valley Rd). While these projects represent direct mitigation actions it is important to recognize the indirect planning strategies taken in the past that have also reduced potential hazards to Stowe such as limiting clear cutting in subdivision regulations and reducing logging along ridgelines through the development of the 1998 Ridgeline Overlay District. While the District may have been created for visibility purposes, it maintains upland tree coverage and provides a windbreak for ridgeline properties as well as reduces erosion issues and reduces floodplain runoff. In the past few years the Town of Stowe has modified their approach to infrastructure repairs by considering the size of the watershed in which projects fall.

5.2 Existing Hazard Mitigation Programs, Projects and Activities

The following is a list of anticipated or recently completed mitigation programs, projects, or activities in the Town of Stowe. Notes for each section describe the completed, deleted or deferred mitigation action as a benchmark for progress; if activities are unchanged, a description has been provided as to why no changes occurred or are not necessary.

Community Preparedness Activities
• Adopted and maintain an Emergency Operations Plan (EOP). Completed. Stowe annually adopts a Local Emergency Operations Plan in accordance with DEMHS’ requirements.
- Participation at Local Emergency Planning Committee (LEPC) meetings and activities. *Ongoing.*
  - Stowe’s EMD is the Vice-Chair of the LEPC.
- Support mission and maintain members in the Lamoille County Community Emergency Response Team (CERT). *Deferred.* The Lamoille County CERT team is currently inactive, due to low membership.
- Ensure procedures are in place for rapid evacuation of essential facilities. *Ongoing.* Evacuation procedures created for Public Works Department and schools. Other facilities have not been evaluated for evacuation and action has been deferred due to undetermined risk. New EOC has an evacuation plan.
- Review and study the need for additional foam capability by the Fire Department to minimize the impact of a HAZMAT incident. *Complete.* Fire Dept. has foam capability and will be maintained.
- Ensure that all emergency response and management personnel receive HAZMAT Awareness training as a minimum. *Ongoing action by each department and will be continued through next planning cycle.*
- Continue to train public officials and local responders in the use of the Incident Command System. *Ongoing.* Stowe will complete DEMHS/VT DHS annual NIMS training survey to benchmark training progress.
- Continue to enhance training of the Emergency Management Director (EMD). *Ongoing.* EMD has taken several required courses for Emergency Management Director Certification program.
- Integrate additional mitigation measures in local land use planning and ordinance development processes. *Stowe is currently in the process of updating its town, maintains zoning and subdivision regulations (2012), and is the only town in Lamoille County to have adopted a fluvial erosion hazard zone.*

**Financial and Tax Incentives**
- Annual investment of local tax dollars in highway mitigation projects. *In Progress.* The town budgets road improvements in the annual highway department budget and bridge and culvert improvements in its capital budget.
- Use of State and Federal funding for mitigation projects and activities. *None completed to date but Stowe is currently working with staff on two potential FEMA projects.*

**Hazard Control and Protective Works**
- Develop a Highway Maintenance Program (culvert survey and replacement, ditching along roadways, cutting vegetation to allow visibility at intersections). *In Progress.* Maintenance priorities are dictated by local needs and budget considerations
- Adopt the revised Vermont Agency of Transportation recommended Codes and Standards for town highways. *Stowe adopted the revised Codes and Standards in April 2011. These standards have additional provisions to ensure investments in town highways are protected with proper drainage, ditching and construction techniques.*

**Insurance Programs**
- Participation in NFIP. *Ongoing*

**Land Use Planning/Management**
• Fluvial Erosion Hazard Overlay District adopted into the Town’s zoning regulations on June 23, 2008.
• West Branch Corridor Management Plan completed in 2004.
• Little River Corridor Management Plan completed in 2009.

Protection/Retrofit of Infrastructure and Critical Facilities
• Mapping of Critical and Essential Facilities. In progress. LCPC finished an update of its database of critical facilities in Lamoille County in 2012. Water supply and waste water facilities will be updated by the ANR. Data will be continually updated as needed.

Public Awareness, Training & Education
• Hazard Identification and Mapping. Completed as part of the development of this plan.
• Institute an Emergency Preparedness Education Program in the schools. Ongoing. Stowe Elementary participated in emergency planning in 2008 and both Stowe Middle and High School have emergency plans, which are reviewed by the Principals and EMD annually. Both the Stowe Middle and High School also have an exercise to secure the building each year, in addition to regular fire and evacuation drills.
• Support Family and Community Disaster Preparedness (LEPC) Deferred from last planning cycle. Progress was made on emergency preparedness planning to address local educational institutions and special populations. In this planning cycle efforts will focus on community notification of evacuation plans and mitigation resources. Free, FEMA supported resources and pamphlets will be distributed at the municipal offices, schools, and through the LEPC.
• Collaborate with American Red Cross chapter to assist with community education programs and shelter agreements.
• Distribute FireWise information during peak wild fire season. Deferred. LCPC has previously assisted communities with wild fire protection planning and is available to work with the town on disseminating this information during future wildfire seasons.

Public Protection
• Survey and designation of shelter(s). Complete.
• Auxiliary Power for Elementary School Shelter. Deferred Action. Lack of financial support on this issue resulted on no progress being made. Efforts will be made in the current planning cycle to complete this task.
• Hazard Vulnerability Assessments. Ongoing assessments following exercises and real events.
• Review and modify evacuation and sheltering plans based on the results of drills and exercises or procedures implemented in an actual incident, share results with community. Ongoing. Efforts will continue following planned drills and spring exercises by LEPC.
• Work with local and regional providers to develop informational database on special needs populations and elderly residents. In progress. The United Way of Lamoille County and Lamoille County Sheriff’s Department have engaged in a joint effort to map and maintain a database of special needs populations for all of Lamoille County.

Science and Technology
• Stream Geomorphic Assessments: Phase 1 and Phase 2 assessments along with a River Corridor Management Plan have been completed on the Little River and the West Branch Mainstem. Project Identification and Municipal Outreach occurred during this past planning cycle and the Town is actively involved in implementing projects identified in the River Corridor Management Plan on Little River. In
progress. LCPC will continue to assist the town with project implementation.

- Fluvial Geomorphic and Erosion Hazard Assessment to evaluate erosion potential in Stowe. Complete. A Fluvial Erosion Hazard (FEH) Risk Assessment and Map was developed for the West Branch Mainstem and the Town adopted an FEH Overlay Planning District along the West Branch Mainstem.

- Annually, review the Stowe Culvert inventory and scour critical bridges to prioritize and perform maintenance and repair while recording progress in implementation. Ongoing. Town has made annual progress (replacements plus maintenance) during last cycle and will continue with assistance from RPC.

- Work with the Lamoille County Transportation Advisory Committee to prioritize the replacement or retrofit of the Luce Hill Bridge in the VTrans capital program. In progress. VTrans has determined that the bridge warrants scour concern.

- Replace 8 foot stormwater culvert on Luce Hill Road that has failed (bottom has corroded out) to mitigate potential flooding hazards from runoff generated from Trapp Hill Road. The outlet of the new structure will require an energy dissipation device to eliminate erosion at the outlet. Deferred due to lack of funding for this action. Efforts will be made in the current planning cycle to complete this task.

- Replace 48-60” culvert on Cemetery Road and repair sink holds in roadway. Complete.

- Replace 48” culvert on Dewey Hill Rd., which is severely corroded. In progress. Town will be replacing this culvert in the current planning cycle.

- Replace 24” culvert on North Rd., which is also severely corroded. Complete.

- Reconstruct the Police, Fire, and Rescue facilities to more adequately meet the needs of the growing community. Complete. New EOC/Fire/Emergency facility construction finished and opened summer 2010.

- Secure funding for generators to ensure adequate backup power is available to elementary school shelter. Deferred due to lack of funding for this action. Efforts will be made in the current planning cycle to complete this task.

- Provide more emergency equipment and early warning systems for population of villages. Complete. New EOC has state of the art equipment and warning siren.

- Increase quantity of emergency equipment such as pumps, generators and drinking water storage systems to mitigate risk to community from flooding events. Wastewater treatment plant could utilize additional pumping equipment. Deferred due to lack of funding for this action. Efforts will be made in future planning cycles to complete this task.

### 5.3 Identified Hazard Mitigation Programs, Projects and Activities

The following identified programs, projects and activities are new and/or planned for the Town of Stowe. In Stowe, the major concern is the impact of serious flooding and a snow, wind or ice storm incident where power may be out and transportation routes to the town would be impacted, effectively leaving the general public and special needs populations at risk due to delayed response time. Highway accidents and mass casualty incidents are also of concern.

- Conduct municipal outreach and education about fluvial erosion hazards on the West Branch and Little River.

- Conduct annual review of the Stowe Culvert Inventory and scour critical bridges to assess need and perform maintenance and/or replacement.

- Secure funding for back-up generator for school shelter and water treatment facilities.

- Develop an evacuation plan for Stowe Village, existing and back-up EOCs, and Stowe Mountain Resort.
• Assess and mitigate slope failures on Barrows Road and River Road
• Amend Flood Hazard Regulations to prohibit development in the 100-year floodplain
• Draft and adopt a Flood Resiliency Element to the Stowe Town Plan
• Continue to obtain river corridor property easements along the Little River in the lower village.
• Widen span, remove, or replace Bridge 7 along the Stowe Recreation Path and relocate the path to reduce erosion and mitigate future repairs to this part of the Path that is repeatedly damaged.
• Work with the state and private property owners to evaluate the structural integrity of dams in Stowe and implement necessary upgrades or drainage measures
• Produce detailed maps of locations near private dams to allow first responders to respond effectively to potential dam failures
• Develop teams and coordinate EOC response including electric and road crew coordination
• Consider regulatory changes to reflect current State procedures and to strengthen new development against potential damage from hazards identified in this plan.

5.4 Priority Hazard Mitigation Actions

In 2004, a section of the Stowe Recreation Path upstream from the Luce Hill Rd. Bridge was replaced after a heavy rainstorm eroded the bank of the West Branch River.

For specific priority mitigation actions to address primary threats to the Town of Stowe including flood inundation, flash flooding, dam failure, windstorms and winter snow or ice storms please see Appendices A and B. Appendix A represents an evaluation of proposed mitigation actions based on: the likeliness of obtaining funding, ease of implementation, ability to protect threatened infrastructure, feasibility of a project, cost benefit, social acceptance and whether a project is considered environmentally sound.

Appendix B lists priority mitigation actions, hazards in which they aim to address, and town priority ranking based on a number of factors including 1) their impact to mitigate loss of life, property and infrastructure, 2) the role it plays in general public safety, 3) the tentative timing of planning activities, and 4) community support. When it comes to public safety, mitigation actions such as installing backup generators in emergency shelters and water treatment facilities as well as developing clear evacuation plans play a key role in reducing the loss of lives during hazardous events. These mitigation actions allow Stowe residents to be directed to safety and ensure critical life support supplies are available such as municipal water, food, heat and electricity.

Additionally, ensuring current infrastructure such as culverts, bridges and dams are structurally sound and functioning properly play a primary role in mitigating the impacts to property damage and people’s lives during major storm events. Failure of culverts, bridges, and dams in Stowe could cause significant structural damage downstream as well as potential isolation of residents and loss of lives. Aside from
structural infrastructure upgrades and direct emergency response equipment and materials, the Town of Stowe has prioritized various planning projects and studies in an effort to mitigate the impacts of future hazardous events. These priority planning activities include but are not limited to, projects such as amending Flood Hazard Regulations to prohibit development in the 100 year floodplain, obtaining river corridor property easements, mapping residential and commercial areas surrounding dams, and conducting Fluvial Erosion Assessments. It is important to recognize that many of these planning studies both directly and indirectly mitigate multiple threats to the community. For instance, prohibiting further development in the 100-year floodplain will directly reduce the impact/level of structural damage caused by future flooding. It also sustains existing tree canopy coverage and provides a windshield for certain structures.
<table>
<thead>
<tr>
<th>Mitigation Action</th>
<th>Responds to significant (likely or high risk) hazard</th>
<th>Likelihood of funding</th>
<th>Protect threatened infra-structure</th>
<th>Implemented quickly</th>
<th>Socially / Politically acceptable</th>
<th>Technically Feasible</th>
<th>Administratively Realistic</th>
<th>Reasonable cost to benefit</th>
<th>Environmentally sound</th>
<th>TOTAL SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace 8 foot storm water culvert on Luce Hill Road to mitigate potential flooding hazards from runoff generated from Trapp Hill Road</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>Continue Fluvial Geomorphic and Erosion Hazard Assessment through project identification/municipal outreach and implement priority assessment erosion control measures. Develop mitigation strategies and actions from project identification.</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td>Replace 48” culvert on Dewey Hill Road, which is severely corroded and causes blockage of water</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
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<td>43</td>
</tr>
<tr>
<td>Widen span or remove bridge 7 along the Stowe Recreation Path and relocate the path. This project would address floodplain and sediment stabilization improvements.</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3</td>
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<td>32</td>
</tr>
<tr>
<td>Conduct annual review of the Stowe Culvert Inventory and scour critical bridges to assess need and perform maintenance and/or replacement</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td>Secure funding for back-up generators and install at the Stowe Water Treatment Plant, Pump Stations, and back-up emergency shelter</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>Develop an evacuation plan for Stowe Village/Lower Village, Town EOCs and Stowe Mountain Resort. Back up EOCs should be located out of the Flood Hazard Area. Coordinate traffic control between Town and resort.</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>Luce Hill Bridge upgrades. Bridge has been severely damaged and repaired multiple times due to restricted passage. Bridge should be widened and fill removed to allow proper water flow.</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>33</td>
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<tr>
<td>Task Description</td>
<td>Score</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>6</td>
<td>7</td>
<td>Total</td>
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</tr>
<tr>
<td>Develop teams and coordinate EOC response including electric and road crew coordination during hazardous events to improve response times and mitigate property/infrastructure damage and improve road safety conditions.</td>
<td></td>
<td>3</td>
<td>2</td>
<td>3</td>
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<td>3</td>
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<td>4</td>
<td>3 29</td>
<td></td>
</tr>
<tr>
<td>Produce detailed maps of locations near private dams to allow first responders to respond effectively to potential dam failures</td>
<td></td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3 33</td>
<td></td>
</tr>
<tr>
<td>Review latest inspection report of Lake Mansfield, and Stowe Mountain Resort dams and work with private owners to promote the implementation of necessary dam upgrades or drainage.</td>
<td></td>
<td>3</td>
<td>2</td>
<td>5</td>
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<td>3</td>
<td>4 28</td>
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</tr>
<tr>
<td>Consult with the land owner and state to evaluate the structural integrity of the Moscow Dam and proposal for removal if necessary to protect life and property downstream.</td>
<td></td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4 29</td>
<td></td>
</tr>
<tr>
<td>Assess and mitigate slope failures on Barrows Road and River Road</td>
<td></td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2 31</td>
<td></td>
</tr>
<tr>
<td>Amend Stowe Flood Hazard Regulations to prohibit development within the 100 year floodplain and strengthen standards.</td>
<td></td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5 35</td>
<td></td>
</tr>
<tr>
<td>Continue to obtain River Corridor property easements along the Little River in the lower village to reduce flooding and stream bank erosion</td>
<td></td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5 35</td>
<td></td>
</tr>
<tr>
<td>Add Flood Resiliency Element to the Stowe Town Plan to promote integration of LHMP and municipal plan</td>
<td></td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3 32</td>
<td></td>
</tr>
<tr>
<td>Public Awareness of hazards: improve advance warning notice of severe storms, proper fuel-burning equipment storage, severe weather driver education, earthquake awareness materials, and distribute severe traveler emergency preparedness materials</td>
<td></td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>5 31</td>
<td></td>
</tr>
<tr>
<td>Consider and amend, if feasible, zoning updates to conform to changes in Vermont River Corridor Protection procedures and upgrade standards for burying power lines, roof loads for snow, and other weather-related changes</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>2 32</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix B. Mitigation Projects Town Prioritization

<table>
<thead>
<tr>
<th>MITIGATION ACTION</th>
<th>WHO (LEADERSHIP)</th>
<th>Town Prioritization</th>
<th>W (FUNDING SOURCE)</th>
<th>HAZARD BEING MITIGATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widen span or replace bridge 7 along the Stowe Recreation Path and relocate the</td>
<td>Stowe Public Works Director, LCPC</td>
<td>1</td>
<td>Stowe Capital Budget; Stowe Land Trust; FEMA grants; other grant funds as</td>
<td>Flood</td>
</tr>
<tr>
<td>path to avoid future damage. This project would address floodplain and sediment</td>
<td>Senior Planner, DEMHS Mitigation Planner</td>
<td></td>
<td>appropriate</td>
<td></td>
</tr>
<tr>
<td>stabilization improvements and storage.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace 48” culvert on Dewey Hill Road which is severely corroded; mitigation</td>
<td>Stowe Public Works Director</td>
<td>2</td>
<td>Stowe Capital Budget</td>
<td>Flood</td>
</tr>
<tr>
<td>would reduce damage from flooding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace 8” storm water culvert; bridge on Luce Hill Road to mitigate potential</td>
<td>Stowe Town Manager, Stowe Public Works,</td>
<td>3</td>
<td>Stowe Capital Budget, VT Agency of Transportation, FEMA grants</td>
<td>Flood</td>
</tr>
<tr>
<td>flooding hazards from runoff generated from Trapp Hill Road – undersized and not</td>
<td>LCPC Regional Planner</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>appropriate for volume of water</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Conduct annual review of the Stowe Culvert Inventory and scour critical bridges</td>
<td>Stowe Public Works Director, LCPC</td>
<td>4</td>
<td>Stowe work program, LCPC’s Transportation Planning funds</td>
<td>Flood</td>
</tr>
<tr>
<td>to assess need and perform maintenance and/or replacement</td>
<td>Transportation Planner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assess and mitigate slope failures on Barrows Road and River Road based on</td>
<td>Stowe EMD and Public Works Director,</td>
<td>5</td>
<td>State/ federal grants; Town funds; LCPC’s Transportation Planning funds</td>
<td>Flood, Landslides</td>
</tr>
<tr>
<td>engineering results</td>
<td>LCPC Transportation Planner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secure funding for back-up generators and install at the Water Treatment Plant and</td>
<td>Stowe EMD, Stowe Public Works Director,</td>
<td>6</td>
<td>State/ federal grants; Town funds; LCPC’s Transportation Planning funds</td>
<td>All</td>
</tr>
<tr>
<td>Pump Stations.</td>
<td>School Board</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop an evacuation plan for Stowe Village/Lower Village, Town EOC and Stowe</td>
<td>Stowe EMD, LCPC Regional Planner, Stowe</td>
<td>7</td>
<td>Stowe annual emergency response appropriations</td>
<td>All</td>
</tr>
<tr>
<td>Mountain Resort. Back up EOC and emergency shelter should be located out of the</td>
<td>Mountain Resort Public Safety lead</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flood Hazard Area. Coordinate traffic control between Town and Resort.</td>
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<tr>
<td>Secure funding for generator and install at the back-up emergency shelter</td>
<td>Stowe EMD, School Board</td>
<td>8</td>
<td>State/ federal grants; Town funds; LCPC’s Transportation Planning funds</td>
<td>All</td>
</tr>
<tr>
<td>(currently Stowe Elementary School)</td>
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</tr>
<tr>
<td>Review latest inspection report of Lake Mansfield, and Stowe Mountain Resort</td>
<td>Stowe EMD, ANR Rivers Program, Private</td>
<td>9</td>
<td>ANR grants, Land Owners, Town of Stowe, Federal grants</td>
<td>Flood, Winter Storms</td>
</tr>
<tr>
<td>dams and work with private owners to promote the implementation of necessary dam</td>
<td>Land Owners</td>
<td></td>
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<tr>
<td>upgrades or drainage.</td>
<td></td>
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</tr>
</tbody>
</table>

**Source**: Town of Stowe, Federal grants, VT Agency of Transportation, ANR grants, Land Owners, Stowe Capital Budget.
Consult with the land owner and state to evaluate the structural integrity of the Moscow Dam and proposal for removal if necessary to protect life and property downstream.

<table>
<thead>
<tr>
<th>Task</th>
<th>Responsible Parties</th>
<th>Method/Grant Source</th>
<th>Disaster Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produce detailed maps of locations near private dams to allow first responders to respond effectively to potential dam failures</td>
<td>Stowe EMD, Stowe Mountain Rescue Chief, LCPC GIS Planner</td>
<td>LCPC’s Emergency management grant</td>
<td>Flood, Dam Failure</td>
</tr>
<tr>
<td>Public Awareness of hazards: improve advance warning notice of severe storms, proper fuel-burning equipment storage, severe weather driver education, earthquake awareness materials, and distribute severe traveler emergency preparedness materials</td>
<td>Stowe Town Planner, Stowe EMD, LCPC Regional Planner</td>
<td>FEMA materials, LEPC 11</td>
<td>All</td>
</tr>
<tr>
<td>Develop teams and coordinate EOC response including electric and road crew coordination during hazardous events to improve response times and mitigate property/infrastructure damage and improve road safety conditions.</td>
<td>Stowe EMD; Stowe Public Works Director</td>
<td>Fire Department, Stowe EMS</td>
<td>All</td>
</tr>
<tr>
<td>Continue Fluvial Geomorphic and Erosion Hazard Assessment through project identification/municipal outreach and implement priority assessment erosion control measures.</td>
<td>LCPC GIS Planner; ANR Rivers Program; Stowe Town Planner</td>
<td>State and Federal Grants</td>
<td>Flood, Landslides</td>
</tr>
<tr>
<td>Amend Stowe Flood Hazard Regulations to prohibit development within the 100 year floodplain</td>
<td>Stowe Town Planner</td>
<td>Town of Stowe, VT Agency of Commerce and Community Development grant</td>
<td>Flood</td>
</tr>
<tr>
<td>Continue to obtain River Corridor property easements along the Little River in the lower village to reduce flooding and stream bank erosion</td>
<td>Stowe Town Planner, Stowe Land Trust</td>
<td>Town of Stowe, VT ANR, Stowe Land Trust fundraising</td>
<td>Flood</td>
</tr>
<tr>
<td>Add Flood Resiliency Element to the Stowe Town Plan to integrate this hazard mitigation plan with other municipal planning goals and objectives</td>
<td>Stowe Town Planner</td>
<td>Corporate as part of plan update</td>
<td>Flood</td>
</tr>
<tr>
<td>Consider and amend, if feasible, zoning updates to conform to changes in Vermont River Corridor Protection procedures and upgrade standards for burying power lines, roof loads for snow, and other weather-related changes</td>
<td>Stowe Town Planner, Stowe Planning Commission</td>
<td>Corporate as part of regular updates</td>
<td>Flood, Snow Storm, Windstorm, Power Outage</td>
</tr>
</tbody>
</table>
TRANSPORTATION CONCERNS
TOWN OF STOWE

For planning purposes only. Not for regulatory interpretation.

Transverse Mercator,
VT State Plane,
Meters, NAD83.

Lamoille County
Planning Commission
PO Box 1637, 52 Portland Street
Morrisville, VT 05661
802.888.4548 f 802.888.6938
www.lcpcvt October 2014

0 0.75 1.5 Miles

Legend

BRIDGE WITH FEDERAL SUFFICIENCY RATING LESS THAN 50 (OUT OF 100)
HIGH ACCIDENT LOCATION
HIGH ROAD EROSION RISK
RIVER CORRIDOR FEH RATING
Extreme
Very High
High
Moderate
Low
Very Low
Not Rated
SPECIAL FLOOD HAZARD AREA

Data Sources:
Bridge Federal Sufficiency Ratings: VTrans, 2009
Critical Culverts: Culverts rated as "critical" or "urgent" in inventories conducted by LCPC since 2011.
Flood Hazard Areas: Digital Flood Insurance Rate Map (DFIRM), FEMA, 2006. Floodplains for planning purposes only.
River Corridor/Fluvial Erosion Hazard Areas: LCPC and VT ANR River Management, various dates. Much FEH boundary data is based on partial stream assessments and therefore is preliminary in nature.
High Road Erosion Risk: Derived from 2014 statewide GIS analysis using soils, slope, and proximity to surface waters.
Extremely Hazardous Sites in Stowe

Map Key
- EHS

Critical Facility Type
- Agriculture, Food, & Livestock
- Banking & Finance
- Commercial & Retail
- Education
- Emergency Response & Law Enforcement
- Energy
- Government & Military
- Health & Medical
- Industry
- Information & Communication
- Mail & Shipping
- Transportation Facilities
- Water Supply & Treatment

Roads, AOT Class
- State Highway
- Class 1 Road
- Class 2 Road
- Class 3 Road
- Class 4 Road
- Private Road

Sources:
- E-911 Roads Database, VT DEMHS, 2013
- Critical Facilities Database, VT DEMHS, 2012

Projection:
- Traverse Mercator
- VT State Plane, NAD83

Date: November 14, 2014

Lamoille County Planning Commission
PO Box 1637, 52 Portland Street
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This map is for planning purposes only. Not for regulatory interpretation.
Figure 1: Site Location Plan

LOCATION OF UPPER GOLF COURSE RESERVOIR DAM

APPROXIMATE SCALE 1"=2 MILES

Note: Base plan derived from Google Maps. ©2014 Google
Emergency Action Plan (EAP) - DRAFT

Lake Mansfield Dam

National Inventory of Dams (NID) No. VT00100
State ID: 199.01
Stowe, Vermont

Lake Mansfield Trout Club
With assistance from the
Vermont Department of Environmental Conservation Dam Safety Section &
Weston & Sampson Engineers, Inc.

Reviewed and Updated:


Date  Date

Copy ___ of ___